

Cultural Heritage - Heritage Assets within Marine Plan Areas

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

Undesignated Heritage Assets: known and potential (Cultural_85-90)

- Prehistoric heritage assets pre-dating the Late Glacial Maximum(LGM)
- Prehistoric heritage assets post-dating the Late Glacial Maximum
- Coastal sites and structures – inshore
- Maritime heritage assets – especially in vicinity of estuaries and navigational hazards
- Aviation heritage assets

Designated Heritage Assets

- There are numerous Scheduled Monuments, Listed Buildings and Registered Parks and Gardens, including in estuaries and tidal rivers. (Cultural_74,75, 78)
- There are no wrecks protected under the Protection of Wrecks Act (PWA) 1973. (Cultural_76)
- The following World Heritage Sites abut or overlap the marine plan area: Frontiers of the Roman Empire (Hadrian's Wall); Liverpool - Maritime Mercantile City. (Cultural_77)
- There are wrecks protected under the Protection of Military Remains Act (PMRA) 1986. (Cultural_71)
- All military air crash sites are automatically protected under the PMRA 1986. (Cultural_72)

Baseline/issues: North East Plan Area 1 2

Undesignated Heritage Assets: known and potential (Cultural_85-90)

- Prehistoric heritage assets pre-dating the Late Glacial Maximum
- Prehistoric heritage assets post-dating the Late Glacial Maximum
- Coastal sites and structures – inshore
- Maritime heritage assets – especially in vicinity of estuaries and navigational hazards e.g. Farn Islands
- Aviation heritage assets

Designated Heritage Assets

- There are numerous Scheduled Monuments, Listed Buildings and Registered Parks and Gardens, including in estuaries and tidal rivers. (Cultural_74,75, 78)
- There are two wrecks protected under the PWA 1973. (Cultural_76)
- The following World Heritage Site overlaps the marine plan area: Frontiers of the Roman Empire (Hadrian's Wall). (Cultural_77)
- The Registered Battlefield of the Battle of Newburn Ford lies partly within the marine plan area on the Tyne estuary. (Cultural_79)
- There are wrecks protected under the PMRA 1986. (Cultural_71)
- All military air crash sites are automatically protected under the PMRA 1986. (Cultural_72)

Baseline/issues: South West Plan Area 8 9

Undesignated Heritage Assets: known and potential (Cultural_85-90)

- Prehistoric heritage assets pre-dating the Late Glacial Maximum
- Prehistoric heritage assets post-dating the Late Glacial Maximum
- Coastal sites and structures – inshore
- Maritime heritage assets – especially in vicinity of estuaries and navigational hazards e.g. The Lizard
- Aviation heritage assets

Designated Heritage Assets

- There are numerous Scheduled Monuments, Listed Buildings and Registered Parks and Gardens, including in estuaries and tidal rivers. (Cultural_74,75, 78)
- There are thirteen wrecks protected under the PWA 1973 within the plan areas. (Cultural_76)
- The following World Heritage Site – which encompasses several discrete areas – abuts or overlaps the marine plan area: Cornwall and West Devon Mining Landscape. (Cultural_77)
- There are wrecks protected under the PMRA 1986. (Cultural_71)
- All military air crash sites are automatically protected under the PMRA 1986. (Cultural_72)

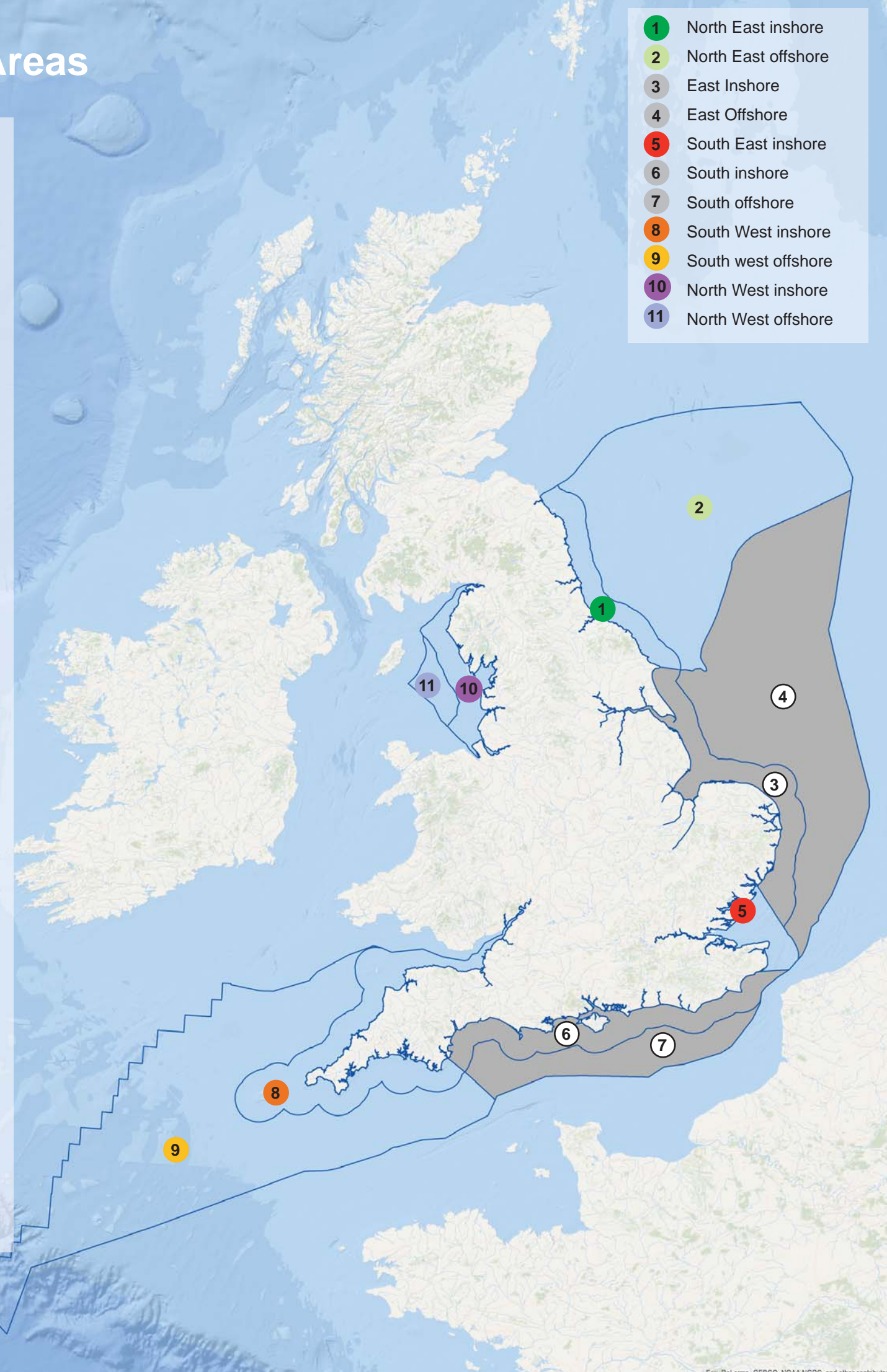
Baseline/issues: South East Plan Area 5

Undesignated Heritage Assets: known and potential (Cultural_85-90)

- Prehistoric heritage assets pre-dating the Late Glacial Maximum – potential especially high
- Prehistoric heritage assets post-dating the Late Glacial Maximum
- Coastal sites and structures – inshore
- Maritime heritage assets – especially in vicinity of estuaries and navigational hazards e.g. Goodwin Sands
- Aviation heritage assets – presence and potential especially high

Designated Heritage Assets

- There are numerous Scheduled Monuments, Listed Buildings and Registered Parks and Gardens, including in estuaries and tidal rivers. (Cultural_74,75, 78)
- There are eight wrecks protected under the PWA 1973 within the plan areas. (Cultural_76)
- The following World Heritage Sites abut or overlap the marine plan area: Royal Botanic Gardens, Kew; Maritime Greenwich; Palace of Westminster, Westminster Abbey and St. Margaret's Church. (Cultural_77)
- The Registered Battlefield of the Battle of Maldon abuts the marine plan area. (Cultural_169)
- There are wrecks protected under the PMRA 1986. (Cultural_71)
- All military air crash sites are automatically protected under the PMRA 1986. (Cultural_72)



Cultural Heritage - Heritage Assets within Marine Plan Areas

Summary of the legislative / policy context

The historic environment includes all aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged. Those elements of the historic environment – buildings, monuments, sites or landscapes – that have been positively identified as holding a degree of significance meriting consideration are called 'heritage assets'.

There is a general presumption that heritage assets should be conserved, encompassing the entire scope of marine planning and all forms of heritage assets. The rationale for conservation is the contribution of heritage assets to quality of life, both to this and future generations. The significance of heritage assets is the principal driver in establishing the form and degree that conservation should take.

The conservation of designated heritage assets must encompass both the heritage asset itself and the setting within which it is appreciated, which may be much more extensive than the asset itself. There is a general presumption in favour of the conservation of designated heritage assets within an appropriate setting. The more significant the asset, the greater should be the presumption in favour of its conservation. Substantial loss or harm to designated assets should be exceptional, and should not be permitted unless it can be demonstrated that the harm or loss is necessary in order to deliver social, economic or environmental benefits that outweigh the harm or loss. (Cultural_70) Specific guidance applies in respect of the legislation and policies applicable to historic military wrecks in offshore marine plan areas.

Non-designated assets have to be conserved in a manner appropriate and proportionate to their significance. Non-designated heritage assets that are demonstrably of equivalent significance to designated heritage assets should be considered to be subject to the same policy principles as designated heritage assets. Details of non-designated heritage assets in inshore marine plan areas can be obtained from Historic England's National Record of the Historic Environment

Applications for marine licences to carry out archaeological investigations occur in each marine plan area. Licences are sought predominantly by groups of volunteers who play a very valuable role in the management of designated heritage assets. Standards for archaeological investigations are set out in codes of practice and guidance. The UK Government has adopted the Annex to the 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage as being best practice in the archaeological and cultural management of underwater sites and artefacts.

There is an obligation to take into account the potential discovery of marine assets in developing and implementing marine plans

Where the loss of the whole or a material part of a heritage asset's significance is justified, the MMO is obliged to identify and require suitable mitigating actions to record and advance understanding of the significance of the heritage asset before it is lost

The historic environment of coastal and offshore zones can be a powerful driver for economic growth, attracting investment and tourism and sustaining enjoyable and successful places in which to live and work. The marine historic environment already plays an important role in place-making and tourism, though this is often not recognised in official measures (see data gaps, below)

Key cross cutting baseline / issues across all plan areas

Although there is generally good provision for marine heritage assets in marine licensing procedures, experience of the particular issues associated with each licensing sector may vary both between sectors and between marine plan areas. Specific guidance is available for some sectors (e.g. aggregates; offshore wind; ports; wave and tidal energy). (Cultural_166)

Public authority functions and decision-making can have major implications for heritage assets. Some public authorities have direct access to in-house historic environment expertise or draw upon the advice of Historic England as the Government's adviser on the historic environment. However, public authorities have not always sought or adopted historic environment advice consistently with respect to their functions and decision-making in marine areas. (Cultural_82)

Various activities in marine plan areas have implications for the conservation of heritage assets but are not subject to licensing or, directly, to public authority decision-making. Depending on circumstances, these may include activities such as anchoring, diving and some forms of fishing. The character and magnitude of effects on the marine historic environment arising from unregulated activities may not have been quantified. Marine plans will need to consider what indirect measures can be taken to conserve heritage assets in respect of activities that are not regulated directly. (Cultural_167)

Processes such as erosion are known to be causing heritage assets to be exposed and degraded in the coastal zone. These processes are likely to be related to changing weather conditions - especially increased storminess - associated with climate change. Comparable changes may be occurring to heritage assets in fully sub-tidal areas, where changes to the seabed can result in hitherto buried material being exposed, causing collapse and prompting decay from a variety of chemical, biological and physical processes. In some cases, seabed erosion may be cyclical, but the exposure of archaeological material that has lain undisturbed for many decades if not centuries suggests that there are long term processes underway that may not reverse naturally. (Cultural_168)

The vast majority of heritage assets in marine plan areas are not designated, for a variety of reasons. For example, statutory heritage provisions may not encompass the particular type of asset (e.g. prehistoric sites without structures), or the area within which the asset is located (e.g. Offshore marine plan areas). Many forms of designation are discretionary so the view may be taken that designation is not appropriate to the management circumstances. It is important for sea-users and decision-makers to be clear that lack of designation does not imply lack of significance. (Cultural_68)

Previously unknown but highly significant heritage assets continue to be discovered in marine plan areas. In addition, some heritage assets that are already known prove to have much greater significance than might have been assumed. Examples include Palaeolithic flint tools discovered off East Anglia; significant shipwrecks investigated in the Thames and off Poole; and discoveries of rare WWII aircraft; among others. (Cultural_64)

Practice in respect of recording and investigating heritage assets affected by marine activities is increasingly well established. However, examples of this understanding being advanced through scientific literature or shared with the wider public as a result of marine planning are rare. (Cultural_61)

Applications for marine licences to carry out archaeological investigations that satisfy the requirements of marine plans and heritage advisors ought to be encouraged for their role in recording, advancing understanding, and engaging the public in the conservation of the marine historic environment. Groups licensed to carry out intrusive investigations under the Protection of Wrecks Act 1973 must also obtain a licence under the Marine and Coastal Access Act 2009. (Cultural_58)

The likely evolution of the environment over the plan duration

- Erosion of shorelines and of intertidal surfaces will damage or destroy heritage assets of all forms, both designated and undesignated.
- Changes in sedimentation – especially the movement of bedforms – will result in heritage assets being uncovered and exposed to damage.
- Increasing sea temperatures may prompt greater damage to submerged heritage assets as a result of biological and chemical changes in their environment.
- The positive trend for the marine historic environment arising from improvements in policy provision, particularly with respect to the decisions and actions of public authorities and the pressure of licensable activities, is dependent on continuing investment in regulatory and curatorial capabilities.
- Streamlined licensing of marine archaeological activities will facilitate investigation and awareness of the marine historic environment, especially amongst volunteer groups.
- Greater recognition of the value of the marine historic environment in social and economic terms should result in increased benefits being achieved in coastal communities.
- Restrictive licencing within the expanding network of Marine Protected Areas (MPAs) could curtail archaeological investigations in these area

Potential interactions with other topics

- Climate change is having a direct impact on heritage assets on shorelines and in intertidal areas, and may be having indirect impacts on submerged material through biological, chemical and physical changes (geology / water quality).
- Nature conservation measures (e.g. designation of MPAs for benthic and ornithology interest etc.) may have implications for access to heritage assets and/or the conduct of archaeological investigations.
- Consents for marine development (aggregates; ports; energy) and other licensable activities are directly relevant to the sustainable management of the marine historic environment.
- Fisheries may have an impact on the marine historic environment but this user group are also an important source of information.
- The marine historic environment is important as a source of economic and social benefits to coastal communities through leisure, recreation and tourism etc.
- The presence of, and access to, heritage assets is increasingly recognised as being important to wellbeing.
- There is a close relationship between the presence of heritage assets and the character, value and appreciation of landscape / seascape.

Cultural Heritage - Heritage Assets within Marine Plan Areas

Potential transboundary issues

- The historic environment is essentially seamless and its character may not reflect or respect current environmental, legal or administrative boundaries.
- Deposits of pre- and post-LGM date with the presence or potential for heritage assets may extend across boundaries, both between UK home countries and between the UK and other countries.
- Extensive heritage assets and landscapes/seascapes may cross boundaries, both between UK home countries and between the UK and other countries; for example the 'War Channel' on the east coast in the First and Second World War that extended into the marine plan area of Scotland.
- Maritime and aviation heritage assets are commonly subject to legal and cultural interests that originate beyond England.

Key data gaps

There is currently no publicly-accessible, comprehensive and authoritative mapping of the following:

- Heritage assets in offshore marine plan areas. (Cultural_93)
- Potential presence of pre-LGM heritage assets in Inshore or Offshore marine plan areas. (Cultural_91)
- Potential presence of post-LGM heritage assets in Inshore or Offshore marine plan areas. Partial and/or non-mapped coverage is provided by the results of Marine Aggregate Levy Sustainability Fund (ALSF) Regional Environmental Characterisation (REC) surveys and secondary sources. Previous attempts at national mapping (e.g. Waterlands) have demonstrated problems and limitations.(Cultural_92)
- Shipwrecks subject to the PMRA 1986. Some appear to be included in the MMO Planning Portal layer 'Protected Wrecks' though the derivation is unclear. It should be noted that vessels designated as Protected Places are referred to in statute by name rather than position.(Cultural_80)
- Known air crash sites subject to the PMRA 1986.(Cultural_81)
- Discoveries of marine heritage assets since the introduction of MCAA 2009. Partial coverage could be derived from reports made under sector- and scheme-specific Protocols for Archaeological Discoveries.(Cultural_65)
- Heritage assets recorded, investigated or published as a result of licences issued by the MMO.(Cultural_62)
- Marine licences granted for archaeological investigations. Individual queries of the Public Register can be made using the activity type 'Removal - Wrecks and other archaeological remains'. (Cultural_59)
- The role of the marine historic environment is rarely identified specifically in the official statistics presented in Taking Part and Heritage Counts. This prevents quantification of the baseline for this issue and impedes the identification of actions through which marine planning could augment the social and economic benefits of the marine historic environment. (Cultural_55)

Cultural Heritage - Heritage Assets Adjacent to Marine Plan Areas

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

There are very large numbers of heritage assets in the immediate vicinity of the marine plan area. They include both designated and non-designated heritage assets. Designated heritage assets in the vicinity of marine plan areas include World Heritage Sites (Frontiers of the Roman Empire (Hadrian's Wall); Liverpool - Maritime Mercantile City), Scheduled Monuments, Listed Buildings, Registered Parks and Gardens and Registered Battlefields. The setting of such assets, which will extend to marine plan areas in many cases, may contribute to their significance. (Cultural_12)

Heritage assets in the immediate vicinity of marine plan areas are often the focus of specific local plan policies. (Cultural_48)

Baseline/issues: North East Plan Area 1 2

There are very large numbers of heritage assets in the immediate vicinity of the marine plan area. They include both designated and non-designated heritage assets. Designated heritage assets in the vicinity of marine plan areas include World Heritage Sites (Frontiers of the Roman Empire (Hadrian's Wall)), Scheduled Monuments, Listed Buildings, and Registered Parks and Gardens. The setting of such assets, which will extend to marine plan areas in many cases, may contribute to their significance. (Cultural_12)

Heritage assets in the immediate vicinity of marine plan areas are often the focus of specific local plan policies. (Cultural_48)

Baseline/issues: South West Plan Area 8 9

There are very large numbers of heritage assets in the immediate vicinity of the marine plan area. They include both designated and non-designated heritage assets. Designated heritage assets in the vicinity of marine plan areas include World Heritage Sites (Cornwall and West Devon Mining Landscape), Scheduled Monuments, Listed Buildings, Registered Parks and Gardens and Registered Battlefields. The setting of such assets, which will extend to marine plan areas in many cases, may contribute to their significance. (Cultural_12)

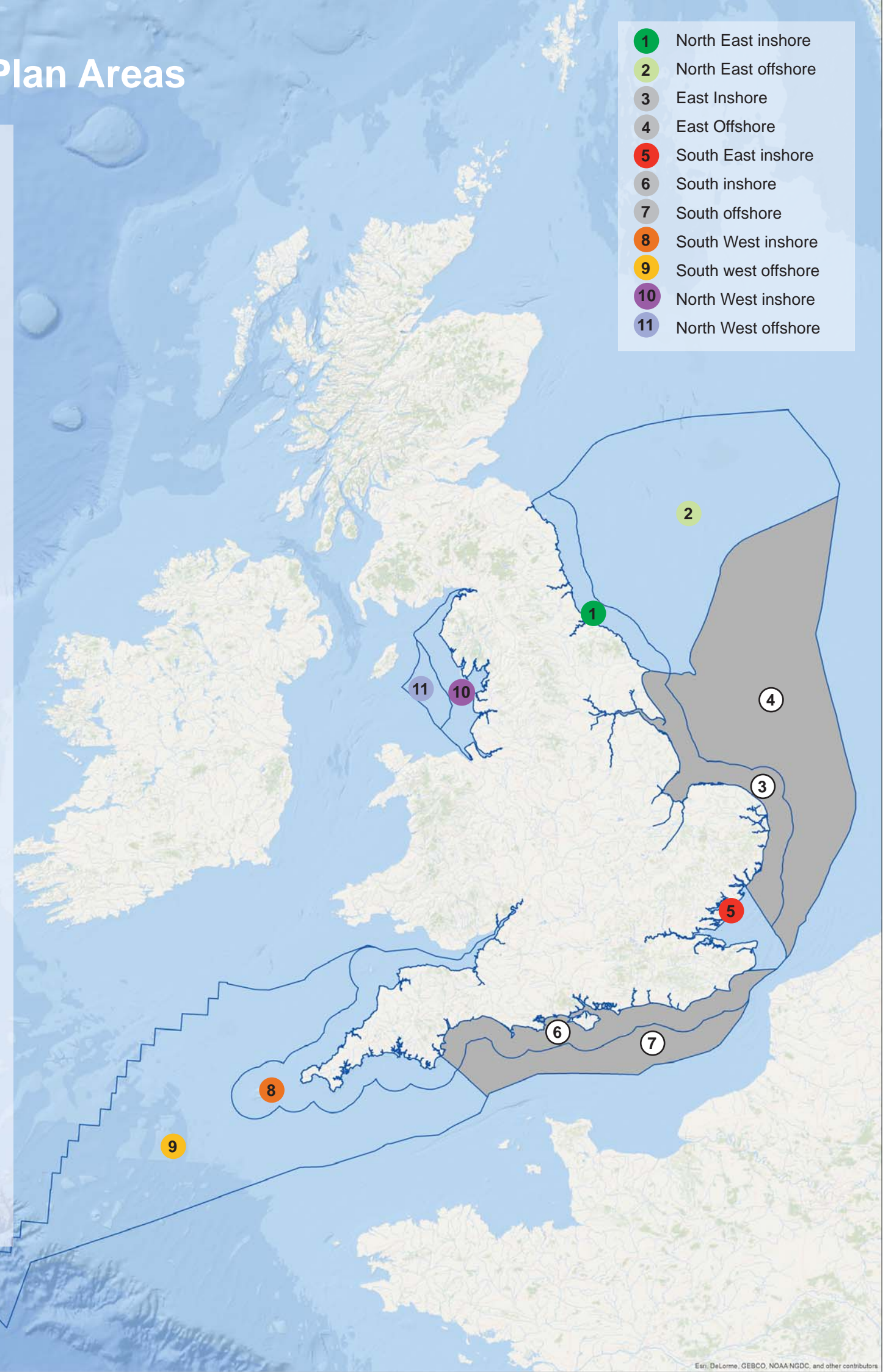
Heritage assets in the immediate vicinity of marine plan areas are often the focus of specific local plan policies. (Cultural_48)

Baseline/issues: South East Plan Area 5

There are very large numbers of heritage assets in the immediate vicinity of the marine plan area. They include both designated and non-designated heritage assets. Designated heritage assets in the vicinity of marine plan areas include World Heritage Sites (Royal Botanic Gardens, Kew; Maritime Greenwich; Palace of Westminster, Westminster Abbey and St. Margaret's Church), Scheduled Monuments, Listed Buildings, Registered Parks and Gardens and Registered Battlefields. The setting of such assets, which will extend to marine plan areas in many cases, may contribute to their significance. (Cultural_12)

Heritage assets in the immediate vicinity of marine plan areas are often the focus of specific local plan policies. (Cultural_48)

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- 11 North West offshore



Cultural Heritage - Heritage Assets Adjacent to Marine Plan Areas

Summary of the legislative / policy context

The historic environment includes all aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged. Those elements of the historic environment – buildings, monuments, sites or landscapes – that have been positively identified as holding a degree of significance meriting consideration are called 'heritage assets'.

Conserving heritage assets in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations, is a core planning principle of the National Planning Policy Framework (NPPF).

Planning is expected to conserve and enhance the historic environment, including both designated and non-designated heritage assets and their settings. (Cultural_14)

Planning is also expected to set out positive strategies that take into account the wider social, cultural, economic and environmental benefits that conservation of the historic environment can bring.

Numerous local plans in the vicinity of marine plan areas include policies on the conservation, enhancement and benefits of heritage assets.

Key cross cutting baseline / issues across all plan areas

The significance of heritage assets in the immediate vicinity of marine plan areas is susceptible to impacts arising from activities within marine plan areas. (Cultural_49)

For heritage assets in the vicinity of marine plan areas, marine plans could have an important role in supporting positive strategies on - for example - place-making and marine tourism. Equally, marine plan policies that do not take into account heritage assets in the vicinity of marine plan areas could undermine or detract from such social and economic benefits. (Cultural_13)

The likely evolution of the environment over the plan duration

- Heritage assets of all forms, both designated and undesignated, that are immediately outside the marine plan area but close to the shoreline will be damaged or destroyed by erosion.
- Shoreline change will result in some heritage assets being uncovered and exposed to damage, whilst other heritage assets that are currently visible will become buried and inaccessible.
- There is likely to be increasing sensitivity to proposed developments within the marine plan area that affect the setting of heritage assets on the coast.
- There will be increasing recognition of the value of coastal heritage assets in social and economic terms, especially in coastal communities.

Potential interactions with other topics

- Climate change is having a direct impact on heritage assets on or close to shorelines.
- Nature conservation measures (e.g. designation of MPAs for benthic and; ornithology interest etc.) may have implications for access to heritage assets and/or the conduct of archaeological investigations.
- Consents for marine development e.g. (ports, energy etc.) that have implications for the setting of heritage assets at the coast are directly relevant to the sustainable management of the historic environment.
- The continued viability of fisheries may be important for the historic character of coastal settlements.
- The marine historic environment is important as a source of economic and social benefits to coastal communities through e.g. leisure, recreation and tourism.
- The presence of, and access to, heritage assets is increasingly recognised as being important to wellbeing.
- There is a close relationship between the presence of heritage assets and the character, value and appreciation of landscape / seascape.

Potential transboundary issues

- The historic environment is essentially seamless and its character may not reflect or respect current environmental, legal or administrative boundaries.
- Prehistoric deposits that pre-date and post-date the Late Glacial Maximum may cross the landward boundary (i.e. Mean High Water Springs) of marine plan areas.
- Maritime heritage assets associated with features within the marine plan area – such as estuaries – may be found beneath land outside the marine plan area as a result of shoreline change and reclamation.
- There is often a very close relationship between the historic character of areas beyond the boundary of marine plan areas and marine features (harbour waters; estuaries; stretches of open sea) within those boundaries.
- Extensive heritage assets and landscapes/seascapes may cross boundaries between marine plan areas and adjacent land.
- The setting of heritage assets at the coast commonly extends seaward across the boundaries of marine plan areas.

Key data gaps

- Data on the social and economic value of coastal heritage assets, especially where aspects of value are attributable to the character of marine plan areas.
- Data on the contribution of marine settings to the significance of coastal heritage assets.

Geology, Substrates and Coastal Processes - Seabed Substrates and Bathymetry, Coastal Features and Processes

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

Bathymetry consistently shallow with depths increasing from the coast to a maximum of approx 50m in some parts of the offshore area. Features include estuarine channels associated with the Dee, Mersey and Solway estuaries and the Lune Deep channel off Fleetwood (Geol_158). The inshore plan area is dominated by shallow subtidal sediments, ranging from infralittoral and circalittoral sandy mud, fine muds to infralittoral mixed sediment, with patches of circalittoral deep sand with few areas of hard substrate (Geol_160). The inshore plan area is considered to have a smooth seabed (mud belt) with net sediment movement in to this area from the wider Irish Sea (Geol_205). Intertidal sediment forms beaches, sandbanks, saltmarshes and muddy shorelines with a variety of habitats ranging from rocky coasts to extensive areas of sediment in Morecambe Bay and sandbanks/ridges in the Solway Firth. High sediment mobility and rates of coastal erosion (e.g. north of Liverpool) are both characteristics within the inshore area (Geol_157).

Much of the plan area is underlain by undifferentiated Triassic Period rocks with sandstone notable near much of the Cumbrian coast and a generally complex underlying bedrock geology (Geol_161).

The East Irish Sea sedimentary basin covers a large proportion of the offshore and part of the inshore plan area and (predominantly) gas production occurs (Geol_159). As of 2014, 66.6km² is licensed for sand extraction (Geol_163).

Shoreline Management Plan (SMP) policy for much of the Lancashire, Merseyside and Cheshire coast is to hold the line, with managed realignment the stated strategy around Formby north to Birkdale. The Cumbrian coast has a more mixed strategy combining no active intervention, hold the line and managed realignment (notably in the Solway Firth) (Geol_155).

Issues for the South West Plan Area 8 9

Diverse bathymetry including: the Severn Estuary and Bristol Channel complex; part of the southern Celtic Sea (depths up to 200m); the continental shelf edge; and a small portion of the Atlantic abyssal plain (where depths plunge to over 2000m)(Geol_133). Coastal features include: steep coastal cliffs broken by estuaries and rias; sand beach/dune systems along the Bristol Channel coast; and various notable estuarine and shingle structures (Geol_207).

There are some distinct differences in the bedrock underlying the SW inshore plan area: in the Bristol Channel the bedrock is predominantly lower Jurassic Period mudstone and limestone along with Triassic Period mudstone; further east within the Seven Estuary mudstone dominates; off north Cornwall Devonian and Carboniferous Period mud and sandstone dominate; off south Cornwall Permian and Triassic Period rocks dominate. In the offshore plan area the predominant bedrocks are mudstones and siltstones. It should also be noted that there are also extensive areas of chalk and sandstone (Geol_135).

In the inshore plan area the seabed sediment is predominantly gravelly sand, which is interspersed with sandy gravel, sand, rock, gravelly muddy sand and muddy sandy gravel. In the offshore plan area the seabed sediment is mainly slightly gravelly sand, gravelly sand, sand, and muddy sand. There are extensive areas of hard substrate in the SW compared to other plan areas including those within the Bristol Channel and in the offshore plan area (Geol_134). Moribund sand ridges are present occasionally including the Celtic Banks (a qualifying geological feature of the South-West Deeps (West) MCZ) (Geol_206). As of 2014, 101.5km² is licensed for aggregate (sand and gravel) extraction within the Bristol Channel – within both English and Welsh waters (Geol_131).

Baseline/issues: North East Plan Area 1 2

The majority of this plan area consists of an undulating submarine plain with offshore depths between 70 and 90m with some prominent shelf troughs providing limited deeper water in the north of the offshore plan area (Geol_169). The underlying bedrock within the plan area forms distinct north-south trending bands of differing strata moving offshore (Geol_172). The inshore plan area is dominated by shallow subtidal sediments, ranging between circalittoral fine and muddy sand, mixed and coarse sediments and rock (sometimes exposed), with patches of deep circalittoral coarse sediment and mud, and localised infralittoral fine sand, muddy sand and rock along coastal areas (Biodiv_368).

Parts of the plan area contain favorable petroleum geology with the majority of the plan area covered by the southern, mid- and central North Sea geological basins (Geol_171).

Coastal features range from the wide embayments of Northumberland through to the cliffs of the Jurassic Yorkshire coast which are softer than the rocks to the north and highly susceptible to erosion, landslips and coastal retreat (Geol_181 and 202) and provide many geological sites of note. Between the Tyne and the Tees estuaries geomorphological landforms including wave-cut platforms, caves, arches and stacks, some sandy bays and sand dunes are present (Geol_203).

SMP policies include no active intervention along the vast majority of the rural Northumberland, County Durham and North Yorkshire coastline, hold the line near coastal communities and some managed realignment, notably in rural Northumberland (Geol_166).

Issues for the South East Plan Area 5

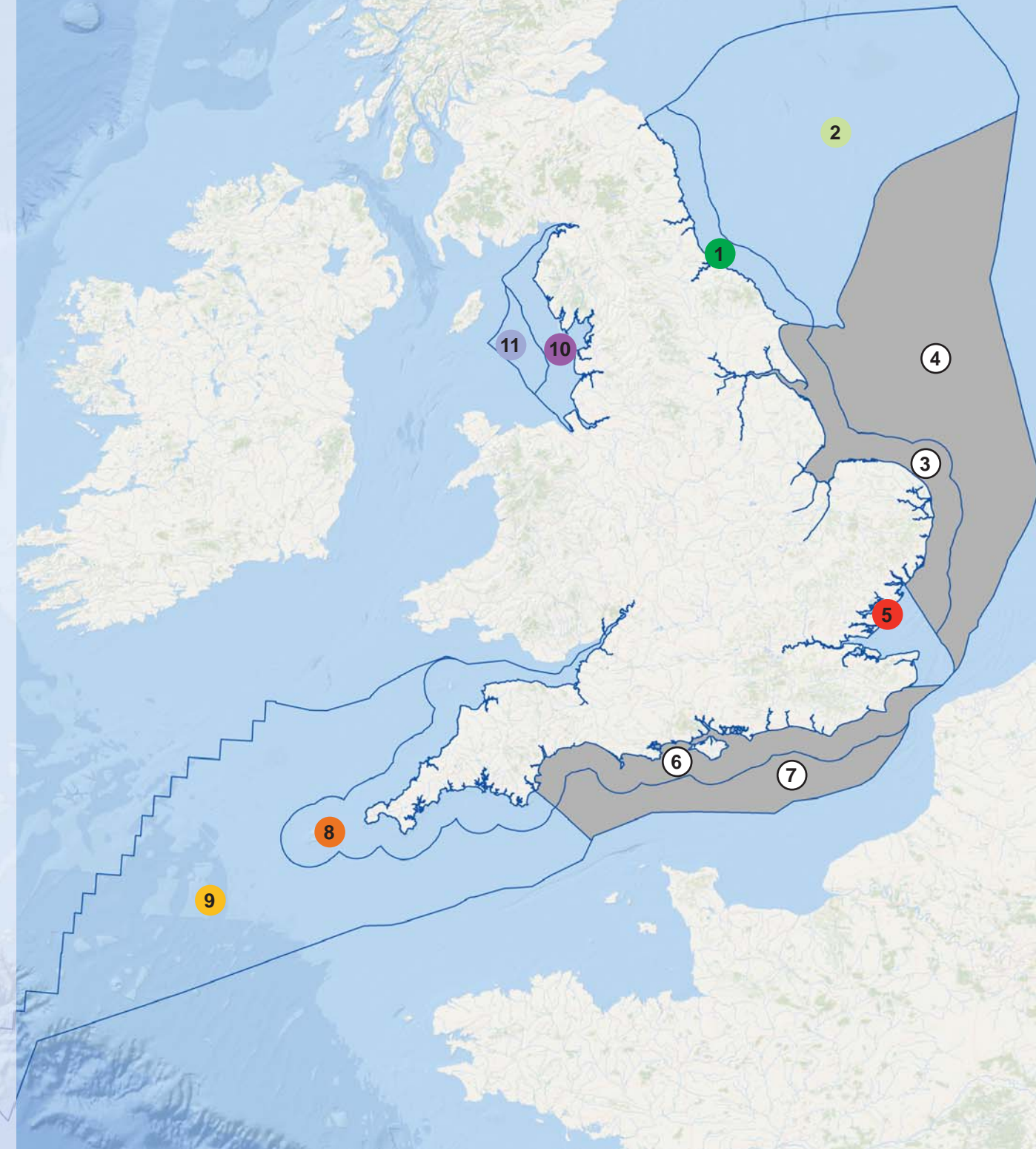
Bathymetry is consistently shallow, with depths of only 20 to 50m. The outer Thames Estuary is dominated by a series of parallel sand bank features which fan out further in to the wider North Sea and aggregate extraction is licensed within the Greater Thames Estuary (Geol_152). Nearshore, the Thames Estuary is characterised by coastal mudflats and saltmarshes created by the deposition of the sediment load into the broadening waters of the outer estuary. Along the Suffolk coast, a mosaic of smaller estuaries creates a complex coastline which also contains relatively large areas of nearshore mudflats and saltmarsh (Geol_138).

Highly variable sediment types form a complex mosaic in this plan area, with shallow and deep circalittoral coarse sediment (notably sand) and patches of circalittoral rock extending further away from the coast notably near Margate and Ramsgate, with isolated occurrences scattered throughout the Essex estuaries (Geol_139). A variety of other bedforms exist in the area including dunes, sand patches, ribbons and streaks. Much of the area is underlain by undifferentiated Eocene Epoch rocks with a substantial area of chalk present off the eastern Kent coast (Geol_140). As of 2014, 35.3km² is licensed for aggregate (sand and gravel) extraction within the plan area (Geol_152).

Much of the coastline is protected by a range of flood defence infrastructure (including the Thames Barrier) with policy support for managed realignment around the Medway Estuary. The low lying coastal features of the plan area are punctuated occasionally by higher coastal relief such as the chalk cliffs on the Isle of Thanet with features including sea stacks and arches such as at Botany Bay (Geol_204). SMP policy to 2030 comprises of hold the line along much of the Essex and North Kent coastlines with the exception of fairly long stretches of coast around the Isle of Sheppey where managed realignment is proposed (29% of all policy units in the plan area) (Geol_141 and Geol_142). No active intervention is only proposed for 12% of policy units – a relatively low percentage compared with the other marine plan areas.

Coastal systems can adapt to sea-level rise by re-arranging their sediments; however, in many coastal systems this adaptive capacity has been compromised by coastal protection structures. This is an issue especially prevalent within this marine plan area (along with the East and South inshore plan areas) (Geol_195) where (for example) flood defences protect 25 million residents in London and numerous economic, cultural and community receptors (Geol_219).

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Geology, Substrates and Coastal Processes - Seabed Substrates and Bathymetry, Coastal Features and Processes

Summary of the legislative / policy context

The key policy considerations include:

- The Marine and Coastal Access Act (2009) provides a means for the conservation of specific “features of geological and geomorphological interest” through the designation of Marine Conservation Zones (MCZs).
- The UK Marine Policy Statement (2011), includes coastal change as a key consideration stating that, “Marine plan authorities should seek to minimise and mitigate any geomorphological changes that an activity or development will have on coastal processes, including sediment movement.”
- The National Planning Policy Framework states that, “In coastal areas, local planning authorities should take account of the UK Marine Policy Statement and marine plans and apply Integrated Coastal Zone Management across local authority and land/sea boundaries, ensuring integration of the terrestrial and marine planning regimes.” This specifically relates to adapting to climate change in full recognition that coastal change is likely to occur.
- The Marine Strategy Framework Directive (2008/56/EC) and the Marine Strategy Regulations (2010). GES Descriptor 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) is especially pertinent.
- Wildlife and Countryside Act (1981) (as amended) – Allows establishment and protection of Sites of Special Scientific Interest (SSSIs) which can be designated for geological features and processes.
- The EC Habitats Directive (92/43/EEC (1992)) – allowing designation and protection of a marine protected area network where geological, sediment and coastal features may be key features and considerations.
- Water Framework Directive (2000/60/EC) – Many coastal and transitional water bodies are defined as heavily modified or artificial for the purposes of the Water Framework Directive (WFD) due to the presence of (inter alia) coastal structures (including flood defences), aggregate extraction and port activity. Hydromorphological quality is a key consideration within the WFD and Good Ecological Potential is required in such heavily modified waterbodies.

Other considerations include legislation/policy and guidance relating to flood risk and management (e.g. Shoreline Management Plans (SMP)), geological storage of carbon dioxide, climate change, aggregate dredging, retrieval of oil/gas reserves and the Geological Conservation Review (GCR). SMPs provide policy recommendations for sub-cells covering the entire coastline. These policies take the form of Hold the Line, Advance the Line, No Active Intervention or Managed Realignment and a summary of these policies is provided on the following page for each Inshore plan area.

Key cross cutting baseline / issues across all plan areas

The vast majority of the English marine plan area lies on the UK Continental Shelf – the exception being the furthest south west part of the SW offshore plan area where the shelf edge leads down to the deep ocean. Geological processes, resulting in differing strata help shape the macro-scale bathymetry of the sea bed with major topographic features including canyons, seamounts and trenches being present along with evidence of past glacial activity. Differing overlying sediment types interact with physical marine processes and seabed energy to help define finer scale bathymetry which can be complex, especially in the coastal zone.

Physical processes that affect the highly dynamic coastal environment (causing either erosion or deposition) include those derived from wind, waves, currents and tides. However, in the absence of human intervention or activity, rapid changes caused by coastal processes are restricted to shallow areas where wave action is strong. The area of greatest change is in the coastal zone with softer coastlines most at risk from rapid change. Coastal erosion is mainly a local to regional process (Geol_193) and erosion is predicted to affect approximately 30% of England's coastline (Geol_175).

Given the potential issues at the coast local planning documents provide many locally focused policies relating to the interaction of geology, physical processes, flood defence and economic activity/coastal communities. Such documents identify sites which are deemed to require specific policy protection which are too numerous to mention in this summary – but which are all set out individually in the database associated with this topic (Geol_10-91 and Geol_101-121).

Eroding coasts backed by coastal structures (e.g. hard flood defences) experience a ‘coastal squeeze’ as the intertidal profile is steepened. Adverse impacts can include reduction in intertidal area and changes to sediment transport and associated physical processes (Geol_194 and Geol_198). Where hard defences (e.g. to achieve Hold The Line policies) are in place long term impacts on sediment supply can result. The issues of coastal erosion and squeeze are of crucial concern around the English coast in general (Geol_176) with loss of saltmarsh and mudflats of particular concern (Geol_179) in certain locations.

Managed realignment of coasts is one measure that can be undertaken which can help with sustainable management of the wider coastline (Geol_213). Some development of innovative concepts and early stage work to promote coastal management using the Dutch sand engine principle is taking place, notably the Crown Estate's sandscaping work (with high potential sites identified in the NW and SW marine plan areas) (Geol_208).

Sediment transport around much of the UK is dominated by tidal influences. However, areas of wave dominance (with limited transport) are present across much of the offshore NE plan area and inshore NW plan area, and shelf edge transport mechanisms occur in the very south west of the SW offshore plan area (Geol_217). Human intervention is most acute at the coast and developments in this sensitive and dynamic environment, plus the advent of offshore developments such as offshore wind farms, can have the potential to affect sediment transport and distribution with potential consequences for marine habitats and species.

The likely evolution of the environment over the plan duration

Geological timeframes are long and it is the dynamic coastal zones which are most likely to change over the plan period where natural processes resulting in erosion/deposition are influenced most strongly by human activity. With both steeping of intertidal profiles and rates of coastal erosion expected to increase in the future, coastal squeeze and associated habitat loss may well be accelerated by continued sea level rise. Local and regional factors, including coastal management strategies (and funding), will also be important considerations in future outcomes. There is only low confidence of any predictions at present. Managed realignment is likely to increase in the future as a key management strategy and although this will result in increased local erosion rates, the enhanced erosion may benefit other sections of coast by reducing erosion or even causing accretion. Adaptation and realignment is emerging as the key coastal management concept to cope with coastal erosion, with novel approaches already being explored in some areas.

There are clear links to economic activity, as increased activity in the coastal zone can potentially lead to changes to coastal and sediment processes in particular. The more notable activities include: dredging for ports (especially in the SE plan area), aggregate dredging, certain forms of fishing activity that interact with the seabed, coastal developments, power generation, growth (or otherwise) of our coastal communities and development of offshore renewable energy projects.

Additional economic activities which may affect geological or coastal receptors in the future also include using geological voids for deep storage of CO₂ within the NW and NE offshore plan areas, tidal lagoon developments (potentially in the SW and NW inshore plan areas), new nuclear power stations (NW, SW and SE plan areas) and underground coal gasification off the NE and NW coasts. Predicting such change is extremely difficult and macro-political and economic drivers become important in directing such activity.

Potential interactions with other topics

There is a direct link to climate change as consideration of its effects and any resultant mitigation or adaptation to coastal change will have a direct influence on coastal processes and features.

Economic and development activities have the potential to affect the seabed, coastlines and related processes and dependent habitats causing a variety of issues. Aggregate extraction has the potential to affect relatively large areas of seabed altering physical/sediment processes and creating sediment plumes, but our understanding of the environment and issues associated with this activity are improving. Impacts from oil/gas exploration are normally considered to result in only local scale effects on sediments, but not exclusively so. Capital dredging for ports must be assessed carefully in relation to changes to coastal or sediment processes and the cumulative effects of developmental activities can be complex, resource intensive and difficult to assess with little current guidance.

Coastal squeeze resulting in loss of intertidal habitats and species may affect the extent or quality of protected sites and require new compensatory habitat to be created and/or designated in coastal areas, particularly estuaries. Additionally, issues relating to access to the coast and other indirect effects on coastal communities can result dependent on the coastal protection strategy selected. Changes to erosion and sedimentation patterns are known to cause heritage assets to be exposed and degraded in the coastal zone.

Large scale, nearshore sandscaping/sand engine coastal management schemes have the potential to trigger regeneration or enhance the resilience of coastal communities through enhanced amenity benefits, habitat creation and or economic development opportunities (Geol_208).

Offshore activities such as oil/gas production and the potential for CO₂ to be stored in geological strata are two activities where geological formations may be affected by man to a relatively high degree.

Geology, Substrates and Coastal Processes - Seabed Substrates and Bathymetry, Coastal Features and Processes

Potential transboundary issues

Coastal and sedimentation processes can operate over large areas spanning UK administrative boundaries (England, Wales, Scotland, Northern Ireland) and UK borders (EU and non-EU countries), requiring co-ordination between devolved administrations and wider governments. Specific large scale issues relating to contamination of sediments and the overall functioning of habitats that rely on key sediments and substrates is being tackled through key EU Directives with implementation at member state level.

There are a number of sites of conservation importance which rely on substrates/sediments for their functioning and character which span the Severn and Dee estuaries (sites that overlap with the Wales National Marine Plan area) and the Solway Firth and Tweed Estuary (overlapping with Scotland's Marine Plan area). It is perhaps these estuarine environments where the greatest transboundary issues occur due to their connectivity and sharing of coastal and sediment processes.

Existing Shoreline Management Plans and Flood Risk Management Areas, through which managed realignment may take place, may cross boundaries of multiple plan areas.

Key data gaps

Despite some progress in recent years, there is relatively little information on seabed composition from very shallow waters and gaps still exist in coverage. However, the coastal zone is so important in relation to erosion, flooding, habitats, and commercial uses, that this is a key area for future work (Geol_185).

Coastal response to sea level rise is strongly determined by site-specific factors and usually it is these factors that determine the coastal response, rather than a global change in sea level or a regional change in wave climate. Predictions of general coastal response due to climate change therefore have a low confidence, and more detailed local or regional studies of coastal response to climate change will increase confidence in predictions. Understanding the rates and distribution of coastal erosion and changes to beach dynamics in response to climate change and sea level rise will be an area for new research and monitoring. The importance of the coastal zone in terms of coastal erosion and flooding, habitats and commercial uses, make this a key area for future work (Geol_199).

More information is needed on how sea level rise will affect both sediment supply, and sediment transport on UK coasts, and the implications for coastal margin habitats (Geol_182).

Local responses to climate change will vary in relation to climate change factors (e.g. sea level rise and changes to wave heights and directions). There is only low confidence of any predictions at present (Geol_212).

Seascape and Landscape - Effects on Seascape and Landscape

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- The Lake District National Park is adjacent to the coast (Landscape_93)
- AONBs in the North West Plan Area that are adjacent / near to the coast are Solway Coast (also borders Scotland), Arnside and Silverdale. The Welsh Clwydian Range AONB may also be affected by activities in this area (Landscape_94)
- Views to the Isle of Man could be affected by activities in this area (Landscape_161)
- There is only one small area listed as a Heritage coasts - St Bees Head. (Landscape_110)
- World Heritage Sites in the vicinity of the coast include Frontiers of the Roman Empire (Hadrian's Wall) (North East and North West) the settings of which need to be protected. (Landscape_162)
- Liverpool Maritime Mercantile City is designated as a World Heritage Site. The docks are cited for being sites of innovation in construction and dock management. (Landscape_83)
- The Lake District is on a tentative list of UK sites that are being considered for inclusion on the World Heritage List. If designated this site will become a World Heritage Site in the next 5-10 years. (Landscape_84)

Baseline/issues: South West Plan Area 8 9

- Exmoor National Park is adjacent to the coast (Landscape_118)
- AONBs in the South West Plan Area that are adjacent / near to the coast are South Devon, Tamar Valley, Cornwall, Isles of Scilly, North Devon, Quantock Hills, Wye Valley (partly in Wales). The Gower AONB (in Wales) could also be affected by development in the South West Plan Area. (Landscape_119)
- Cornwall and West Devon Mining Landscape is designated as a World Heritage Site by UNESCO (Landscape_81)
- A significant amount of the South West plan area is designated as Heritage Coast. The Heritage Coasts are North Devon, Exmoor, Isles of Scilly, Lundy and a large proportion of Cornwall (Rame Head, Gribbin Head – Polperro, The Roseland, The Lizard, Penwith, Godrevy – Portreath, St Agnes, Trevose Head, Pentire Point – Widemouth, Hartland). (Landscape_121)

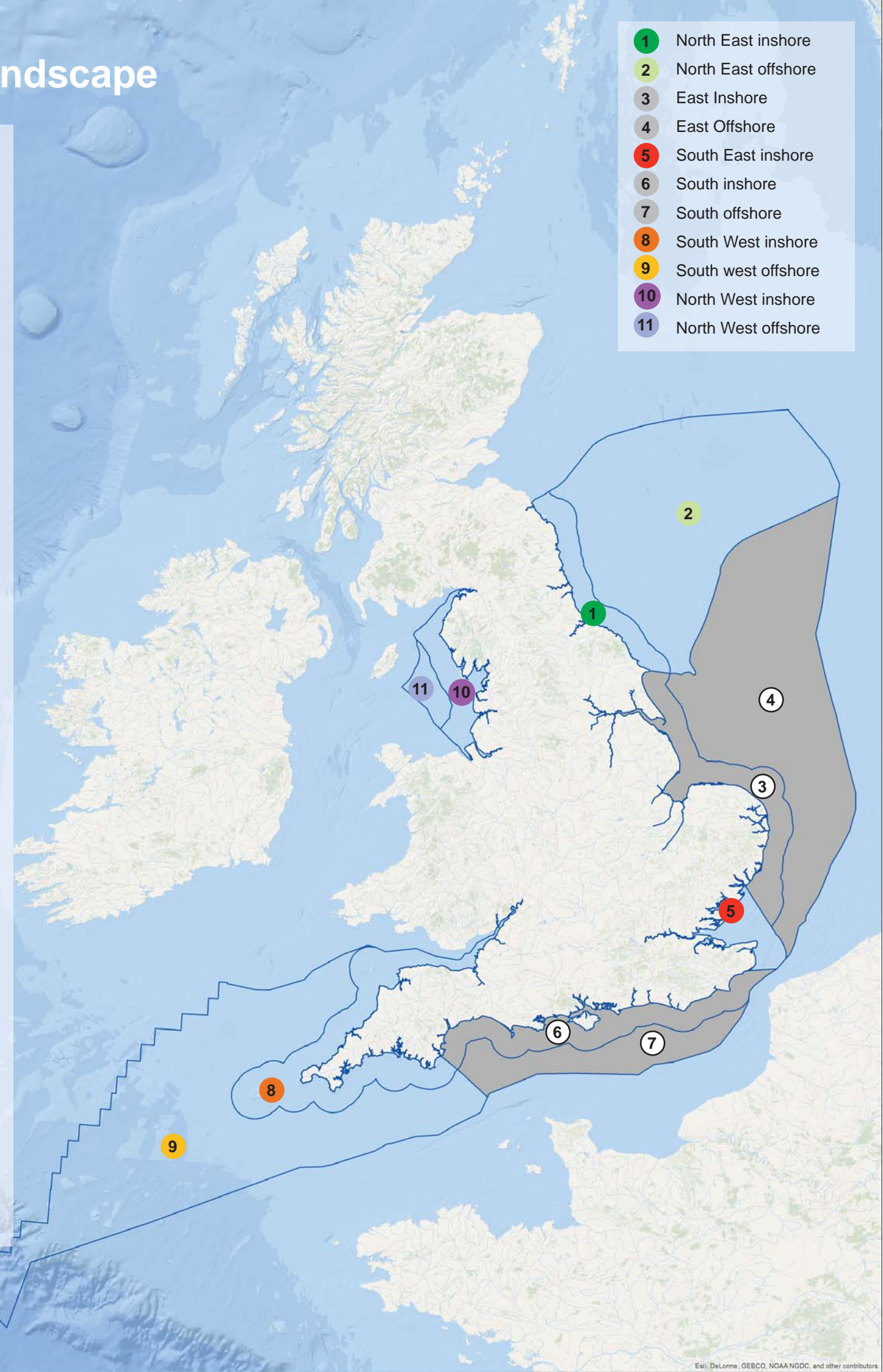
Baseline/issues: North East Plan Area 1 2

- The North York Moors National Park is adjacent to the coast (Landscape_87)
- The Northumberland Coast AONB is adjacent to the coast (Landscape_88)
- A large part of the North East Plan Area Coastline is designated as Heritage Coast. The Heritage Coasts in the area are North Northumberland, Durham, North Yorkshire and Cleveland and Flamborough Headland. (Landscape_89)
- Monkwearmouth and Jarrow monastic sites are on a tentative list of UK sites that are being considered for inclusion on the World Heritage List. If designated this site will become a World Heritage Site in next 5-10 years (Landscape_85)
- World Heritage Sites in the vicinity of marine plan areas include Frontiers of the Roman Empire (Hadrian's Wall) (North East and North West) the settings of which need to be protected. (Landscape_162)

Baseline/issues: South East Plan Area 5

- There are no National Parks adjacent / near to the coast (Landscape_111)
- The Kent Downs AONB is adjacent to the coast in the SE Plan Area (Landscape_112)
- There is a small area of the South East Plan Area designated as Heritage Coast, South Foreland and Dover - Folkestone Heritage Coasts. (Landscape_116)
- Chatham Naval Dockyard is on a tentative list of UK sites that are being considered for inclusion on the World Heritage List. If inscribed this site will become a World Heritage Site in next 5-10 years. (Landscape_82)
- Southend on Sea has a planning policy which does not allow tall and large buildings which could adversely impact upon the skyline of Southend as viewed from the foreshore and other important viewpoints and vistas within and outside the Borough. (Landscape_160)

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Seascape and Landscape - Effects on Seascape and Landscape

Summary of the legislative / policy context

Under European Landscape Convention (ratified in UK 2006) it is acknowledged that all landscape can be important in the formation of local cultures and quality of life, these can be in degraded areas as well as in areas of high quality, in areas recognised as being outstanding beauty as well as everyday areas. Consequently, it is necessary to include considerations of impact on seascape and landscape in all development and not just areas designated for particular features. It specifically includes marine areas in its scope.

The MPS states there is no legal definition for seascape in the UK but the European Landscape Convention (ELC) defines landscape as “an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors”. In the context of this document, references to seascape should be taken as meaning landscapes with views of the coast or seas, and coasts and the adjacent marine environment with cultural, historical and archaeological links with each other. Ensuring a strong healthy and just society is a high level objective of the MPS, which includes people’s appreciation of its seascapes. The MPS acknowledges the national economic and social benefits of seascapes as well as their contribution of quality of life and well-being of coastal communities. With respect to seascape the NPPF states that local planning authorities should ‘maintain the character of undeveloped coast, protecting and enhancing its distinctive landscapes.....and improve public access to and enjoyment of the coast.’

The Marine and Coastal Access Act 2009 allows for the creation of continuous, managed route around entirety of English (& Welsh) coastline.

The National Planning Policy Framework sets out that in and adjacent to Areas of Outstanding Natural Beauty and undeveloped coast, developments would not be allowed except in exceptional circumstances and should generally be very small scale.

Natural England - National Parks in England. National Parks are run by National Park Authorities for the purpose of conserving and enhancing the natural beauty, wildlife and cultural heritage and to provide opportunities for the understanding and enjoyment of the Park by the public. National Park Authorities also grant planning consents within their National Parks.

To deliver UK Government objectives of energy security and decarbonisation, DECC believes that nuclear should be free to contribute as much as possible towards meeting future need for non-renewable capacity. Although there can be no certainty of development consent being obtained, the Government does not believe there are any alternative sites to those listed in NPS for Nuclear Power Generations (volume I). Volume II provides details of each potential location including potential seascape impacts.

Key cross cutting baseline / issues across all plan areas

Any potential development in the marine environment which is inter-visible with the coast (or coastal developments themselves) may influence views in different ways depending on structure type, size, number, type of movement and orientation, coastal form, lighting, aspect and scale, settlement pattern and type. Attitudes of people observing the change and the resultant development typically also vary widely.(Landscape_132)

Visual impacts may arise from developments which are built directly at the coast (such as harbours) or at some distance from the coast, such as offshore wind turbines. With regards to the latter, the visual impact of offshore developments which have surface infrastructure above sea level is generally a function of their visibility from the coast which is dependent on their size, distance from a viewpoint, and the atmospheric conditions (such as contrast and haze) at the time of viewing. (Landscape_133)

All the Marine Plan areas have overlapping designations that affect the coast and these include National Parks, AONB’s and Heritage Coasts) (Landscape_176).

Several existing and nominated new sites for nuclear power stations within marine area plans under consideration including Hartlepool (NE inshore), Bradwell (SE inshore), Hinkley Point and Oldbury (SW inshore), Heysham and Sellafield (NW inshore). All UK nuclear power stations are located at marine/estuarine sites and hence have a significant impact on seascape. The National Policy statement makes specific reference to Sellafield’s impact due to its proximity to Lake District National Park. (Landscape_150)

The likely evolution of the environment over the plan duration

- Climate change is likely to have an impact on coastal landscapes and this could particularly affect protected landscapes.
- There may be several new World Heritage Sites within the inshore plan areas over the next 5-10 years including Chatham Naval Dockyard, The Lake District, and Monkwearmouth and Jarrow monastic sites
- The seascape and coastal landscape will continue to be at risk from development pressures including in relation to energy, industrial and ports developments.

Potential interactions with other topics

There are inter-relationships between most if not all sectors but specifically Historic environment, Climate change, Economy, Noise, Geo-diversity, Tourism and recreation and energy developments. Seascape and landscape are intrinsically linked to other issues including, but not limited to, archaeological sites, heritage sites, historic landscapes including prehistoric sites

Potential transboundary issues

Adverse impacts on seascape could affect neighbouring receptors including in Wales, Isle of Man, Scotland and other Marine Plan Areas (East Inshore and Offshore Plan Areas and South Plan Inshore and Offshore Plan Areas)

Key data gaps

The Seascape assessments for the South East, North East, North West and the North East areas have been produced to desk study stage (stakeholder engagement and field study outstanding) and the work does not yet appear to be in the public domain. The South West Seascape assessment is also outstanding

Water - Tides and Currents

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- Most of the region has a tidal range of between 8m and 5 m (Water_201)
- Annual mean significant wave heights are some of the smallest around England, with wave heights at the coast of <0.76m and offshore up to 1.5m (Water_202)
- The area has been identified as having potential for wave, tidal stream and tidal range energy resources (Water_264)

Baseline/issues: North East Plan Area 1 2

- Annual mean significant wave heights onshore are low, around 1m. Slightly further offshore these wave heights increase to up to 1.5m and further offshore may reach up to 2.5m (Water_221)
- Most of the region has a tidal range of between 1m to 4 m. This area has not been indicated an important area for potential for wave, tidal stream and tidal range energy resources (Water_222).
- Surfing activities occurs at various beaches and are an important sport in this region. Any pressures that cause hydro morphological changes could affect the integrity of the surfing breaks (Water_271).
- The continued presence of structures in the North Sea will also have impacts on the hydro geomorphology (Water_280).

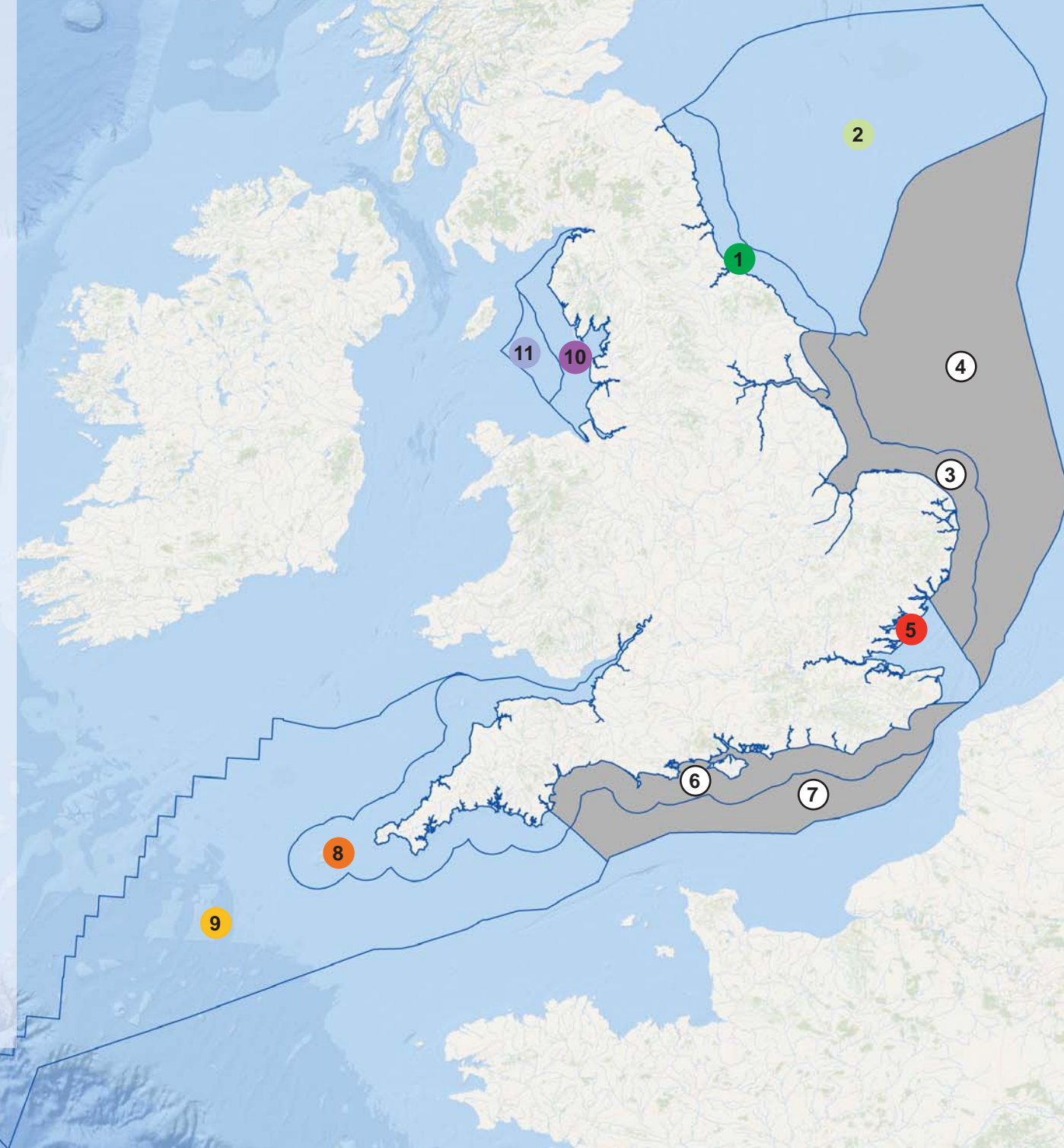
Baseline/issues: South West Plan Area 8 9

- Most of the region has a tidal range of between 1m and 5m. The region around the Bristol Channel has a far higher tidal range, in excess of 12m in places, which is one of the biggest in the world (Water_184)
- Annual mean significant wave heights are some of the greatest around England, with wave heights at the coast of 1m to 1.5m and just offshore 1.5m to 2m. Moving further offshore wave heights reach up to 2.75m (Water_185)
- The South West has been identified as having potential for wave, tidal stream and tidal range energy resources. The first tidal range technology has been consented to be developed in the South West (Water_264)
- Surfing activities occurs at various beaches and are an important sport in this region. Any pressures that cause hydro morphological changes could affect the integrity of the surfing breaks (Water_271).

Baseline/issues: South East Plan Area 5

- Annual mean significant wave heights are some of the smallest around England, with wave heights at the coast of <0.76m and offshore up to 1.5m. (Water_202)
- Most of the region has a tidal range of between 1m to 4 m (Water_222)
- The South East has been identified as having potential for wave, tidal stream and tidal range energy resources. (Water_264)

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Water - Tides and Currents

Summary of the legislative / policy context

The Marine Strategy Framework Directive (MSFD) includes a qualitative descriptions of Good Environmental Status (GES) for hydrological conditions: The nature and scale of any permanent changes to the prevailing hydrographical conditions (including but not limited to salinity, temperature, pH and hydrodynamics) resulting from anthropogenic activities (individual and cumulative), having taken into account climatic or long-term cyclical processes in the marine environment, do not lead to significant long term impacts on those biological components considered under Descriptors 1,4, and 6 (Water_169). In December 2015 a program of measures for achieving GES were put in place for MSFD for achieving Descriptor 7 (hydrological conditions), which included a large number of measures that are being or will be implemented that are sufficient to maintain the GES for descriptor 7.

Key cross cutting baseline / issues across all plan areas

- The status currently for hydrographic conditions, based on the MSFS Initial Assessment, indicated there are no significant broad scale alterations of hydrographic conditions affecting ecosystems in UK waters beyond those currently covered by provisions of the WFD, through classification as heavily modified water bodies, plus the wider application of the Environmental Impact Assessment Directive through the marine licensing process (Water_166).
- Tidal ranges and wave heights vary with region and exploitation of these resources is being considered for energy production. The South West, South East and North West have been identified as having potential for wave, tidal stream and tidal range energy resources (Water_264)
- Whilst unlikely to be directly impacted by climate change, sea level risk and storminess will impact upon hydrological impacts and could exacerbate the impacts of tides and currents for risk to coastal areas (Water_298)

The likely evolution of the environment over the plan duration

For Descriptor 7 (hydrographical conditions) of the MSFD, it is considered that the application of the WFD in the coastal area, plus the wider application of the Environmental Impact Assessment Directive through the marine licensing process, will be sufficient to achieve GES for this Descriptor across the UK's marine waters (Water_166)

Potential interactions with other topics

Sea level rise and coastal flooding may potentially cause an increase in demand for aggregates for building and maintaining sea defences. This may result in hydrological impacts.

Potential transboundary issues

Scotland has set ambitious targets for renewable energy by aiming to generate the equivalent of 100% of Scotland's own electricity demand from renewable resources by 2020 and to deliver an 80% reduction in greenhouse gas emissions by 2050. Offshore wind and marine renewables will play a part in this and the role of offshore generation will increase further into the 2020s and beyond. There may be consequences on currents due to these structures. This would need to be considered in the North East marine plan area (Water_307)

Development of wave and tidal energy is particularly prominent in Wales at present, which could have transboundary effects on hydrodynamics in the South West and North West marine plan areas.

Key data gaps

Tidal power lagoons are a new and previously untried technology in the UK. Hydrological impacts of these lagoons, both individually and cumulatively need to be considered.

Water - Marine Litter, Water Temperature and Salinity

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- There is a problem with beach litter, although less so than in the South West but the problem is getting better or at least not worsening (Water_273)
- Warming is one of the most pronounced areas in the UK (0.7°C per decade over the last 3 decades) (Water_266).
- The salinity of the Irish Sea shows no significant long-term trend (Water_322).

Baseline/issues: North East Plan Area 1 2

- There is a problem with beach litter, although less so than in the South West but the problem is getting better or at least not worsening (Water_273)
- Warming has been identified to be between approx. 0.3 and 0.5°C per decade (Water_279)
- The salinity of the upper ocean has been generally increasing since a fresh period in the 1970s. A minimum occurred in the mid-1990s, and present day conditions are relatively saline. North of the UK, the deep water (800 m) flows from the Nordic Seas; they have freshened since 1950 but salinity has been steady for the last decade. In the northern North Sea (Region 1) the salinity is heavily influenced by inflowing North Atlantic water and has become more saline since the 1970s, though the trend is not clear (Water_322).

Baseline/issues: South West Plan Area 8 9

- Has the highest densities of beached litter attributed to pressure from tourism and fishing as well as litter entering UK waters through prevailing currents (Water_233). There is evidence to suggest the problem is getting worse (Water_254)
- Marine litter issues have been associated with combined sewer overflows, particularly in the South West. The occurrence of overflows may increase in the future (Water_255)
- Warming has been identified to be the lowest of all the UK waters at approx. 0.3°C per decade (Water_258)
- The salinity of the upper ocean has been generally increasing since a fresh period in the 1970s. The western English Channel (Region 4) is influenced by North Atlantic Water, tidal currents and local weather conditions. There is no discernible long-term trend in over a century of observations, but in recent years salinity has been higher than average (Water_322).

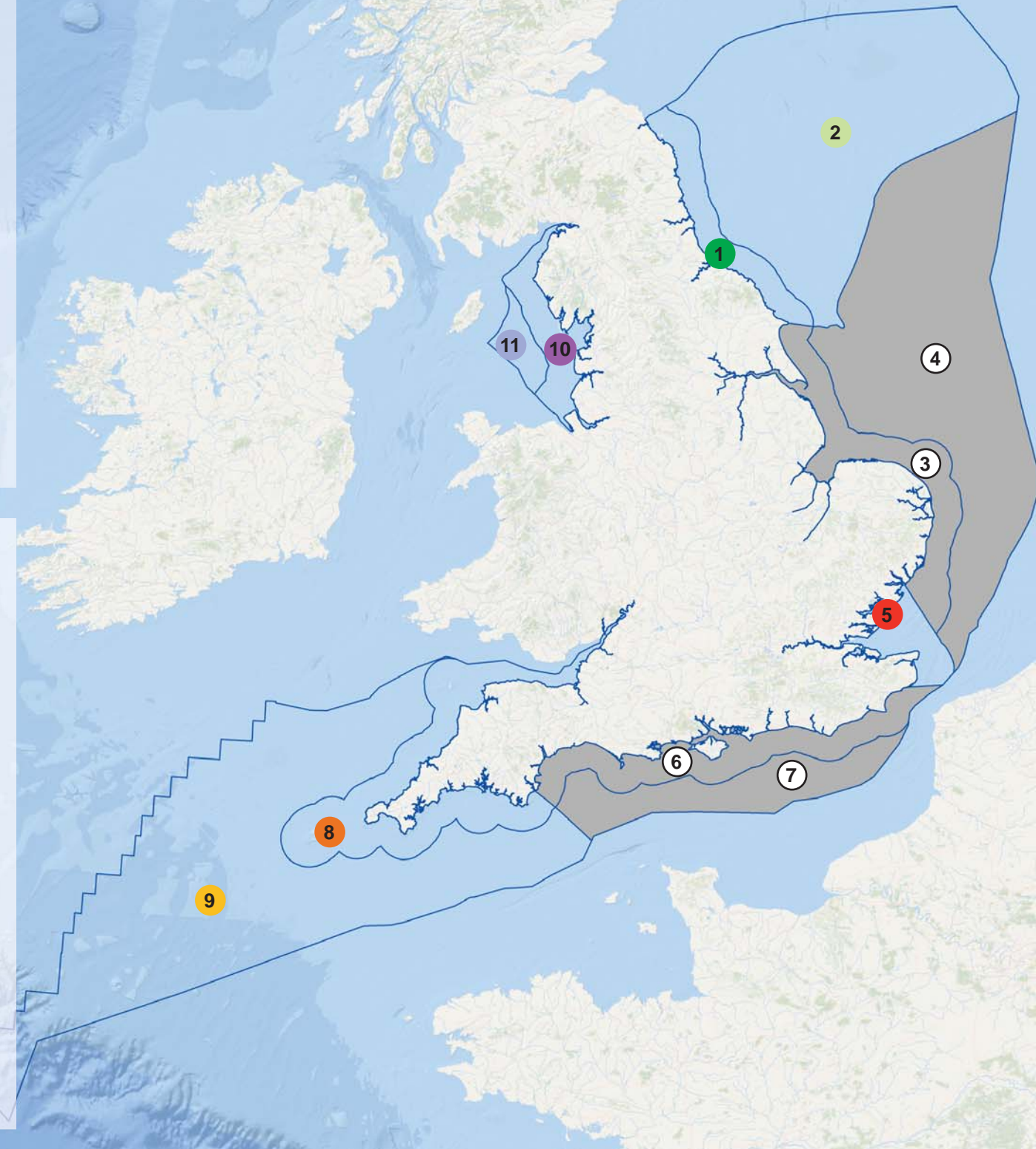
Baseline/issues: South East Plan Area 5

- There is a problem with beach litter, although less so than in the South West but the problem is getting better or at least not worsening (Water_273)
- Warming in the South East is one of the most pronounced areas in the UK (0.7°C per decade over the last three decades) (Water_259)
- The salinity of the upper ocean has been generally increasing since a fresh period in the 1970s. A minimum occurred in the mid-1990s, and present day conditions are relatively saline. The salinity of the southern North Sea (Region 2) is dominated by river run-off balanced with flow through the Dover Strait and there is no clear trend since the 1970s (Water_322)

Summary of the legislative / policy context

- The Marine Strategy Framework Directive includes a qualitative descriptions of Good Environmental Status (GES) for marine litter: the properties and quantities of marine litter do not cause harm to the coastal and marine environment (Water_23). In December 2015 a program of measures for achieving GES were put in place for marine litter and these included; a range of measures aimed at reducing marine litter and the introduction of surveillance indicators for marine litter on the seafloor and in the stomachs of fulmars (Water_241). The surveillance indicators will allow a target for 2018 to be developed (Water_243)
- It is expected that these measures will contribute towards an overall reduction in the number of visible items on coastlines and in the marine environment. However, it is recognised that there is little understanding of marine litter, the biodegradability and toxicity is minimal. It is recognised that further action may need to be taken should the monitoring programme show that the effect of the combined measures will not deliver GES in line with expectations (Water_244).
- In accordance with the provisions of the OSPAR Convention, which is in support of the MSFD, contracting parties, including the UK, aim to facilitate and coordinate the work of relevant Contracting Parties in achieving good environmental status under the EU Marine Strategy Framework Directive by 2020. The OSPAR Strategy aims to (by 2020) substantially reduce marine litter in the OSPAR maritime area to levels where properties and quantities of marine litter do not cause harm to the coastal and marine environment (Water_24).
- In December 2015 OSPAR announced, that industry representatives will meet with key policy makers, NGOs and experts to discuss potential measures to reduce microplastic emissions from sources as diverse as paints, abrasive cleaning agents, clothing and tyres. The conference will identify and prioritise concrete measures to stem the flow of microplastics from land-based sources that end up in the marine environment and help to develop common policies that can be implemented by the 15 governments which are signatories to the OSPAR Convention together with the EU (Water_28).
- Particularly important legislation includes; the International Convention for the Prevention of Pollution from Ships (MARPOL) . One of the most important feature of the Annex is includes a complete ban imposed on the disposal into the sea of all forms of plastics (Water_5).
- The Bathing Water Directive (2006/7/EC) requires that bathing waters are inspected visually for pollution including litter and that measures are taken to remove any such items found (Water_23)
- The Marine Strategy Framework Directive includes a qualitative descriptions of Good Environmental Status for hydrological conditions: The nature and scale of any permanent changes to the prevailing hydrographical conditions (including but not limited to salinity, temperature, pH and hydrodynamics) resulting from anthropogenic activities (individual and cumulative), having taken into account climatic or long-term cyclical processes in the marine environment, do not lead to significant long term impacts on those biological components considered under Descriptors 1,4, and 6 (Water_169).

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Water - Marine Litter, Water Temperature and Salinity

Key cross cutting baseline / issues across all plan areas

- Marine litter is comprised mainly of synthetic material and is found in oceanic water, sediments on beaches (Water_252). Marine litter can accumulate in certain areas dependent upon currents and winds (Water_253), however there has only been limited surveying of this (Water_240).
- There is an oceanic garbage patch in the North Atlantic (Water_288). Higher densities of offshore litter have been found at specific locations (Water_253).
- Microplastics in seawater in Eastern Atlantic and the North Sea have been measured between 0.01 to 0.32 cm³/m³, however there are no reliable estimates. Even if all sources of plastic were to immediately stop, the number of microplastics would continue to increase due to fragmentation (Water_320).
- Marine litter on UK beaches is a particular problem because the geographical location of the UK worsens this problems (the English channel being one of the busiest shipping lanes in the world, proximity to the industrialised nations of Northern Europe and the Atlantic gulf stream) (Water_289). The Marine Conservation Society's Beachwatch programme reported that, based upon beaches included in the programme, 35% of litter on beaches came from beach users, 14% from fishing activities and up to 40% of litter items remain unassigned each year, either because they are too small or too weathered to identify a source, or because they could have come from a number of sources. Around 70% of beached marine litter is plastic (Water_234). Levels of marine litter are considered problematic in all areas where there are systematic surveys of beached litter density (Water_240) and we thought to have almost doubled between 1994 and 2007 (Water_233).
- The main risks to marine life include entanglement of, and ingestion by, marine species and transport of non-indigenous species. Impacts have been particularly recognised on marine mammals, seabirds and turtles (Water_231). Additional risks are thought to exist from ingestion of microplastics which can cause physical and chemical toxicity effects (Water_291, Water_321).
- Warming is indicated in all regions during all seasons and in all areas. The UK Climate Predictions 2009 (Lowe et al., 2009) indicate that the seas in all of the regions will continue to increase in temperature. In the surface waters, the temperature is predicted to increase by between 1.5-3.5 degrees (relative to the 1961-90) by the 2080s. No data is available with regard to trends in water salinity (Water_248).
- The salinity of the upper ocean (0-800 m) to the west and north of the UK (Region 8) has been generally increasing since a fresh period in the 1970s. A minimum occurred in the mid-1990s, and present day conditions are relatively saline. The pattern of change over the last ten years around the UK reflects the conditions of the North Atlantic. Trends in salinity elsewhere are more variable and predictions for the future are unclear (Water_322).

The likely evolution of the environment over the plan duration

- Densities of beached litter recorded in the UK have increased since monitoring commenced in 1994. There have been reductions in the density of beach litter on the south coast of England, driven primarily by reductions in public litter. The highest densities of beached litter are found in the South West. The MSFD Programme of Measures for achieving Descriptor 10 (marine litter) includes a large number of measures that are being or will be implemented to reduce marine litter. It is expected that these measures will contribute towards an overall reduction in the number of visible items on coastlines and in the marine environment. However, it is recognised that there is little understanding of marine litter, the understanding of biodegradability and toxicity is minimal and it is recognised that further action may need to be taken should the monitoring programme show that the effect of the combined measures will not deliver GES in line with expectations. There is likely to be a mixed picture with regard to the likely future evolution of the issue. However, this is against a backdrop of a general increase. (Water_233)
- Microplastics, as a specific type of marine litter, are unlikely to decrease in the marine habitat, despite any reductions in litter entering the marine environment, as macro plastics (e.g. plastic bottles) etc. already present in the environment will continue to fragment over time, eventually forming microplastics
- The UK Climate Predictions 2009 (Lowe et al., 2009) indicate that the seas in all of the regions will continue to increase in temperature. There is considerable uncertainty regarding future salinity. The projections currently available weakly suggest that the shelf seas and adjacent ocean may be slightly fresher (less saline) in the future than at present. On the shelf the oceanic influence will dominate the mean long-term salinity. There remains uncertainty in quantifying large-scale, long-term changes in salinity as there are considerable uncertainties on the effects of climate-driven changes in precipitation, evaporation, ocean circulation and ice-melt. For Descriptor 7 (hydrographical conditions, including salinity and temperature) of the MSFD, it is considered that the application of the WFD in the coastal area, plus the wider application of the Environmental Impact Assessment Directive through the marine licensing process, will be sufficient to achieve GES for this Descriptor across the UK's marine waters (Water_165)

Potential interactions with other topics

- The key inter-relationships are with marine biodiversity. The main risks to marine life include entanglement of and ingestion by, marine species and transport of non-indigenous species. Microplastics can become globally distributed and have been found on beaches, in surface waters, seabed sediments and in a wide variety of biota (invertebrates, fish, birds, mammals), from the Arctic to Antarctic. Effects have been indicated in marine organisms due to the plastics and also due to chemicals adsorbed to the plastic materials. See also the Biodiversity report cards, especially that dealing with marine mega fauna.
- There are also links to seascape and landscape with litter obviously being unsightly whether on the sea or washed up on beaches. Increases in temperature and/or salinity could result in the following effects (both positive and negative), for a range of industries and habitats/species. An increase in temperature may allow more ships to use Arctic shipping routes with benefits to ports. There may be impacts on the abundance and distribution of species. There may be an increased prevalence of diseases and infections in aquaculture species and also nuisance species in aquaculture. Ocean acidification may impact fish and shellfish reproduction and growth (wild and aquaculture). Increased sea temperature rise may increase the numbers of people involved in recreational fishing and visitors to coastal areas and associated recreational use of the water. Acidification could affect the behaviour and bioavailability of contaminants in the marine environment (Water_301)

Potential transboundary issues

- Litter is a transboundary issue as it does not respect borders and tends to accumulate in certain areas as a result of wind and currents. The highest densities of beached litter are found in the south-west of England, which has been attributed to the busyness of the English Channel and associated resulting levels of litter entering the marine environment, pressure from tourism and fishing as well as prevailing currents and wind patterns.
- Scotland's National Marine Plan includes a policy whereby users of the marine environment must take measures to address marine litter where appropriate. One of the pilot areas for Scottish regional marine spatial plans, Shetland, has included a policy on the development of waste/litter minimization. Northern Ireland marine plans, subject to the consultative process, will require decision-makers to consider the potential risks of litter entering the marine area and demonstrate proportionate measures to reduce the risk. It is anticipated that future plans will play a stronger role in shaping activities and their impacts in the marine environment, including marine litter.
- Changes to water temperature and salinity also have transboundary links, as clearly the effects of climate change are the result of worldwide activities.

Key data gaps

- Seabed litter has been surveyed at only a few sites and data are sparse, which limits the possibilities for an assessment of changes in quantities of litter over time or between regions. The available data indicate that there is a generally low, but variable, abundance of litter on the seabed ranging from 0 to 17 items per hectare. Surveillance of seafloor litter has been included in the MSFD program of measures. This data should be used to drive targets in the future (Water_244).
- There are currently no agreed assessment tools to quantify the impacts on marine life at the population level from the presence of marine litter. Impacts have been particularly recognised on marine mammals, seabirds and turtles. Surveillance of litter in the stomach of fulmars has been included in the MSFD program of measures. This data should be used to drive targets in the future. (Water_231)
- Evidence regarding the potential for effects on organisms from microplastics is uncertain at present, including the potential for toxicity effects of chemicals associated with the plastics relative to chemical exposure from other sources, e.g. in sediments and the water phase.
- Data on the trends in salinity indicate very variable patterns and predictions about what will occur in the future are unclear.

Water - Water Pollution and Water Quality (Including Eutrophication)

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- There are two River Basin Management Plans (RBMPs) in this area: the North West and the Dee RBMPs (Water_197). The North West draft 2016 RBMP: coastal and estuarine waters between Whitehaven and Carlisle are of MES. Between Whitehaven and Fleetwood waters are of GES and the majority southwards of Fleetwood are MES, other than the Ribble estuary (PES) and Morecambe (BES). The areas between Whitehaven and Carlisle, Wyre, Mersey are of PCS. All other water coastal and estuarine water bodies are of GCS. The majority of groundwater in coastal areas is of gGCS. There are at least eight Shellfish Waters that are failing to achieve the designated assessment criteria (Water_198).
- There is an active nuclear power station at Heysham and a spent fuel reprocessing site at Sellafield. Discharges from Sellafield have been shown to be reducing. A new nuclear facility is planned at Heynsham (Water_228).
- The number of beaches classified as bathing waters is the lowest of the entire UK (approximately 26) but the area has the highest number of beaches classified as poor including Allonby, Cleveleys and Silloth. There are no blue flag beaches. This area is not popular with surfers (Water_195).
- There are two agglomerations of <150000 people at Shotwich and Glan-y-don (in Wales but likely to be having an effect), that may be causing pollution of the coastal areas (Water_196)
- An estimated 30% of the sea pollution is due to Combined Sewer Overflows (CSOs) (Water_315).

Baseline/issues: South West Plan Area 8 9

- There are two RBMPs in this area: the South West and Severn RBMPs (Water_186). The Severn draft 2016 RBMP: the Severn estuary is a HMWB of MES. Much of the western area of the Severn Estuary is of PCS, however the Inner Severn estuary is achieving GCS. Small estuaries, such as the Severn River and Avon are achieving GCS (Water_182). The South West draft 2016 RBMP: most coastal areas are GES and areas on the north Coast of Cornwall are of HES. Most estuaries are of MES or lower. Estuaries that are MES are the Fal, Helford, Fowey, Erne, Kingsbridge, Camel and Taw. All estuaries and coastal waters are achieving GCS, other than an estuary and adjoining coastal waters in the Falmouth area that is of PCS. The groundwaters are of gPCS in most areas. In the South West RBMD of the 33 classified Shellfish Waters, only 2 are achieving the objectives. 1.3% deterioration of surface water bodies (includes freshwater and water bodies outside of the South West Plan area) occurred between 2009 and 2015 (Water_187).
- There are approximately 126 bathing beaches and approximately 91% are achieving either good or excellent status. Four are classified as poor. There are 10 blue flag beaches and a high level of surfing/water sports activity throughout the year. Water quality is vital for tourism / human health (Water_181).
- There are five problem areas for eutrophication in the South West (Truro, Tresillian and Fal estuaries, Taw estuary and Lower Fal Estuary) (Water_208).
- There are just over 1,700 CSOs and from 2000 to 2010 South West Water has invested £75 million to reduce the volume and improve the quality of discharges in the most sensitive areas including bathing and selfish waters (Water_312).
- Large scale farming in the area between Trevoise head to Stepper Point can have large scale impacts for example soil run off into the sea in heavy rainfall (Water_39). Devonport is the only defence site in England able to discharge radioactivity into the waters (Water_183).

Baseline/issues: North East Plan Area 1 2

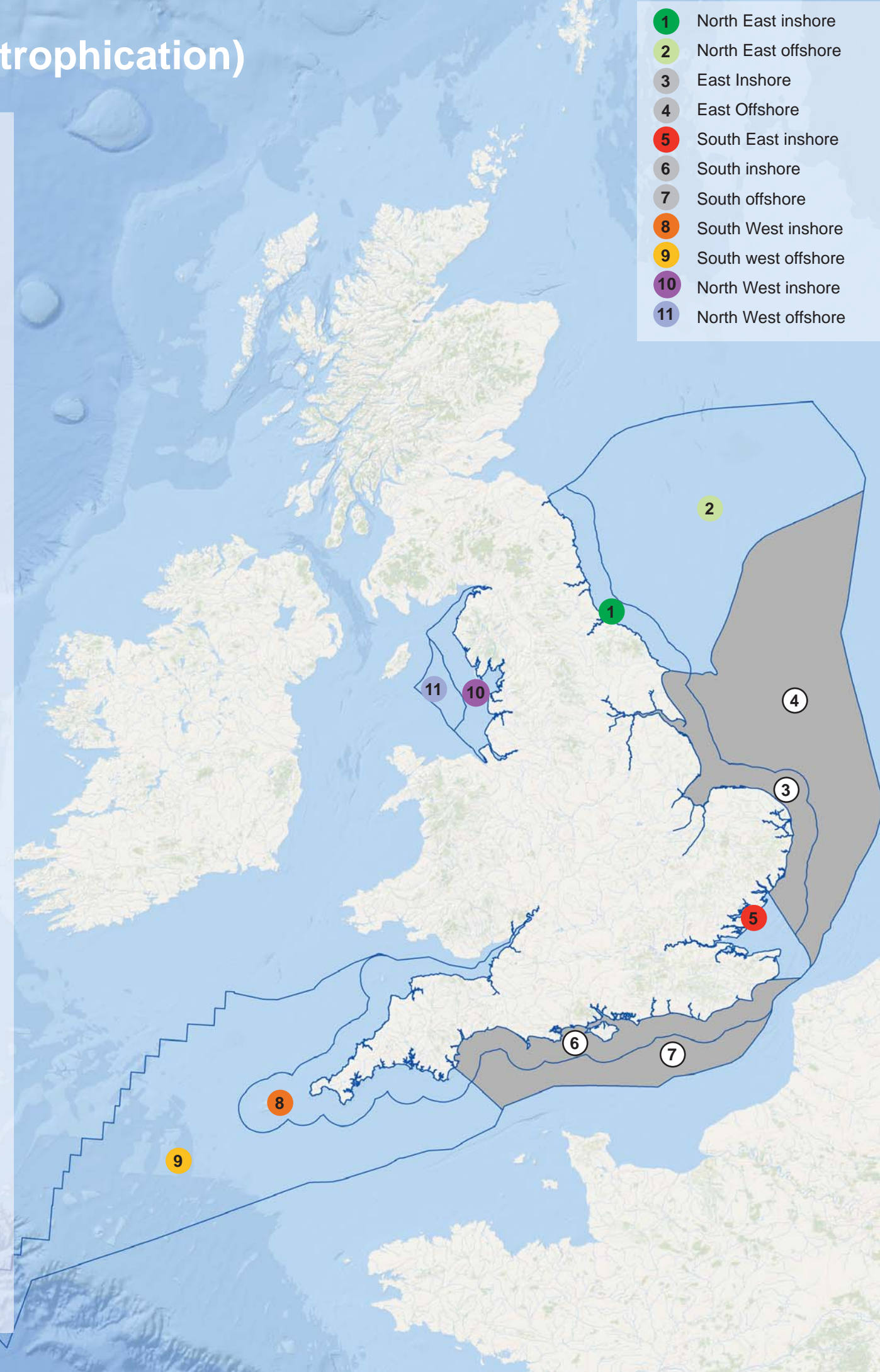
Key: High/Good/Moderate Ecological Status (HES) (GES) (MES); Poor/Bad Ecological Status (PES) (BES); Good/Poor Chemical Status (GCS) (PCS); groundwater Good/Poor Chemical Status (gGCS) (gPCS); Heavily Modified Water Body (HMWB)

- There are two RBMPs in this area: the Northumbria and the Humber RBMPs (Water_205). Northumbria draft 2016 RBMP: much of the coastal and estuarine waters are of GES, however, the small estuaries and coastal area between Hartlepool and Staithes are of MES. All estuarine and coastal waters, apart from between Seahouses and Dunbar are of GCS. Much of the coastal groundwaters are of gPCS. There is one designated shellfish area (Lindisfarne National Nature Reserve area) and this is failing to achieve the assessment standards (Water_206). The Humber draft 2016 RBMP: the coastal and estuarine waters are HMWB of MES. The coastal areas, other than the Esk, are all of GCS. Much of the groundwater in coastal and estuarine areas is of gPCS (Water_207).
- There are approximately 48 beaches classified as bathing beaches and 90% are classified as good or better. There are seven blue flag beaches. Water quality is vital for tourism / human health. Spittal and Staithes were rated as Poor in 2015. (Water_204)
- There are two areas related to eutrophication (Seal Sands in the Tees Estuary and Lindisfarne National Nature Reserve) (Water_208).
- Data from the oil and gas industry 2000 to 2014: a decrease in discharges (concentration less than 50% OSPAR recommended limit). No accidental releases > 200 tonnes of chemicals (2014) (Water_225) (Water_226)
- 31 out of the 34 bathing beaches are affected by CSOs (Water_316).

Baseline/issues: South East Plan Area 5

- There are three RBMPs in this area: the South East RBMP, the Thames and the Anglian RBMPs (Water_191). The Thames draft 2016 RBMP: this includes the Thames which is a HMWB of MES and many smaller estuaries which are mainly of GES, other than two smaller estuaries (including the Swale) of MES. All of the coastal and estuarine waters are of GCS. Groundwaters in the coastal areas include a large area of gPCS. There are two classified shellfish waters, one is achieving the Shellfish Waters Objectives and one is failing (Water_192). The South East draft 2016 RBMP: all coastal and estuarine waters are HMWB of MES, other than a small estuary (assumed to be the Stour) of PES. All of the estuarine and coastal areas are of GCS. Much of the groundwater in coastal areas is of gPCS. The designated Shellfish Waters are failing to achieve the assessment standards for shellfish waters (Water_193). The Anglian draft 2016 RBMP: all coastal and estuarine waters are HMWB of MES and GCS. Large areas of groundwater in the coastal area are of gPCS. There are a large number of designated shellfish waters in the area of which the majority are failing to comply with the Shellfish waters assessment (Water_194).
- Although a small plan area, there are approximately 42 bathing beaches. Nearly 90% of these are achieving good or above status. 22 beaches are Blue Flag. Beaches identified as having 'Poor' water quality were Clacton (Groyne 41), and Walpole Bay, Margate (Water_188).
- There is an agglomeration with a generated load of 150000-1000000 at Southend on Sea with is not compliant with EU legislation. There are three agglomerations of <150000 at Holland on Sea, Jawick and Canvey Island that are not compliant and may be causing pollution of the coastal areas (Water_190).
- The Thames Tideway Tunnel is a 15 mile-long sewer which will run beneath the River Thames and transfer the sewage to Beckton works where it will be treated. The project will be completed by 2023 and will modernise London's water and sewer networks (Water_261).
- There has been a significant reduction in the number of Category 3 (minor) pollution incidents but there are more Category 2 (significant) incidents than ideal (Water_309).

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Water - Water Pollution and Water Quality (Including Eutrophication)

Summary of the legislative / policy context

- The Water Framework Directive (WFD) (the most substantial piece of European water legislation to date) is designed to improve and integrate the way water bodies are managed in Europe. The Directive takes a holistic approach to water management, preventing deterioration of aquatic ecosystems and restoring surface waters (which includes rivers, lakes, estuarine and other transitional waters, and coastal waters out to 1 nautical mile) and groundwater to “good status” in terms of ecological and chemical objectives for surface waters and quantitative and chemical objectives for groundwater by 2015. Two daughter directives accompany the WFD; the Groundwater Directive (2006/118/EC) and the Priority Substances Directive (2008/105/EC). This legislation underpins the requirements of the WFD with regard to groundwater and surface water pollution. The latter will not only contribute to the decline in the emission of priority substances, but also the cessation of their discharge by 2020.
- The Marine and Coastal Act (2009) provides the legal mechanism to deliver European and International marine conservation commitments such as the OSPAR Convention and the Marine Strategy Framework Directive (MSFD).
- The MSFD aims to achieve Good Environmental Status (GES) by 2020 and includes specific qualitative descriptors of GES including those related to human-induced eutrophication (and its effects), concentrations of contaminants, and contaminants in fish and other seafood for human consumption. In accordance with the provisions of the OSPAR, Convention, which is in support of the MSFD, contracting parties shall take all possible steps to prevent and eliminate pollution and protect the maritime area so as to safeguard human health and to conserve marine ecosystems and, when practicable, restore affected marine areas (Water_1). The convention includes a range of strategies for dealing with problems in the UK such as hazardous substances, agricultural inputs, radioactive substances and eutrophication (Water_10, Water_11, Water_12).
- Other important pieces of legislation include:
 - The Bathing Water Directive (2006/7/EC)
 - The Urban Wastewater Treatment Directive (91/271/EC),
 - The Nitrates Directive, The Priority Substances Directive (2008/105/EC)
 - The Environmental Quality Standards (2008/105/EC)
 - International Convention for the Prevention of Pollution from Ships (MARPOL Convention).

Key cross cutting baseline / issues across all plan areas

- Developments and other activities can have adverse effects on transitional waters, coastal waters and marine waters. This includes increased demand for water, discharges to water, adverse ecological effects resulting from physical modifications to the water environment and increased risk of spills and leaks and transmission of invasive non-native species (Water_286).
- Most of the areas in UK seas where there are problems from contamination with hazardous substances are local in nature and are particularly in industrialised estuaries and coasts and generally associated with historic discharges and emissions (Water_176).
- Aquaculture is being promoted strongly in the Blue Growth Strategy, the Atlantic Strategy and the reformed Common Fisheries Policy (CFP) and some UK administrations have also adopted specific aquaculture policies and strategies to encourage or support industry growth and development. Aquaculture has the potential to lead to eutrophication and release chemicals into the water (Water_274).
- Environmental concentrations of monitored hazardous substances in the sea have generally fallen, for example concentrations of TriButyl Tin (TBT) (Water_276) and radioactivity (Water_163) have shown large improvements, however for other contaminants they are still above levels where there is a risk of pollution in many coastal areas (Water_177). Particularly of concern are the Persistent Organic Pollutants (POPs) in water and sediments (Water_237) which may become mobilised, e.g. due to dredging and disposal of dredged material (Water_172, Water_173) and have been demonstrated to bio accumulate in marine organisms (Water_263, Water_171).
- At present the UK does not propose implementing measures to reduce persistent legacy contamination in sediments on the grounds that the actions would be disproportionately costly (Water_237).
- Persistent oestrogenic compounds in waters in estuaries have also been indicated as an increasing problem (Water_251).
- There are relatively few eutrophication problem areas in UK waters at present (Water_178). Pressure on eutrophication status is biggest in the East, South and North West of England where nutrients of human origin have enriched coastal waters. Microbial contamination of coastal waters from sewage treatment plants has fallen significantly but some areas still experience problems and climate change and the potential increased storminess may exacerbate this problem (Water_287, Water_300, Water_302).

The likely evolution of the environment over the plan duration

- Hazardous substances in the sea have shown a general decreasing trend, and it is likely these trends will continue overtime, with the continued implementation of ever more stringent regulatory controls. Exceptions are likely to be chemicals of a particularly persistent nature, such as Persistent Organic Pollutants (POPs). Sediment contamination is also likely to remain a problem into the future and may present a risk to the water habitat where it becomes remobilised, for example in the North Sea as a result of oil and gas decommissioning operations or in dredging or extraction operations.
- Wetter winter weather is expected to result in a greater number of overflows from CSOs with potential for water quality issues, in particular eutrophication and microbiological.
- Pollution events resulting from industry and construction are likely to become less significant as the Environmental Damage Regulations (Prevention and Remediation) 2009 will provide tougher penalties and fines for those causing environmental damage.
- Particular problems are the chemical quality of groundwater, and failure to reach the shellfish waters standards. Remediation of these is likely to be over the long term.
- Climate change resulting in more frequent extreme storms and waves may exacerbate problems caused by pollutants and contaminants in the marine environment.

Potential interactions with other topics

- The key-inter-relationships are with marine biodiversity, communities, health and wellbeing, and geology, geomorphology and coastal processes. Also see the report cards for these topics.
- The main risks to marine life are from acute pollution events, e.g. oil spills from ships or industrial discharges. Events of this nature can result in the immediate death of organisms. Acute toxicity from low level environmental contamination is also a concern, which can have chronic effects of marine biodiversity, e.g. the recent publication in Science journal indicating the high bioaccumulation rates of POPs in killer whales and bottlenose dolphins, which is thought to have caused impacts on reproduction. Acidification could affect the behaviour and bioavailability of contaminants in the marine environment.
- The risks to communities, health and wellbeing are mainly around the potential health effects of using waters for recreational purposes at times when they have dangerous concentrations of microbial contaminants. Monitoring is only carried out during the summer when recreational usage is at its highest, however some beaches continue to have large numbers of water users all year round.
- The risks associated with geology, geomorphology and coastal processes are due to the linkage between the water environment and the sediment. Most contaminants enter the water environment, however, many will enter the sediment environment, where they can often remain for long durations. Remobilisation of these sediments back into the water phase can occur.

Water - Water Pollution and Water Quality (Including Eutrophication)

Potential transboundary issues

- Decommissioning of oil and gas infrastructure is forecast to increase dramatically, particularly post 2020. Much of this will take place in the North Sea but also includes the Irish Sea and may have impacts on the North East and North West plan areas. Decommissioning activities are subject to EIA and are controlled by DECC. 'Making safe' activities must be carried out in line with environmental and safety considerations in preparation for removing a facility or decommissioning a pipeline. 'Making safe' of facilities includes cleaning, freeing equipment of hydrocarbons, disconnection and physical isolation, and waste management (Water_281)
- The Scottish National Plan details the belief that carbon capture and storage (CCS) technology is a critical component in the decarbonisation of Scotland's energy supplies. It states that 'the North Sea is the largest CO2 storage resource in Europe and this, coupled with our existing oil and gas capabilities, ready supply chain and existing infrastructure means that Scotland is in a strong position to be at the centre of CCS development in Europe'. The potential for environmental impacts is dependent upon the extent to which it is possible to use existing pipelines, installations and wells. Potential impacts include siltation, reduction in water quality, acidification/salinity changes, pollution from contaminants used (Water_306)
- Development of wave and tidal energy is particularly prominent in Wales at present and there are multiple existing and proposed new nuclear power stations in the Wales region, which could have transboundary effects on water quality in the South West and North West Marine Plan areas.
- The North West and South West plan areas both encompass River Basin Management Plans that are under Welsh jurisdiction

Key data gaps

- The source of failures in water quality are not always known, e.g. Allonby Bay North and need to be resolved before changes can be implemented to improve water quality (Water_195)
- Due to the timescales of the project the 2016 Draft River Basin Management Plans (RBMPs) have been reviewed as the final RBMPs were published very shortly before the publication of the SA scoping report. It would be useful to review the final RBMPs before the SA assessment stage begins.

Air Quality - Air Pollutants

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

The most highly populated and industrial areas adjacent to the coast are the main ports and this is where the focus needs to be with regard to analysing air quality impacts of inshore activities. The major ports in the North West marine plan area include:

- Liverpool (Seaforth, Birkenhead) - commercial, containers, bulk cargo, general cargo, ship fabrication and repair. New deep water container terminal completion 2015 doubles port capacity (Air_16)
- Manchester (via the Manchester Ship Canal), Eastham, Port Irlam, Ellesmere Port, Port Ince, Port Salford, Port Warrington, Runcorn (part of Peel Ports – working in conjunction with Liverpool) - commercial, containers, bulk cargo (Air_16)
- Fleetwood (Associated British Ports) - fishing, offshore gas, general cargo. Potential Celtic Array offshore wind development (Air_16)
- Heysham (Peel Ports) - ferry, bulk cargo, offshore gas, Potential Celtic Array offshore wind development (Air_16)
- Barrow in Furness (Associated British Ports) - general cargo, bulk cargo, shipbuilding, offshore wind (Air_16)

None of the port areas are designated AQMAs (Air_16)

Baseline/issues: South West Plan Area 8 9

The major ports in the South West Marine Plan Area include:

- Plymouth – defence, fishing, ferry, general cargo (Air_12)
- Falmouth - shipyards and maintenance (Air_12)
- Avonmouth (and Bristol) - commercial and industrial (Air_12)

None of these port areas are designated AQMAs (Air_12)

Baseline/issues: North East Plan Area 1 2

The major ports in the North East marine plan area include:

- Newcastle upon Tyne and associated ports - car ferries / cruises/ conventional and bulk cargo (Air_17)
- Sunderland - continental ferry port, cargo handling, North Sea oil and gas (Air_17)
- Hartlepool - fishing, bulk cargo, oil & gas & renewable energy (Air_17)
- Teeside including Teesport, Middlesborough, Billingham and Redcar - cargo annually, renewable energy (Air_17)

None of the port areas are designated AQMAs (Air_17)

Baseline/issues: South East Plan Area 5

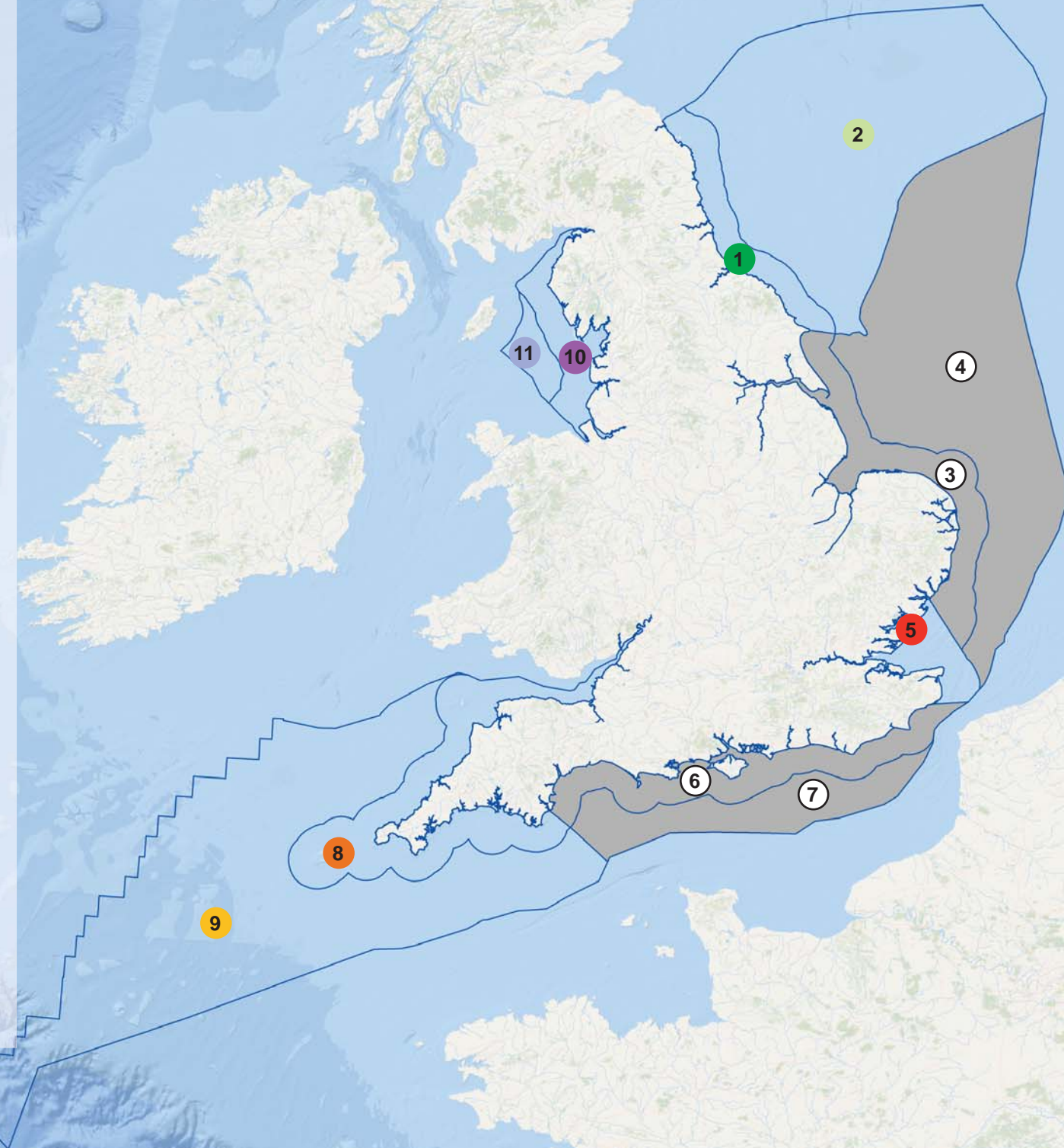
The major ports in the South East plan area include:

- The Port of London (including Tilbury and London Gateway) – logistics (Air_24)
- Felixstowe / Harwich - warehousing and cross-docking (Air_24)
- Thamesport - commercial including container terminal, ro-ro ferries and bulk carriers (Air_24)
- Dover - ferry, cruise liners, cargo terminal (Air_24)

AQMAs are in place in Tilbury (Greater London - AQMA 24 Covers Tilbury Dock Road and Calcutta Rd Road transport - Pollutants declared NO2) and Dover (Dover Docks - AQMA Covers Dover Eastern Docks including residential properties in East Cliff and Athol Terrace - Pollutants declared SO2) (Air_24)

An AQMA is designated for the Dooley Inn, Ferry Lane next to Felixstowe Port. Container handling activities on the Port, and heavy duty vehicles on roads external to the Port made the greatest contribution to NO2 levels within the AQMA (Air_24)

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Air Quality - Air Pollutants

Summary of the legislative / policy context

- Shipping is a key contributor to sulphur dioxide emissions. Under EU Directive 1999/32/EC, from July 2010 ships operating in Sulphur Emission Control Areas must not use fuel exceeding 1% sulphur. This was reduced to 0.1% from 2015. However, sulphur dioxide emissions may not be as significant to the inshore areas as other industries.
- Directive 1996/62/EC aims to ensure prevention and reduction of airborne pollutants for the protection of human health and the environment.
- With regard to marine environment specifically, the Marine Policy Statement for the UK recognises that activities and developments in the marine and coastal area can have adverse effects on air quality and the UK is a signatory to various conventions, the most significant one being MARPOL (Marine Pollution Convention, 1973 / 1978). This is the main convention governing the prevention of pollution of the marine environment from ships and in part oil rigs and production platforms. It covers pollution by chemicals, oil, harmful substances in packaged form, rubbish, sewage and air pollution. It was amended in 2008 to further reduce harmful emissions from ships of sulphur oxides (SOx) and nitrogen oxides (NOx).

Key cross cutting baseline / issues across all plan areas

- Shipping is a key contributor to sulphur dioxide emissions. EU Regulations will require higher quality fuels to be used to reduce sulphur emissions. Under Directive 1999/32/EC: From July 2010 ships operating in Sulphur Emission Control Areas (ECA) must not use fuel exceeding 1% sulphur. This was reduced to 0.1% from 2015 (Air_8)
- There are Emission Control Areas in place in the Baltic Sea ECA (sulphur oxides only), the North Sea ECA (sulphur oxides) and North American ECA (sulphur oxides, nitrogen oxides and PMs). The marine plan areas have more restrictive emissions standards and this may have transboundary effects on air pollutants (Air_15)
- There is the potential for negative cumulative ecological effects from air quality as a result of new nuclear power stations. However, the Environment Agency (EA) assesses that non-radioactive aerial emissions (sulphur dioxide, nitrogen oxides and volatile organic compounds) from nuclear power stations are extremely low compared to other regulated industries (Air_20)
- Ongoing challenges with air quality (from transport emissions amongst others) in Air Quality Management Areas at the coast and on land could lead to eutrophication of the marine environment (Air_23)
- Ports such as Dover do not show 'hotspots' of SO2 concentrations indicating it is not necessarily shipping itself that accounts for the peaks but the nearby industry linked to the ports (Air_25)

The likely evolution of the environment over the plan duration

Agreed amendments to MARPOL will help improve air quality at ports. There have been quite substantial reductions in emissions of nitrogen oxides during the last decades in Europe. From 1990 to 2009 the NOx emissions in Europe decreased by 31%. The reductions were in the first decade mainly caused by a change from burning of coal and gas to nuclear power. NOx emissions from traffic especially in Western European have also decreased, even though fuel consumption increased. However, increased shipping activity, port expansion and associated industry growth could lead to increased sulphur oxides and nitrous oxides emissions at certain coastal locations, which in turn could contribute to the breach of national objectives for air quality. These include London Gateway port development, planned expansion of the Port of Felixstowe, Port of Dover Masterplan and the Port of Liverpool Masterplan. Therefore, it can be seen that there is likely to be a mixed picture in terms of the likely evolution of the environment dependent on location.

Potential interactions with other topics

The main interaction is with economy, particularly ports development, shipping and industrial emissions. There are also interactions between air quality and human health.

Potential transboundary issues

There are Emission Control Areas in place in the Baltic Sea (sulphur oxides only), The North Sea (sulphur oxides) and North American ECA (sulphur oxides, nitrogen oxides and PMs). The marine plan areas have more restrictive emissions standards and this may have transboundary effects on air pollutants (Air_15)

Key data gaps

Air quality is not routinely monitored at offshore sites so it is difficult to predict the future trends of air quality within offshore plan areas. There is currently a paucity of data from which to generate a strategic understanding of where particular air quality sensitivities exist. As a consequence, it will be difficult to determine plan impacts on particular areas for air quality (Air_18)

Climate - Greenhouse Gas Emissions and Climate Change Resilience and Adaptation (Including Flooding)

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- By the 2050's the following climate impacts are predicted (Climate_180):
- Increase of 2.5 degrees by the 2050's and 3.6 degrees in the 2080s under the medium emissions 50 percentile estimate;
 - Coastal infrastructure is also projected to see an increasing vulnerability due to average sea level increases by the 2080s of up to 63cm (UKCP09) across most of the region and from more frequent storm surges;

Sea level rise is already affecting intertidal habitats which balance delicately on the basis of tidal inundation (Climate_140)

Baseline/issues: North East Plan Area 1 2

By the 2050's the following climate impacts are predicted (Climate_184):

- Increased summer temperatures, reduced summer rainfall, and more erratic rainfall patterns;
- Increased flooding s and storm surge heights;
- Low water availability in the summer, increased flooding and coastal erosion;
- Sea level rise and storm surges.

The highest number of properties at risk from coastal flooding is likely to be around Yorkshire and the Humber Estuary (Climate_164)

Baseline/issues: South West Plan Area 8 9

By the 2050's the following climate impacts are predicted (Climate_176):

- Increase in the magnitude of winter flash floods due to increased winter rainfall and reduced summer rainfall;
- An increase of 3-5 °C in mean summer temperatures in the eastern parts of the region, though by less than this in most of Devon and Cornwall.

The peatlands of Bodmin, Dartmoor and Exmoor support internationally important mires and heaths provide 70% of our local drinking water and lock up significant amounts of carbon (Climate_177)

Baseline/issues: South East Plan Area 5

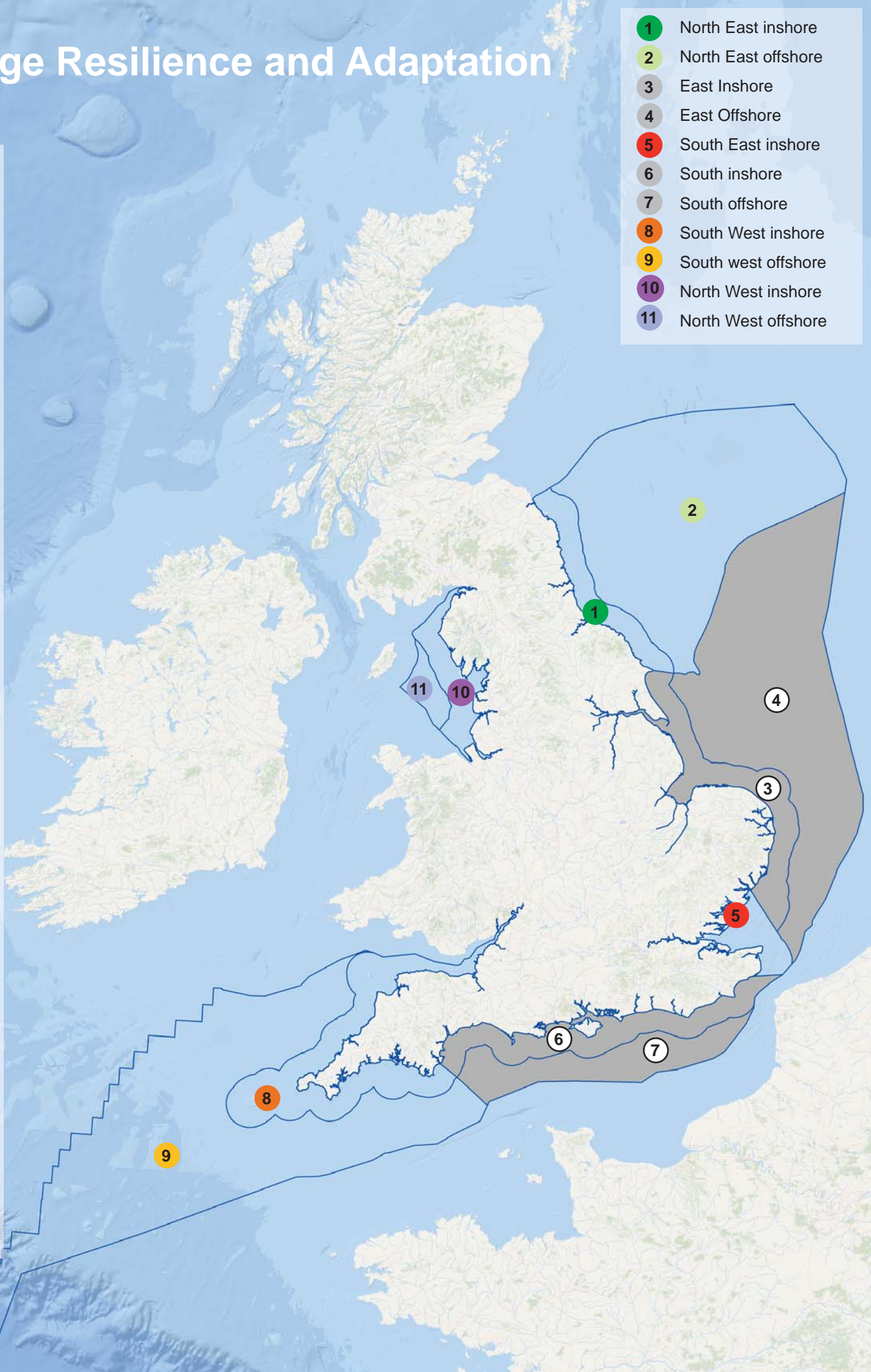
By the 2050's the following climate impacts are predicted (Climate_182):

Extreme high water from rising sea levels combined with storm surge and large waves could lead to a higher risk of a breach in low-lying areas of the coast and reorganisation of coastal ecosystems. This risk is particularly apparent in East and South England;

- The greatest increases in risk of river and tidal flooding affecting high-quality agricultural land occurring in the South and East.
- Rising sea levels and storms will also put pressure on coastal flood defences (Climate_181)

Coastal groundwater systems are vulnerable due to predicted increase in sea level (Climate_139)

Fifteen per cent of the city's surface area lies on the floodplains of London's rivers. The Thames Barrier will continue to provide flood protection to London through most of this century with some modification (Climate_147)



Climate - Greenhouse Gas Emissions and Climate Change Resilience and Adaptation (Including Flooding)

Summary of the legislative / policy context

The UK Marine Policy Statement (MPS) sets a number of high level marine objectives which 'enable the UK's move towards a low carbon economy in order to mitigate the causes of climate change and ocean acidification and adapt to their effects'. This includes recognition that the marine environment plays an important role in mitigating climate change and makes it clear that the use of the marine environment should be spatially planned where appropriate and based on an ecosystems approach which takes account of climate change.

Various legislative and policy requirements are in place to reduce greenhouse gas emissions from all sectors. Key examples are as follows:

- UK Climate Change Act 2008 commits the government to reduce greenhouse gas emissions by 34% in 2020 and at least 80% by 2050 (compared to 1990 levels);
- The UK has a legally binding target to produce 15% of its energy needs from renewable sources by 2020, required under the Renewable Energy Directive (2009);
- The Committee on Climate Change recommends that international shipping emissions are included in the UK's 2050 target to reduce emissions by 80% on 1990 levels. However, other mechanisms, for example, via the International Maritime Organisation (IMO) could play a role in reducing relative emissions via technical and operational measures (such as efficiency improvements);
- The UK low carbon transition plan (2009) details how targets for UK GHG reductions will be achieved. Around half the emissions reductions are expected to come from the power and heavy industry sectors with more modest contributions (about one third in total) being made by transport, homes and communities;

In addition the consideration of greenhouse gas emissions is also evident in UK legislation through:

- The 2008 Planning Act and 2011 Localism Act, supported by the National Planning Policy Framework (NPPF). This requires local planning authorities to develop policies and adopt proactive strategies to mitigate and adapt to a changing climate, taking full account of flood risk, coastal change and water supply and demand considerations (Climate_169).

Key cross cutting baseline / issues across all plan areas

The impacts of climate change are already being observed, and impacts are predicted to continue (Climate_115).

- Average UK temperatures have risen since the mid 20th century, as have average sea level and sea surface temperatures around the UK coast. There has been an approximate 14 cm rise in mean sea-level since the beginning of the 20th century, which has significantly increased (as much as doubled) the risk of flooding at many locations around the coast (Climate_121).
- The UK is likely to experience hotter, drier summers and warmer, wetter winters. (Climate_127)
- For the UK's marine environment, the impacts of climate change include relative sea level rise, increased seawater temperatures, ocean acidification and changes in ocean circulation (Climate_127)
- If carbon emissions continue unchecked, surface ocean pH will decrease to between 7.6 and 7.8 by the year 2100 (Climate_118).
- Emissions from ships are estimated to be approximately 3 per cent of global CO2 emissions, projected to rise to approximately 15 to 30 per cent by 2050 due to expected increase in global trade. UK shipping emissions are estimated between 0.8 and 5 per cent of global shipping emissions (Climate_110)

Management and adaptation to these impacts should be a priority for terrestrial planning on the coast (Climate_6) for example protecting and restoring marine habitats; (Climate_132).; using natural means of flood defence using ecosystem-based approaches and ensuring that that inappropriate types of development are not permitted in those areas most vulnerable to coastal change.

- In the absence of adaptation (which may become prohibitively expensive), beaches will narrow and some dune systems may be lost (Climate_129).
- In particular it is important to note that climate impacts have wider environmental and social implications, and are derived from both inundation processes, and anthropogenic action including coastal defence and other coastal infrastructure (such as cable and pipe landfall, new port infrastructure) and sea-level change (Climate_134).

The likely evolution of the environment over the plan duration

- The realignment of some coastal infrastructure and housing may be expected (Climate_131). Around 700 properties could be lost to coastal erosion over the next 20 years (Climate_171).
- Future effects of climate change are also likely to include increased storm intensity, increased rainfall, increase in seawater temperature and acidity leading to ecological impacts. This could have practical implications for licensing and exploration. The rate of coastal erosion is likely to increase as sea levels rise. This could lead to deeper water in near shore areas, which would in turn cause an increase in wave energy reaching the coast. Impacts of coastal erosion on buildings and infrastructure located along the coast are therefore likely to increase (Climate_116).
- Over the next 20 years, there will be a need to reduce greenhouse gas emissions in order to meet UK climate legislation. It is envisaged that further development of renewable energy generation including offshore wind farms and wave and tidal energy generation, could contribute to this reduction. There are also a number of important ports within these marine plan areas and marine planning can make a contribution to climate change mitigation and adaptation in line with United Kingdom national policies and recent International Maritime Organization measures (Climate_3).

Potential interactions with other topics

There are particularly clear links identified with biodiversity, ecosystem services, economy, ports and shipping, renewable energy and communities. A number of examples are listed below; however please see other report cards for topic specific impacts:

- Renewable energy offers the potential for mitigating greenhouse gas emissions from energy production. It also provides opportunity for socio-economic benefits including employment, energy security and export business (Climate_159)
- Rising air temperature and sea temperatures and associated sea level rise has implications for the majority of marine ecology receptors identified within the biodiversity report cards. For instance, the loss of intertidal habitat through coastal squeeze and the effect on foraging bird species (Climate_126)
- Ocean acidification, through the uptake of CO2 from the atmosphere, is predicted to have negative impacts on calcifying organisms, including numerous plankton taxa, molluscs and echinoderms, which will resonate at higher trophic levels (Climate_135)
- Marine aggregates are required for the maintenance of coastal defences required for climate change adaptation. Marine aggregates can present reduced impacts on local communities compared to the extraction of land-won aggregates, including skilled, stable employment and the generation of income through the construction industry supply chain. Potential adverse impacts include changes to the hydrodynamic regime that may alter coastal processes; loss of seabed habitat and heritage assets; impacts on fisheries and secondary impacts to marine life and habitat associated with sediment plumes; disturbance of fish spawning, migration routes, nursery and overwintering areas; overflows from dredging vessels and impacts on geodiversity

Climate - Greenhouse Gas Emissions and Climate Change Resilience and Adaptation (Including Flooding)

Potential transboundary issues

- Climate change is a global issue and therefore transboundary in nature. Climate change has the potential to exacerbate erosion and flooding issues on a national scale and as such, climate change resilience and adaptation techniques set out in shoreline management plans should take account of transboundary impacts in other plan areas.
- Sea surface temperature has risen approximately 0.7 degrees Celsius per decade and air temperature approximately 0.6°C per decade in the period 1984 to 2008 tending to be largest in the south and east of England and smallest in Scotland (Climate_117)
- Coastal groundwater systems are also vulnerable due to predicted increase in sea level - implications for coastal flooding are particularly evident in the Southern North Sea (Climate_139)

Key data gaps

There are a number of key data gaps mainly relating to current knowledge gaps and uncertainties in climate change predictions and impact:

- Knowledge of the impacts of ocean acidification on marine species is limited (Climate_161)
- Coastal responses to changes in sea level, extreme storms and waves are complex and localised (Climate_160)
- Regional variability of sea-level changes are poorly addressed at the current resolution of Global Climate Models used for climate projections (Climate_144)
- An increased frequency in storms and storm surges (including an increase in wave height) which can be directly attributed to climate change, remains unproven in the most recent probabilistic projections for the UK (Climate_119)
- A lack of long-term records from deep-sea Habitats means that there is no baseline against which to assess climate change impacts (Climate_165)
- Sea surface warming is the most evident in the OSPAR Region II (North Sea), however there is no data recorded for the immediate east coast of England, or the English Channel (Climate_123)
- Improved knowledge of how regional patterns in rainfall and winds will change over the next century is needed to understand potential changes to stratification in shelf seas (Climate_162)
- Due to the timescales of the project the 2016 Draft River Basin Management Plans (RBMPs) have been reviewed as the final RBMPs were published very shortly before the publication of the SA scoping report. It would be useful to review the final RBMPs before the SA assessment stage begins (Climate_157)
- The Environment Agency have updated climate change allowances (these are predictions of anticipated change for: peak river flow by river basin district; peak rainfall intensity; sea level rise; offshore wind speed and extreme wave height). This updated guidance was published shortly before the publication of the SA scoping report and it would be useful to review the climate change allowances for the river basin districts within each plan area before the SA assessment stage begins (Climate_156)
- Climate Ready has produced regional summaries of the UK climate change risk assessment and it would be beneficial to review before the assessment stage of the SA begins (Climate_172)

Communities - Health and Wider Determinants of Health and Effects on Protected Equality Groups

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- Living environment domain (2015 IMD) shows some more deprived Lower Super Output Areas (LSOA) on the coast, especially in the South West, the North East rural areas and the North West in some more rural areas as well as urban coastal areas. (Communities_40)
- Mariculture and aquaculture farms predominately employ people within the age range of 16-44. The majority of the proprietorships are held by men while the on-shore processing activities are dominated by women. Mariculture and aquaculture activities are strongest in the North West and South West plan areas (Communities_31)
- The North West and North East have an above national average proportion of people with a limiting long term illness. (Communities_33)

Baseline/issues: North East Plan Area 1 2

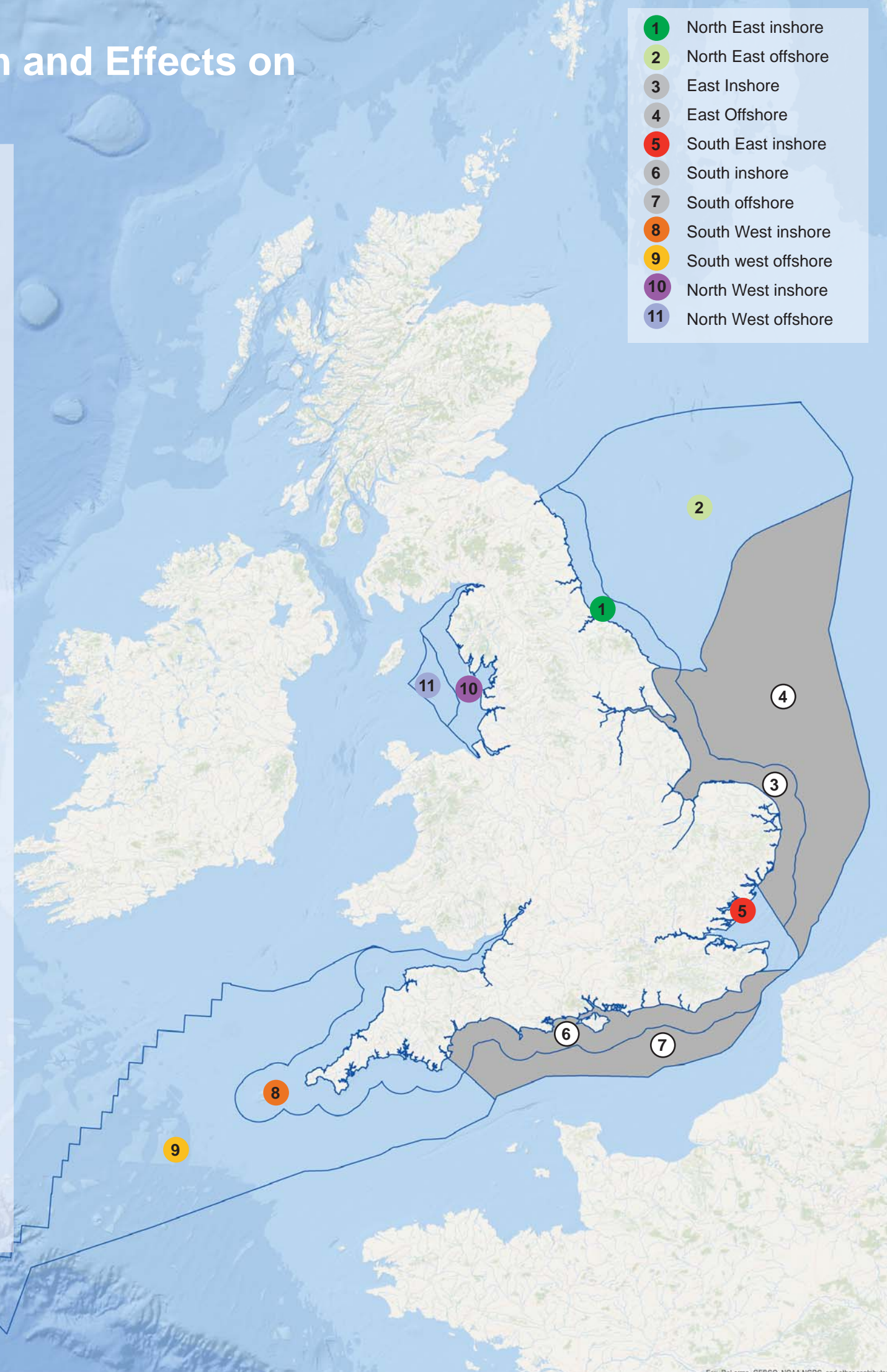
- Living environment domain (2015 IMD) shows some more deprived LSOA on the coast, especially in the South West, the North East rural areas and the North West in some more rural areas as well as urban coastal areas. (Communities_40)
- High levels of deprivation within this plan area including high levels of 'striving communities' (Communities_29)
- Effects of poor bathing water quality at Spittal on the amenity value of the coastline (Communities_30)
- There is poor health and well-being performance with sometimes stark health and well-being inequalities (Communities_38)
- There is a push to increase accessibility to the coast and marine area, although fewer issues from 'coastal squeeze' compared with other areas (Communities_73)
- The North West and North East have an above national average proportion of people with a limiting long term illness (Communities_33)

Baseline/issues: South West Plan Area 8 9

- Living environment domain (2015 IMD) shows some more deprived LSOA on the coast, especially in the South West, the North East rural areas and the North West in some more rural areas as well as urban coastal areas. (Communities_40)
- Maximize health linked recreation in the North Devon AONB and evaluate opportunities and impacts of sea-based recreation. (Communities_58)
- Mariculture and aquaculture farms predominately employ people within the age range of 16-44. The majority of the proprietorships are held by men while the on-shore processing activities are dominated by women. Mariculture and aquaculture activities are strongest in the North West and South West plan areas (Communities_31)

Baseline/issues: South East Plan Area 5

- 27% of Londoners live in poverty after housing costs are taken into account, compared with 20% in the rest of England. The cost of housing is an important factor in London's higher poverty rate (Communities_132)
- There are no specific health and well being issues relating to this plan area in addition to the cross cutting issues



Communities - Health and Wider Determinants of Health and Effects on Protected Equality Groups

Summary of the legislative / policy context

The MPS aims to ensure equitable access to the coast and seas and recognises that the marine area provides national social and economic benefits and contributes to the well being and quality of life of coastal communities. (Communities_6)

Plan-making should support strong and healthy communities and living environments which make physical activity easy to do; supports the reduction of health inequalities; considers the local health and wellbeing strategy; and encourages healthy lifestyles including opportunities for sport and recreation. (Communities_46)

High Quality Care for All, the 2008 Darzi review of the National Health Service, supported services to promote health including combating obesity, consumption of healthy food, increased levels of physical activity, and encouragement to companies to invest more in the health of their workforce. (Communities_3) "Fair Society, Healthy Lives, the 2010 Marmot Review of health inequalities, highlighted the need to reduce health inequalities as a matter of fairness and social justice. It concluded that action on health inequalities requires action across all the social determinants of health. It identifies the creation of healthy, sustainable communities as one of a priority set of objectives for improving health, the promotion of which is via measures which also help tackle climate change and achieve sustainability objectives. (Communities_4) The Marine Policy Statement (MPS) sets out to "ensure a strong, healthy and just society" where the use of the marine environment is benefitting society as a whole and contributing to cohesive communities and physical and mental wellbeing. (Communities_5)

The Equality Act 2010 covers nine protected characteristics – age, disability, gender reassignment, pregnancy and maternity, race, religion or belief, sex, sexual orientation, marriage and civil partnership (applicable only to the need to eliminate unlawful discrimination) – which cannot be used, either directly or indirectly, as a basis for unequal treatment. The Sustainable Development Commission's 2010 report 'A key to tackling health inequalities' concludes that measures such as active travel, promoting green spaces and healthy eating will yield co-benefits for both health and carbon emissions and requires that opportunities for healthy, low-carbon living should be distributed in ways that favour people with low incomes and so help to reduce their vulnerability to ill-health. The MPS aims to ensure equitable access to the coast and seas and recognises that the marine area provides national social and economic benefits and contributes to the well-being and quality of life of coastal communities. It states that marine planning should contribute to securing sustainable economic growth in regeneration areas and areas that already benefit from strong local economies. (Communities_1) Sport England is working to increase participation in sports for women and young people. (Communities_134)

Key cross cutting baseline / issues across all plan areas

- Health deprivation and disability domain (2015 IMD) shows some more deprived LSOA on the coast compared with the rest of England. In addition, deprivation in relation to income, income deprivation affecting children and older people, employment and education (2015 IMD) shows some more deprived LSOA on the coast compared to the rest of England. Living environment domain (2015 IMD) also shows some more deprived LSOA on the coast, especially in the South West, the North East rural areas and the North West in some more rural areas as well as urban coastal areas.
- Good health could be most prevalent in areas close to the coast and areas showing high deprivation could benefit from being close to the coast. This could be a result of individuals being able to partake in activities to reduce stress and increase physical exercise. However, research findings are uncertain. There could be a "healthy migrant effect"; the ability of healthy (and wealthy) individuals moving to the coast and therefore showing a higher good health to proximity ratio. (Communities_54)
- Access to high quality open spaces and opportunities for sport and recreation can make an important contribution to the health and well-being of communities. (Communities_43)
- Leisure time at the beach, coastal walking and outdoor swimming continue to have the largest contribution to participation across the UK. Natural England survey results found that respondents felt refreshed, relaxed and enjoyed their time in nature. Additionally, health/exercise and walking the dog were the top motivators for being outdoors. (Communities_56) Reference to the importance of recreation to health has been implied through the estimation of cost to employers (£3.75 billion) and the British society (£77 billion) due to staff taking time off work to deal with stress related issues. (Communities_55)
- Many coastal communities comprise sizeable or growing numbers of older people with significant care needs. This places an increased demand on health and social care services. (Communities_45)
- Women in fisher families, enterprises and communities largely took on multiple responsibilities ranging from being accountants and book keepers, to administrators, crews' cooks, drivers, representative at meetings and community organisers. This latter role helps them to become social and political networkers and become involved in decision making at different levels. (Communities_50)

The likely evolution of the environment over the plan duration

- Growing numbers of old people in many coastal communities will place an increased demand on health and social care services. Increasing likelihood of more frequent and more severe extreme weather events and coastal flood risk due to climate change may mean health, social care and emergency services lack the resilience to cope with demands when a major flood or other extreme weather event occurs.

Potential interactions with other topics

- Climate change could increase risks to the well being of people living near the coast. Water quality, air quality and pollution could affect people's health at the coast, including both residents and visitors.
- There are strong links between leisure, recreation and tourism at the coast with the health and well being of residents in these areas. As identified above as a cross-cutting issues, good health could be most prevalent in areas close to the coast and this could be a result of individuals being able to partake in activities to reduce stress and increase physical exercise. However, research findings are uncertain and there could be a "healthy migrant effect"; the ability of healthy (and wealthy) individuals moving to the coast and therefore showing a higher good health to proximity ratio. This 'healthy migrant effect' should be noted, however, in connection with recreation and leisure.
- There is also a strong connection between maintenance of "natural" seascape character areas, protecting historic heritage, maintaining and enhancing biodiversity with recreation/leisure and health and wellbeing.
- Employment and skills levels can be connected to the well being of communities in that higher levels of employment and educational achievement can correlate with people's health, such as the proportion of the population who describe their health as 'good' in census returns. Effects on Protected Equality Groups can relate to employment inequalities and patterns relating to gender and age groups.

Potential transboundary issues

None identified

Key data gaps

No key data gaps are identified, however, it should be noted that data and issues relating to coastal communities are difficult to map, particularly at the scale of the marine plans and this is a difficulty identified within the collation of data.

Communities - Effects on Communities (Including Employment and Skills)

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- There is a big maritime skills sector in Liverpool (Communities_135)
- Coastal communities are losing population and experiencing the effects of industrial decline (Communities_70)
- Fishing appears to be most important in Whitehaven (although it should be noted this is the port into which catches are taken and not necessarily where boats are registered) (Communities_63)
- Tourism appears to be most important in Blackpool and Liverpool (Communities_64)
- Aquaculture is a growing marine activity and is seen as the means to increase seafood supplies and in turn increase employment (Communities_92)
- Coastal communities in this region are benefitting from a number of projects awarded funding via the Coastal Community Fund. For example, the Blackpool "LightPool" scheme which will deliver improvements to the visitor economy offer and support the retail sector (Communities_100)
- The typology of coastal communities is not geographically distinct. In many areas places of each type are intermingled and adjacent functioning as part of a wider spatial system. The benefits offered by these linkages (including transport, work patterns and personal relationships), anchored in the distinctiveness of the coast, should be considered. (Communities_101)

Baseline/issues: North East Plan Area 1 2

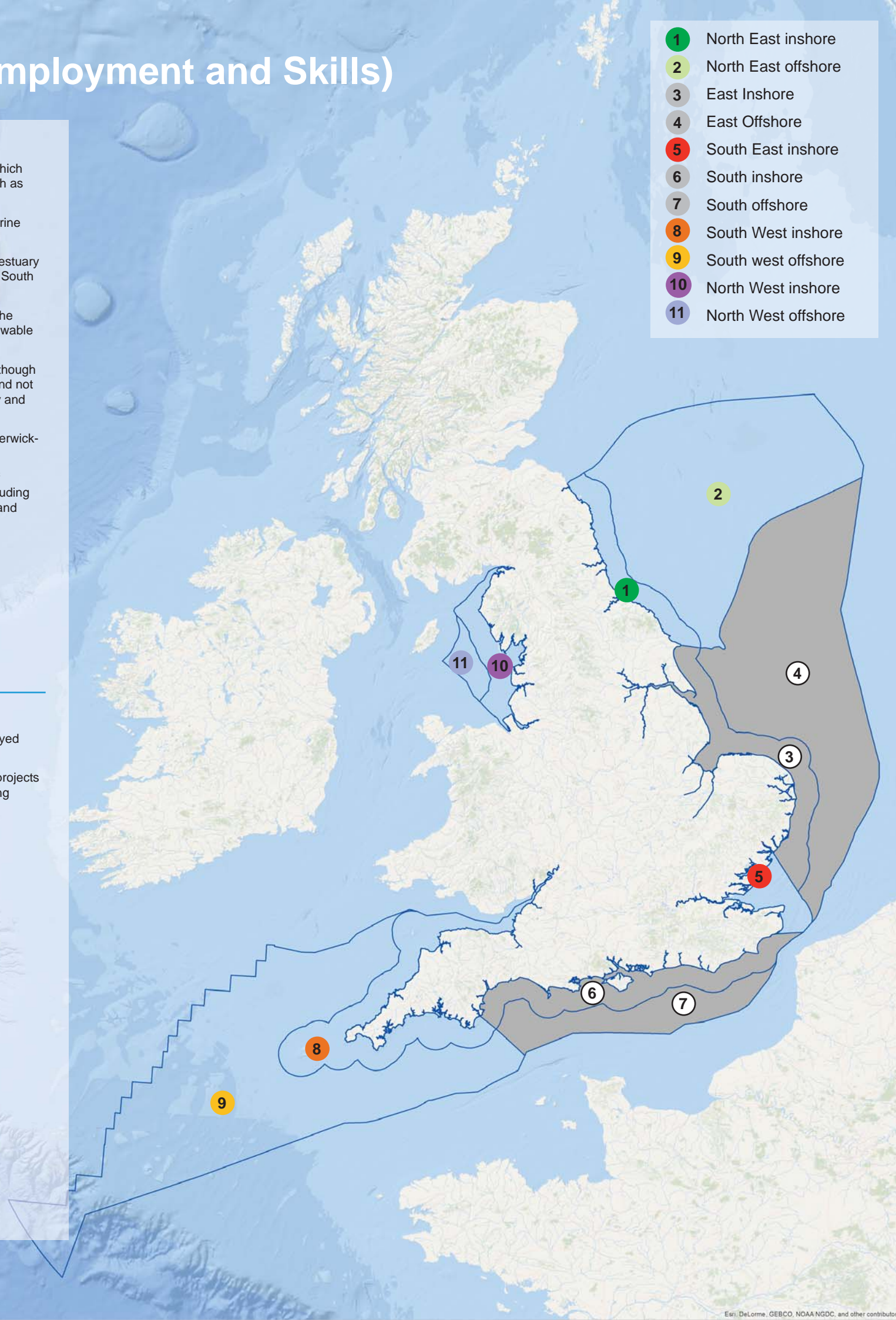
- The plan area includes communities with high levels of deprivation which are struggling to diversify away from traditional economic activity such as ship-building and fishing. (Communities_35)
- Employment in the ports and shipping industry is the lowest of all marine plan areas. (Communities_32)
- There is large scale social and cultural investment in tidal rivers and estuary areas (including Newcastle/Gateshead) and planned regeneration in South and North Tyneside (Communities_67)
- Social opportunities are being provided through the development of the North East 'Renewable Energy Coast' and 'Centre for Offshore Renewable Energy'(Communities_68)
- Fishing appears to be most important in the following settlements (although it should be noted these are the ports into which catches are taken and not necessarily where boats are registered): Blyth; North Shields; Whitby and Scarborough (Communities_71)
- Tourism appears to be most important in the following settlements: Berwick-upon-Tweed and Scarborough (Communities_72)
- Coastal communities in this region are benefitting from wide range of projects and significant funding via the Coastal Community Fund including community-led regeneration in Redcar-Coatham (Communities_90) and North Shields Fish Quay (Communities_91)

Baseline/issues: South West Plan Area 8 9

- Aquaculture is a growing marine activity and is seen as the means to increase seafood supplies and in turn increase employment (Communities_92)
- Protection of Plymouth's waterfront is needed to support the local economy (Communities_57)
- Tourism appears to be most important in Torquay, Newquay and Bristol (Communities_61)
- Fishing appears to be most important in the following settlements (although it should be noted these are the ports into which catches are taken and not necessarily where boats are registered): Newlyn; Plymouth and Ilfracombe (Communities_60)
- Coastal communities in this region are benefitting from a number of projects awarded significant funding via the Coastal Community Fund including the Penzance Coastal Community Team for investment in Jubilee Pool and egeneration of key sites across Penzance. (Communities_125)

Baseline/issues: South East Plan Area 5

- South East is the plan area with the highest number of people employed through the ports and shipping sector. (Communities_24)
- Coastal communities in this region are benefitting from a number of projects awarded significant funding via the Coastal Community Fund including Jaywick community led regeneration (Communities_107)



Communities - Effects on Communities (Including Employment and Skills)

Summary of the legislative / policy context

The Marine Policy Statement (MPS) sets out to “ensure a strong, healthy and just society” where the use of the marine environment is benefitting society as a whole and contributing to cohesive communities and physical and mental wellbeing. (Communities_5)

Local enterprise partnerships are partnerships between local authorities and businesses. They decide what the priorities should be for investment in roads, buildings and facilities in the area. (Communities_136)

The Blue New Deal aims to deliver stronger economies for UK coastal communities, supporting more and better jobs through a healthier marine environment. It covers five policy areas:

- Sustainable fisheries and aquaculture;
- Renewable energy;
- Responsible tourism, leisure and recreation
- Innovative coastal management; and
- Re-connecting people with nature. (Communities_133)

Key cross cutting baseline / issues across all plan areas

- Generally, there is often isolation of coastal towns due to lack of infrastructure. (Communities_15) There is high tourism employment dependency across all plan areas. The highest percentage contribution of recreational employment to total employment number is held by Yorkshire and the Humber as well as the South East at 1.69%, this is followed by the South West at 1.61%. Whilst jobs numbers have grown in coastal economies, the jobs created tend not to be well paid, and are frequently part time. (Communities_27) There are also high levels of transience and an ageing population (young people migrating out and older people migrating in; countered in some localities by increasing in-migration by young migrants to the UK). (Communities_37)
- Deprivation in relation to income, income deprivation affecting children and older people, employment and education (2015 IMD) shows some more deprived Lower Super Output Areas (LSOA) on the coast compared to the rest of England. Living environment domain (2015 IMD) also shows some more deprived LSOA on the coast, especially in the South West, the North East rural areas and the North West in some more rural areas as well as urban coastal areas.
- It has been announced that the Coastal Communities Fund is to be extended to 2020/2021 and at least a further £90 million will be available to help seaside towns revitalise areas, create jobs, and boost local economic growth. Seaside towns across the country will have a chance to bid for the additional government funding under measures announced by the Chancellor in the 2015 budget. Launched in 2012, the Coastal Communities Fund has already invested nearly £119 million on 211 projects local infrastructure and economic projects across the UK. This is helping to create almost 13,700 jobs and provide more than 10,280 training places and apprenticeships. (Communities_42)
- Climate change (sea level rise, temperature rise and increased storminess) leading to coastal squeeze with adverse effects on local communities and their social benefits. This is particularly important in nationally designated landscapes. (Communities_44) Climate change may bring an increase in the numbers of visitors to coastal destinations, longer tourism seasons, increase in infrastructure and demand on the natural environment. (Communities_48)
- Tourism can offer a number of benefits and costs to individuals and local communities specifically in terms of development, town characteristics and well-being effects. There is a need to achieve a balance between the costs and benefits that tourism brings to coastal communities, such as increased revenue, infrastructure development, protection of the natural environment, second home ownership, house prices, community cohesion, character, population structure and control of tourism development. (Communities_47) The highest tourism employment dependency is in the South West of England at 8.63% followed by London at 7.03%, South East England at 6.62% and North West at 6.48%. Additionally, the South West of England is most dependent on tourism for GVA (3.53%) followed by London (3.12%) (Communities_66)
- Decline in fisheries due to overfishing and the implementation of the quota system under the Common Fisheries Policy (CFP) has made fishing as a livelihood and way of life difficult in recent years. (Communities_49) Decline in employment in fish catching sector and improvement in education promotes employment in other sectors or emigration of younger generation from local fishing communities. Younger generation turning to other more secure jobs in the local and regional economy. (Communities_52)
- Fishing activities can help support communities which are fragile by providing direct employment but also employment along the supply chain which are often “closely linked to the local economy.” (Communities_51) Crew members are likely to come from settlements distributed over a wider geographical area making social networks weaker and more dispersed. (Communities_53) Fishing and interaction with the marine environment provides more than an economic role; it provides fishers with specialist skills, identity, solidarity and status which spill over into fisher families and communities by creating distinct characteristics, culture and values. (Communities_62)

The likely evolution of the environment over the plan duration

- Climate change (sea level rise, temperature rise and increased storminess) leading to coastal squeeze could have adverse effects on local communities and their social benefits.
- Existing issues of isolation of coastal towns due to lack of infrastructure, transience, ageing populations and deprivation relating to income and employment in coastal communities may continue in the future but efforts are being made to address these issues through the funding of projects via the Coastal Community Fund. With this investment, jobs numbers and the quality of jobs could improve.
- The New Blue Deal is likely to have an impact on employment in all plan areas.

Potential interactions with other topics

There potential interactions between this topic and all economic areas. Levels of employment is closely linked to the economy, investment, national policy and market forces which dictate growing and waning industries. Work forces can also be influenced by national and international policies. Employment and skills levels can be connected to the well being of communities in that higher levels of employment and educational achievement can correlate with people's health, such as the proportion of the population who describe their health as 'good' in census returns. Effects on Protected Equality Groups can relate to employment inequalities and patterns relating to gender and age groups, such as are reported within the 'Health and Wider Determinants of Health and Effects on Protected Equality Groups' Report Card in relation to fishers and aquaculture workers.

Potential transboundary issues

There could be interactions with other countries in some localities, such as fishing ports, where some of the labour force can originate from other countries. In some localities there is increasing in-migration by young migrants to the UK.

Key data gaps

- Employment data is collected from a terrestrial perspective making it difficult to isolate marine influences on data metrics.
- It should be noted that data and issues relating to coastal communities are difficult to map, particularly at the scale of the marine plans and this is a difficulty identified within the collation of data.

Economy - Ports and Shipping

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- Shipping routes within the Irish Sea are composed of North-South routes along the Irish Sea and connecting routes to Ireland. Most notable are Holyhead and Liverpool to Dublin, Heysham and Liverpool to the Isle of Man and Belfast (Economy_439).
- There are IMO Traffic Separation Schemes in the plan area near the entrance to Liverpool and Mersey Ports (Economy_447)
- There are four major ports in the North West plan area: Fleetwood, Heysham, Liverpool and Manchester. Liverpool is ranked 6th busiest port in the UK and the main activities are containers, bulk cargo, general cargo, ship fabrication & repair. The new deep water container terminal (which was completed in 2015) doubles port capacity in Liverpool (Economy_377)

Baseline/issues: North East Plan Area 1 2

- The East coast ports of the Tyne and Tees provide clear corridors of shipping activity. routes into the North Sea connect to the Baltic States, and most notably, ferry routes to the Netherlands from the Humber (Economy_440)
- There are no IMO Traffic Separation Schemes in place within the plan area (Economy_411)
- There are 3 major ports in the North East Plan area: Sunderland, Teesport and Hartlepool and Port of Tyne. Teesport and Hartlepool port is the third busiest in the UK (Economy_373)
- Teesport is an international asset with good deep water access. It is the largest exporting port by tonnage in England, exporting 20m tonnes (Economy_149)
- There are numerous smaller ports servicing smaller vessels in the inshore area (Economy_413)

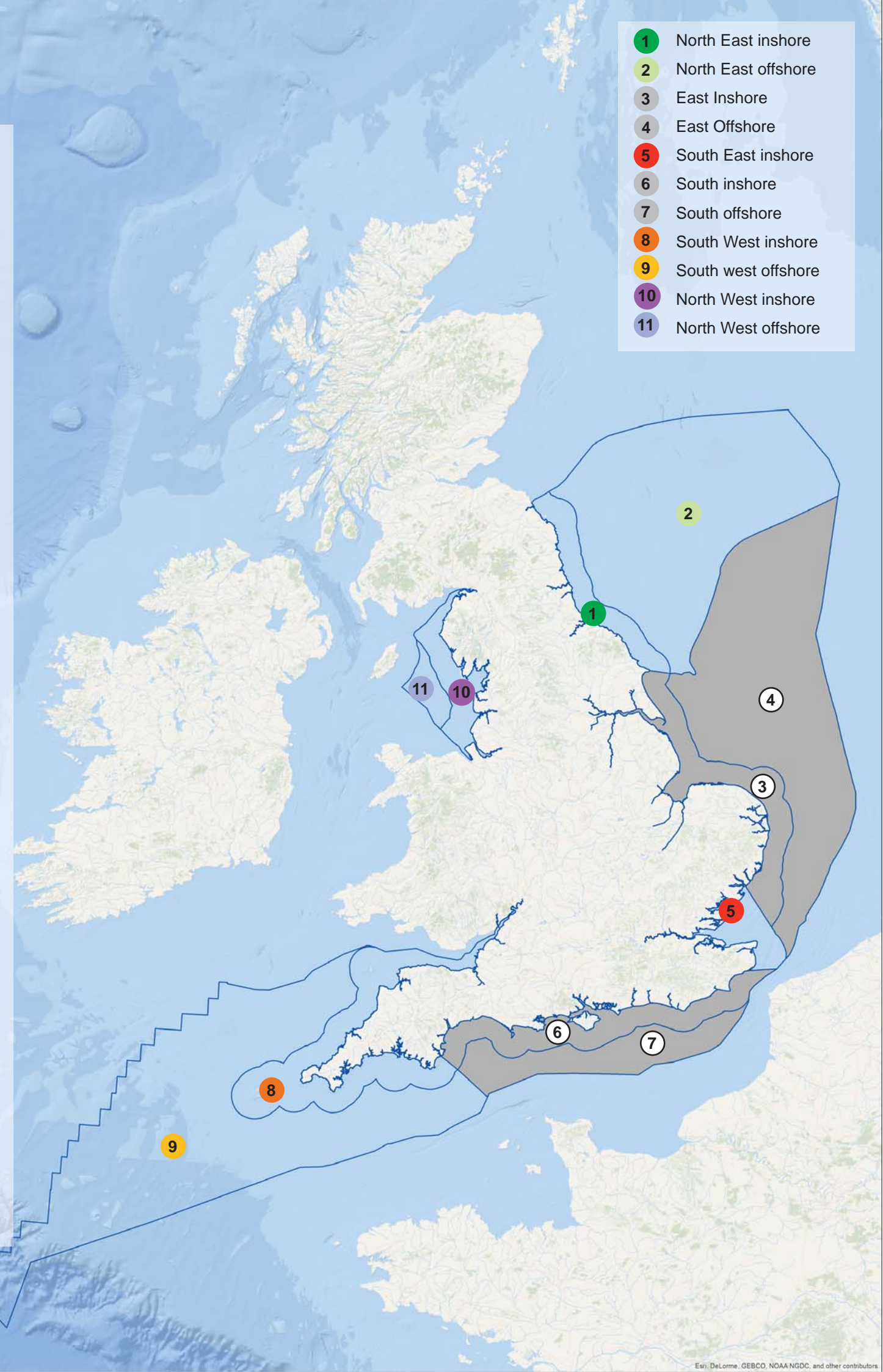
Baseline/issues: South West Plan Area 8 9

- There is an inshore shipping route running along the South coast linking two way traffic to a point off Land's End, from which two distinct traffic routes can be seen heading in a North-South orientation for traffic transiting into the Irish Sea. Clearly defined routes can be seen into the Severn Estuary, and vessels bound for Milford Haven in Pembrokeshire (Economy_437)
- There is an IMO Traffic Separation Schemes in the plan area around the Isles of Scilly (Economy_446)
- There are three major ports in the South West Plan area: Bristol, Fowey and Plymouth. None of these are in the top ten list of busiest ports but ferry services to the Isles of Scilly from Penzance are important (Economy_383)
- Her Majesty's Naval Base Devonport and Dockyard is a major component of the UK's strategic defence capability (Economy_289)
- South West has 22% of English ports handling mainly passenger and fishing traffic (Economy_307)
- In February 2015, the MMO quashed the marine licence for dredging activity at HMNB Devonport and disposal of material at the Rame Head South disposal site (Economy_561)

Baseline/issues: South East Plan Area 5

- The English Channel is one of the world's busiest shipping routes, linking the North and Baltic Seas to the North-West Atlantic (Economy_434)
- Dover to Calais is most popular international passenger route accounting for 48% of all short sea international passengers (Economy_331)
- IMO Traffic Separation Schemes in the plan area: Thames Estuary and Dover Strait and around the South coast (Economy_449)
- There are seven major ports in the South East plan area: Dover, Felixstowe, Harwich, Ipswich, London, Medway, and Ramsgate. London is ranked as the second busiest port in the UK, Felixstowe is ranked seventh and Dover is ranked eighth (Economy_380)
- Felixstowe is the busiest container port and Dover has the greatest amount of ro-ro freight (Economy_326)
- The South East contributes over £2.5 billion to the national economy from ports and shipping, (the greatest amount of GVA of all the marine plan areas) (Economy_328)

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Economy - Ports and Shipping

Summary of the legislative / policy context

Shipping is predominantly regulated internationally and navigational safety is paramount. There are various laws / practices including principles laid down in the United Nations Convention on the Law of the Sea (UNCLOS) and International Regulations for Preventing Collisions at Sea 1972 (COLREGS). COLREGS set out navigation rules in order to prevent collisions between two or more vessels. IMO Traffic Separation Schemes are designated shipping lanes for the safe navigation of vessels in busy and densely populated shipping areas

The National Policy Statement for Ports (2012) provides the framework for decisions on new port development. The NPS allows judgments about when and where new developments might be proposed to be made on the basis of commercial factors by the port industry or port developers operating within a free market environment; and ensure all proposed developments satisfy the relevant legal, environmental and social constraints and objectives. In the Marine Policy Statement the Government seeks to encourage sustainable port development to cater for long-term forecast growth in volumes of imports and exports by sea thus contributing to long-term economic growth and prosperity.

The Marine Policy Statement highlights the fact that increased competition for marine resources may affect the sea space available for the safe navigation of ships. Marine plan authorities and decision makers should take into account and seek to minimise any negative impacts on shipping activity, freedom of navigation and navigational safety and ensure that their decisions are in compliance with international maritime law. The Maintenance Dredging Protocol is in place to ensure all conservation aspects are considered in relation to the Natura 2000 network for maintenance dredging and, where possible, ensure good status/ ecological potential is achieved.

Key cross cutting baseline / issues across all plan areas

- The UK ports sector is the largest in Europe, in terms of tonnage handled. It comprises a variety of company, trust and municipal ports although much of the tonnage handled is concentrated in a small number of ports, with the top 15 ports accounting for almost 80% of the UK's total traffic (Economy-my_429)
- The location of ports in England and Wales has changed over time, in response to changes in global markets, in the size and nature of ships, and in the transport networks which support them. Currently, the largest container and ro-ro terminals are in the South East, while the west coast has naturally been best placed to meet the needs of transatlantic and Irish traffic (Economy_430)
- Environmental impacts from the ports and shipping sector can be through accidental pollution from ships in the course of navigation or lawful operations, pollution caused by unlawful operational discharges by ships, such as oil, waste or sewage, or physical damage caused by groundings or collisions. Other pressures on the environment from shipping and ports relate to noise, airborne emissions and the introduction and spread of non-indigenous species (transported on the hulls of ships or in ballast water) (Economy_421)
- Shipping is an essential and valuable economic activity for the UK. There are significant movements of ships around the UK coast and into and out of UK ports serving the UK's economic interests. There are also significant levels of legitimate passing traffic, for example through the English Channel and other ships freely using the navigable seas adjacent to the UK (Economy_425)
- Dredging and disposal of marine sediment needs to be facilitated in line with the objective to prevent, reduce and eliminate where practicable pollution caused by dredging operations and the disposal of dredged sediments (Economy_452)

The likely evolution of the environment over the plan duration

Shipping will continue to provide the only effective way to move the vast majority of freight in and out of the UK, and the provision of sufficient sea port capacity will remain an essential element in ensuring sustainable growth in the UK economy. UK Government Port forecasts show a continued strong growth in the ports sector. There are a number of recent developments in the Marine Plan Areas which will see further development at certain ports including:

- The Port of Felixstowe: consent granted in February 2006 would provide capacity for an estimated further 1.6m to 2m twenty foot equivalent unit (teu) at Felixstowe South;
- Bathside Bay (Harwich): consent granted March 2006 would provide capacity for an estimated 1.7m teu per annum, though this development is not expected to proceed for some years;
- London Gateway: consent granted June 2007 would allow capacity for an estimated 3.5m teu per annum;
- Teesport, handled 0.18m teu in 2009. Consent granted February 2008 would provide capacity for a further 1.5m teu;
- Liverpool handled 0.6m teu in 2009. Consent granted March 2007 would allow capacity for around a further 0.6m teu; and
- Bristol handled 0.07m teu in 2009. Consent granted September 2010 will allow an estimated further 1.5m teu.

It is also evident that demand for port capacity to service offshore windfarms will be substantial, especially in the short term in support of the 'Round 3' offshore developments. Generally, it is not possible to anticipate future commercial opportunities. New shipping routes and technologies may emerge. The needs of trading partners may change as their economic circumstances develop. So capacity needs to be provided at a wide range of facilities and locations, to provide the flexibility to match the changing demands of the market, possibly with traffic moving from existing ports to new facilities generating surplus capacity. There is also an increasing trend toward larger vessels and deeper drafts requiring larger quays and port-side facilities. This will pose additional requirement for more frequent or large scale dredging and this will have implications on biodiversity and water.

Potential interactions with other topics

Dredging is an enabling activity which is essential to the functioning of ports and marinas. Ports and shipping has positive interactions with economic and social topics including job creation and benefits to local fishermen, as well as wider benefits to national, regional or local economies (including tourism and recreation). Ports and shipping can have some negative interactions with other sustainability topics. Sea ports also play an important role in the tourism and leisure industries, supporting many different forms of economic and social activity, including passenger cruise liners, Channel ferries, sea going yachts and dinghies. Particular impacts might include: impacts to the local hydrodynamic and sedimentary regime; loss of intertidal habitats; disturbance of historical contamination during capital works; impacts on migratory and juvenile fish; impacts on important bird populations and impacts on heritage assets.

Ports and shipping also has key interactions with other users of marine space. Increased competition for marine resources may affect the sea space available for the safe navigation of ships. Marine plan authorities and decision makers should take into account and seek to minimise any negative impacts on shipping activity, freedom of navigation and navigational safety and ensure that their decisions are in compliance with international maritime law. There are particular issues with regard to shipping and offshore renewable energy installations. Navigational safety around such installations is essential and the Government have issued various guidance notes on this issue. There are also issues with regard to keel clearance and tidal stream devices. There are a number of standing management measures in place to manage interactions between ports / shipping / dredging and other activities

There are obvious interactions between port and energy. Ports have a vital role in the import and export of energy supplies, including oil, liquefied natural gas and biomass, in the construction and servicing of offshore energy installations and in supporting terminals for oil and gas pipelines. Port handling needs for energy can be expected to change as the mix of our energy supplies changes and particularly as renewables play an increasingly important part as an energy source. Ensuring security of energy supplies through our ports will be an important consideration, and ports will need to be responsive both to changes in different types of energy supplies needed (and to the need for facilities to support the development and maintenance of offshore renewable sites) and to possible changes in the geographical pattern of demand for fuel, including with the development of power stations fuelled by biomass within port perimeters.

Please also see the water and energy report cards.

Potential transboundary issues

By its very nature shipping is an international issue which crosses boundaries. Shipping is an essential and valuable economic activity for the UK. There are significant movements of ships around the UK coast and into and out of UK ports serving the UK's economic interests. There are also significant levels of legitimate passing traffic, for example through the English Channel and other ships freely using the navigable seas adjacent to the UK. In 2014, 4 out of every 5 tonnes of freight handled by UK ports was being imported or exported from international ports. Ports play a significant role in domestic freight transport through coastal shipping (including transshipment) and links with Northern Ireland. Ports in the North East have a role supporting north sea oil and gas activity, as well as wind farm development.

Key data gaps

The MMO is undertaking a strategic review of disposal sites around the coast of England to provide additional information to assist future decision making on marine licensing applications. This review will look at the current status of each site, sensitivities and forthcoming designations, and the process for identifying and using disposal sites. This may provide useful information to the SA process (Economy_562)

Economy - Fisheries and Aquaculture

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- In the North West, fishing appears to be most important in Whitehaven (although it should be noted this is the port into which catches are taken and not necessarily where boats are registered) (Communities_63)
- Fishing is also an important activity here with a larger proportion of over 15m vessel activity than in other marine plan area (Economy_526)
- The percentage of plan area utilised by shellfish production is as follows: North West 29.4%. There are important shellfish beds for cockles in Morecombe Bay and mussels in Heysham flat, New Brighton and Lytham and pacific oyster in Silloth (Economy_300)
- Non English fleet fishing in the North West plan area include: Belgian, Scottish, Welsh and Northern Irish (Economy_345)
- The North West has only 0.010% of the work force employed in aquaculture. However, this is still significant to areas which are deprived or peripheral and restricted in the alternative economic sectors that could provide employment opportunities (Communities_65)

Baseline/issues: South West Plan Area 8 9

- In 2011 39% of landings into English ports by UK vessels landed into Plymouth (South West plan area), Brixham (South plan area), and Newlyn (South West plan area), with Plymouth landing the most (Economy_384)
- Plymouth and Newlyn have a large proportion of high value catch, caught by a few large vessels over 15m in length (Economy_314)
- Fishing appears to be most important in the following settlements (although it should be noted these are the ports into which catches are taken and not necessarily where boats are registered): Newlyn, Plymouth, Ilfracombe (Communities_60)
- Non UK fleet fishing in the South West plan area include: Spanish long line activity targeting hake, and Spanish bottom trawler targeting hake, megrim and monkfish (Economy_319)
- The percentage of plan area utilised by shellfish production is as follows: South West inshore: 8.8%, South West offshore: 0%. In the South West there are several important shellfish beds, including pa-cific oyster in Salcombe, blue mussel and pacific oyster in the Dart, Fowey and Yealm Estuaries, pacific oyster in Bigbury and Avon and native oyster, blue mussel and pacific oyster in Truro, Tresillian and Fal (Economy_300)

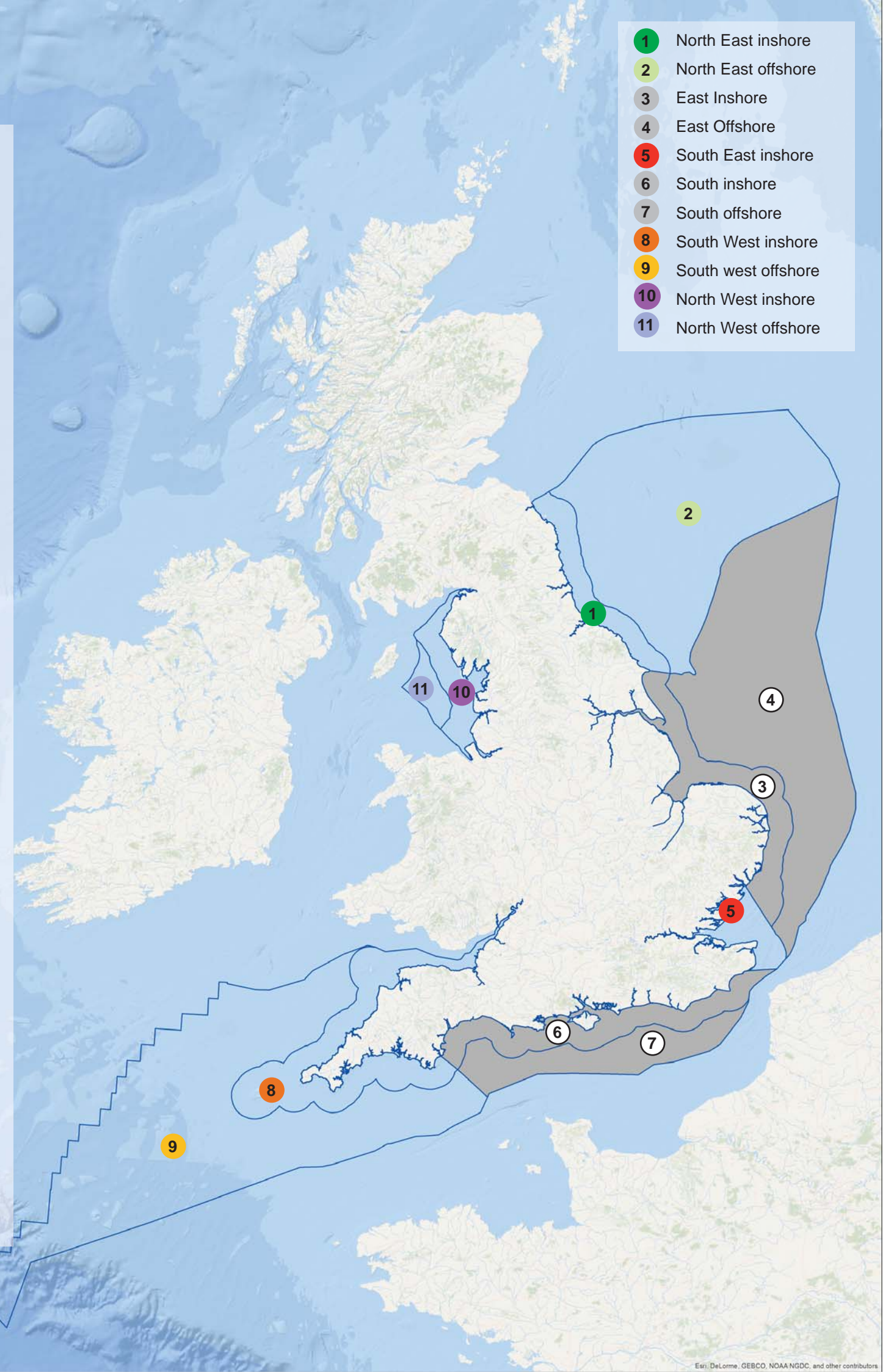
Baseline/issues: North East Plan Area 1 2

- There is significant fishing activity in the North East plan area including lobster fishing which is the most lucrative stock for inshore vessels (Economy_371) and there are a number of Ports that show a comparatively greater volume of fish landed when compared to its overall value including North Shields in the North East area (Economy_374). Inshore vessels activity is particularly high in North East Plan Area (Economy_375)
- Fishing appears to be most important in the following settlements (although it should be noted these are the ports into which catches are taken and not necessarily where boats are registered): Blyth; North Shields; Whitby; and Scarborough (Communities_71)
- Non UK fleet fishing in the North East plan area include: Dutch, Danish, French, and Belgian (Economy_364)
- The percentage of plan area utilised by shellfish production is as follows: North East inshore: 1.6%. The North East is the area that has the least aquaculture activity - there are only two shellfish sites (for native oyster and pacific oyster around holy island) (Economy_300 and 462)

Baseline/issues: South East Plan Area 5

- The South East has 200 employed persons in fishing both full-time and part-time. It has a GVA of £73 million (Economy_333)
- Non UK fleet fishing in the South East plan area include: French, Belgian and Spanish (Economy_333)
- The percentage of plan area utilised by shellfish production is as follows: South East: 38.2%, the most significant of all the plan areas. In the South East, there are several important shellfish beds in the plan area: On the Swale, Thames and North Kent Coast (native oyster, pacific oyster and manila clam); Colne to Blackwater (blue mussel, pacific oyster, manila clam, native oyster); and Walton backwaters (manila clam, native oyster and pacific oyster). (Economy_300)
- Native oysters were once extensive and supported a large industry in this area. Restoration of the native oyster is the focus of a project being run by the Kent and Essex IFCA (Economy_561)

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Economy - Fisheries and Aquaculture

Summary of the legislative / policy context

There is a raft of legislation that protects water quality relating to shellfish waters, for example, and this is outlined in more detail in the water report card. UK environmental policy will continue to improve the quality of shellfish harvesting areas (including those for wild shellfish) by seeking to adopt appropriate microbiological standards when implementing the Water Framework Directive. Aquaculture is being promoted strongly in the Blue Growth Strategy, the Atlantic Strategy and the reformed Common Fisheries Policy (CFP). Some UK administrations have also adopted specific aquaculture policies and strategies to encourage or support industry growth and development. The EC Regulation on Alien Species in Aquaculture (708/2007) requires Member States to establish a process by which the risk of introducing alien species for aquaculture is fully assessed before any introductions of such species are consented.

The Common Fisheries Policy (CFP) provides the main framework for decisions concerning the management of fisheries in EU waters although a Member State may take non-discriminatory measures that are more restrictive than the CFP measures to those fisheries operating within their 0-12 nautical mile zones in respect of national fleets and, with the approval of the Commission and affected Member States, to other EU vessels subject to where historic fisheries rights exist in the 6-12 nautical mile zone.

The Marine Policy Statement makes it clear that both fishing and aquaculture are key in maintaining food security and that sustainable fish stocks have the potential to maintain a prosperous and efficient fishing industry and provide social, cultural and economic benefits to often fragile coastal communities.

Key cross cutting baseline / issues across all plan areas

The South West has the highest number of employed persons in fishing both full-time and part-time totalling 900 people followed by Yorkshire and the Humber with 400 people. The highest GVA, however, is associated with the catch in the East of England region amounting to £90m followed by the South West with £84m. Decline in fisheries due to overfishing and the implementation of the quota system under the Common Fisheries Policy (CFP) has made fishing as a livelihood and way of life difficult in recent years (Communities_26)

The majority of marine aquaculture in England consists of shellfish farming, particularly mussels. Other species include scallops as well as pacific and native oysters (Economy_299). The farming of seaweed as a food or fuel is a growing part of this sector. This is currently mainly in Scotland but there is some small scale activity in Cornwall and this could spread to other areas of the UK (Economy_469)

The likely evolution of the environment over the plan duration

The number of UK fishing vessels has been declining since the 1990's and levels of fishing effort have therefore fallen dramatically. However, the capability of vessels is increasing. Fisheries are generally in recovery. In terms of aquaculture, trends in the industry are closely tied in with changes in wild fisheries, the availability of investment, and site availability. There is evidence that the aquaculture industry across Europe has stagnated, despite some areas of the UK experiencing growth in the sector. This has led to an increased reliance on fish products from outside the EU. However, Aquaculture is being promoted strongly in the Blue Growth Strategy, the Atlantic Strategy and the reformed Common Fisheries Policy (CFP). Therefore, the likely evolution of this sector is currently uncertain.

Potential interactions with other topics

There are obvious links between fisheries and biodiversity. Good environmental status requires populations of all commercial fish and shellfish stocks to be exploited within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock. Achieving good environmental status will also involve better managing and mitigating the impact of fisheries on the wider marine environment, such as wider biodiversity impacts. Fishing activity is sensitive to changes in other sea uses. Marine developments have the potential to prevent, displace or encourage fishing activities. There are potential social, economic and environmental impacts of displacement of fishing activity caused by other sea uses, particularly if from well-established fishing grounds. Fishing can have negative environmental impacts. As well as over-exploitation of commercial fish stocks, this can include threats to vulnerable or rare species, including by-catch, and can cause extensive damage or destruction to habitats and the historic environment. Such impacts can often be associated with particular gear types and the intensity of fishing activity. Interactions between fishing activity and marine developments and their consequent impacts on fish stocks and the environment are complex and need to be considered.

With regard to aquaculture, the impacts are diverse, reflecting the broad scope of the industry. The precise nature of impacts will vary depending on the nature of the activity and local conditions. Shellfish and algal culture can improve local water quality as these activities require good quality water if sold for food and the industry recognises the importance of being neutral or positive regarding water quality. Negative water quality impacts are generally lower for shellfish production than finfish production (which is present in Scottish waters but not English waters) as shellfish don't require supplementary feed or antibiotics and are generally low density cultures. However, it should be recognised that shellfish are considered keystone species and therefore they have the ability to affect the surrounding environment in both negative and positive ways. They influence primary and secondary productivity and can start a series of cascade effects on water column and sediment population and dynamics. Effects can include phytoplankton modification, reduced turbidity, increase ammonium and metals concentration, increased deposition, modification of topography and introduction of non native species. However, bivalves also have the potential to change topography and provide novel habitats that would not normally occur and can provide for a diversity of species. There are also potential conflicts between aquaculture and recreational boating. However, there are opportunities for multiple uses of large infrastructure sites i.e. wind farm and aquaculture and habitat creation.

There are also obvious links with communities. Fishing does not just provide a livelihood – its helps to shape whole communities. Please also see the communities, health and well-being report cards.

Potential transboundary issues

In addition to marine fish stocks associated with commercial sea fishing, the coastal environment is important as a corridor for migrating Atlantic salmon and European eel, and in providing the marine feeding ground for sea trout. These important species that support coastal and inland commercial fishing and recreational angling could be vulnerable to a wide range of coastal activities.

Marine plan authorities should engage with other regions to where activity is displaced to ensure that a comprehensive picture of impacts is developed and unintended consequences are avoided. Wherever possible, decision makers should seek to encourage opportunities for co-existence between fishing and other activities. Inshore Fisheries Groups in Scotland and Inshore Fisheries and Conservation Authorities (IFCAs) in England will be expected to participate fully in wider marine planning. Welsh Ministers are also seeking to put in place a mechanism to enable local and national input into fisheries management plans and policies.

Aquaculture is important to communities throughout the UK and in particular on the west and north coasts of Scotland and the Western and Northern Isles and in parts of North and South Wales, and in Northern Ireland.

Key data gaps

None identified although the future of both the fishing and the aquaculture industries is uncertain.

Economy - Leisure and Recreation / Tourism

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- Of the top 20 towns and cities visited in Great Britain by UK residents in 2013 four of them are from the North West plan area: Blackpool (ranked 3rd), Manchester (ranked 4th), Liverpool (ranked 6th), and Lancaster (ranked 16th) (Economy_301)
- The revenue from leisure and small commercial marine activities in the UK is recorded, the most recent available data shows in the North West annual turnover was £86.4 million (Economy_346)
- Recreational marinas in the North West plan Area include Maryport, Whitehaven, Douglas Harbour (isle of Man), Glasson Basin, Fleetwood Harbour Village and Liverpool (Economy_576)
- All of the plan areas include a number of Royal Yachting Association cruising routes, sailing areas and racing areas and these extend through to the offshore area (Economy_571)
- Although the south coast (including the South West) dominates participation in boating activities, the Merseyside area, Thames area and the North East coastal region are popular for boating (Economy_573)

Baseline/issues: South West Plan Area 8 9

- Of the top 20 towns and cities visited in Great Britain by UK residents in 2013 two of them are from the South West plan area: Newquay (ranked 13th), Bristol (ranked 15th) (Economy_301)
- Surfing is of major significance in Cornwall, Devon and Dorset in England and the Gower Peninsula in Wales (Economy_315)
- The revenue from leisure and small commercial marine activities in the UK is recorded, the most recent available data shows in the South West annual turnover was £711.6 million (Economy_320)
- Recreational marinas in the South West plan area include Dart and Dartmouth, Mayflower, a number around Plymouth Sound, Southdown, Torpoint, Mylor Yacht Harbour, Falmouth, Padstow, Watchet, Portishead Quays, Victoria Basin (Glos), Bristol, Porthaven, Saltford and Bath (Economy_578)
- All of the plan areas include a number of Royal Yachting Association cruising routes, sailing areas and racing areas and these extend through to the offshore area (Economy_571)
- Scuba diving is particularly popular in Plymouth and the Isles of Scilly (Economy_359)
- Recreational and sport fishing is widespread although participation rates are highest in the South West, South East and North East (Economy_370)
- The South West is also an important destination for wildlife watchers with a number of small boat operators around the coast (Economy_524)
- The south coast (including the South West) dominates participation in boating activities (Economy_572)

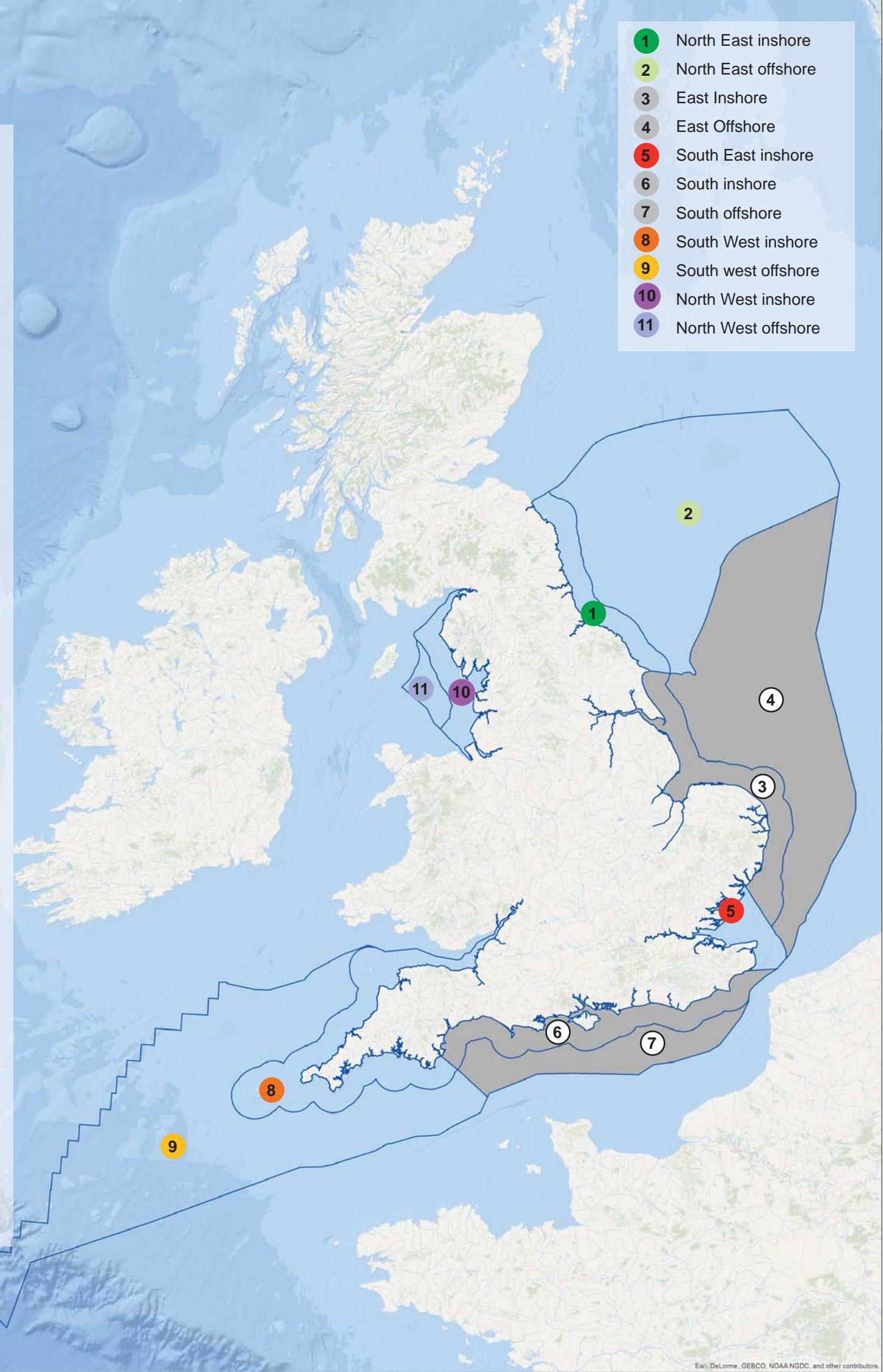
Baseline/issues: North East Plan Area 1 2

- Of the top 20 towns and cities visited in Great Britain by UK residents in 2013, two of them are from the North East plan area: Scarborough (ranked 2nd) and Berwick-upon-Tweed (ranked 17th) (Economy_301)
- The revenue from leisure and small commercial marine activities in the UK is recorded, the most recent available data shows in the North East annual turnover was £16.8 million (Economy_365)
- Recreational marinas in the North East Plan Area include Scarborough, Whitby, Sunderland, St Peters and Ambleside (Economy_575)
- All of the plan areas include a number of Royal Yachting Association cruising routes, sailing areas and racing areas and these extend through to the offshore area (Economy_571)
- Recreational and sport fishing is widespread although participation rates are highest in the South West, South East and North East (Economy_370)
- Tourism is not as big a contributor to the local economy as other plan areas (Economy_357) although there is high potential for surfing and wind surfing along the north sea coast-at Seahouses and Scuba diving and boat angling at the Farne Islands (Economy_362)
- The North East Plan area includes some wildlife sites that are of significant value to the local economies. The Farne Islands and Coquet Island support wildlife watching boat trips which also occur along the cliffs of the Flamborough and Filey Coast pSPA. They are the cornerstone of nature tourism in this area (Economy_532)
- Although the south coast (including the South West) dominates participation in boating activities, the Merseyside area, Thames area and the North East coastal region are popular for boating (Economy_573)

Baseline/issues: South East Plan Area 5

- Of the top 20 towns and cities visited in Great Britain by UK residents in 2013 one of them is from the South East plan area: London (ranked 1st) (Economy_301)
- The revenue from leisure and small commercial marine activities in the UK is recorded, the most recent available data shows in the South East annual turnover was £1119.2 million. The South East generates the most revenue from leisure and small commercial marine activities that the other plan areas (Economy_334)
- Recreational marinas in the South East plan area include a large number along the Thames estuary, Titchmarsh (Walton on the Naze), Highway, Conyer Creek, Allington, Gillingham, Medway Bridge, Cuxton, Elmhaven, Hoo, Halcon, Burnham Yacht Harbour, Tollesbury and Blackwater (Economy_577)
- All of the plan areas include a number of Royal Yachting Association cruising routes, sailing areas and racing areas (Economy_571)
- Recreational and sport fishing is widespread although participation rates are highest in the South West, South East and North East (Economy_370)
- Although the south coast (including the South West) dominates participation in boating activities, the Merseyside area, Thames area and the North East coastal region are popular for boating (Economy_573)

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Economy - Leisure and Recreation / Tourism

Summary of the legislative / policy context

The Marine Policy Statement aims to ensure equitable access to the coast and seas and recognises that the marine area provides national social and economic benefits and contributes to the wellbeing and quality of life of coastal communities. It states that marine planning should contribute to securing sustainable economic growth in regeneration areas and areas that already benefit from strong local economies.

A European Strategy for More Growth and Jobs in Coastal and Maritime Tourism: European Commission (February 2014) proposes joint responses to the multiple challenges of the tourism sector, with a view to capitalise on Europe's strengths and enabling it to substantially contribute to the Europe 2020 objectives for smart, sustainable and inclusive growth. The Commission has identified 14 actions which can help the sector grow sustainably and provide added impetus to Europe's coastal regions.

Key cross cutting baseline / issues across all plan areas

Please note that the subjects of leisure / recreation and tourism will be assessed separately and are different issues. Data has also been collected for both subjects separately as part of the economy database. However, for presentation sake these have been presented together on one report card.

Seaside tourism makes an important contribution to overall tourism. It supports some 21,000 jobs and contributes £3.6bn to the economy. A similar picture exists for recreation where, for example, the estimated economic contribution of recreational boating to the UK economy was £1.042 billion in 2009/10 and employed nearly 35,000 in this sector (Economy_481)

The sea can provide a variety of tourism and recreational opportunities. These will vary from area to area but will include pleasure boating, sailing, recreational diving (including diving on wrecks), sea angling, kayaking and surfing, as well as exploration of underwater and coastal heritage assets. The coast also provides inspiration for a range of artistic and cultural activities and food-based tourism. There is also growing interest in eco-tourism and wildlife experiences. All these activities can generate a considerable amount of income for the economy and can be a mainstay for many coastal towns, supporting their quality of life, and providing health and well being benefits. These activities will be enhanced by a well-managed and healthy marine environment, attractive and well-maintained beaches, seashore and clean bathing water (Economy_482).

There is high tourism employment dependency across all plan areas (Communities_20). The highest percentage contribution of recreational employment to total employment number is held by Yorkshire and the Humber as well as the South East at 1.69%, this is followed by the South West at 1.61%. However, with regards to GVA contribution London is has the highest GVA contribution to total income (1.83%), followed by the East Midlands (1.68%) and the South East (1.61%) (Communities_27)

The likely evolution of the environment over the plan duration

Participation in boating activities has been decreasing and this is highlighted in the recent RYA Watersports Participation Report 2016 (although levels are still higher than pre-Olympic levels). The same report found that although 2014 saw a decline in domestic tourism, it was the end of a downward trend spanning back to 2011. The projected end of year total for domestic holidays (based on the YTD numbers) shows a 10% rise in trips. Ageing populations may have an effect on coastal recreational activities in the future as older participants retire from activities and are not replaced. Boat ownership trends are fairly stable. However, recent years have seen a shift in popularity with inland boating becoming more popular and coastal boating less popular. Therefore, there is a mixed picture with regard to future levels of recreation and tourism.

Under climate change scenarios sea level rise, more frequent extreme storms and waves, sea temperature rise, and changes to fluvial inputs may affect Ecotourism (access to sites in bad weather, decrease in some bird species populations); safety of recreational fisheries during bad weather; coastal tourism during bad weather; integrity of coastal tourism infrastructure; loss or degradation of beaches; decrease in suitable conditions for scuba diving and decrease in bathing water quality during storms and operation of combined sewer overflows. However, air and sea temperature rise may create benefits through increased ecotourism, increased recreational fishing, increased coastal tourism and improved conditions for scuba diving; and more extreme storms and waves, air and sea temperature rise and coastal flooding creating benefits through increased opportunities for some water sports such as sailing and surfing

Potential interactions with other topics

Leisure, recreation and tourism are dependent on a well-managed and healthy marine environment, attractive and well-maintained beaches, seashore and clean bathing water. There are clear links to water quality and the water database discusses bathing water quality. See also the water report cards.

Tourism can provide environmental benefits through helping to enhance understanding and appreciation of the marine environment through activities such as eco-tourism and nature watching. Environmental effects/impacts may include the removal of marine fauna and flora, the physical or visual disturbance of wildlife, pollution from waste water and litter and pressures from increased visitor numbers in environmentally sensitive areas. Socio-economic benefits include positive economic benefits through increased visitor numbers and improved access. Outdoor recreation and enjoyment of the coast can also provide benefits to physical and mental wellbeing.

Seasonality of employment in the tourism sector is a long-term issue and links to deprivation in coastal communities and various social issues.

Potential transboundary issues

It will be important that activities that may affect recreational activities in Wales and Scotland are examined for their effects. For example, scuba diving occurs mainly along rocky coastlines in areas with good water visibility with particularly popular spots including St Abbs-Berwickshire, Weymouth, Plymouth, the Isles of Scilly, Sussex, Scapa Flow (Orkney), the Pembrokeshire islands (Economy_359).

Key data gaps

None identified

Economy - Marine Manufacturing and Defence

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- Securing manufacturing investment and the associated supply chain for offshore wind in the UK will require a port (or ports) with the required facilities and commercial land. These would provide an industrial hub for wind turbine manufacturers and their supply chain. The only port suited for Round 3 offshore wind farm development in the North West Plan area is Barrow (Economy_533)
- Barrow port is the site of BAE Systems' submarine design and manufacturing facility (Economy_536) and Barrow and Fleetwood ports service the UK offshore wind industry (Economy_537)
- Heysham port forms a major offshore supply base for oil and gas and is ideally located as a support base for the future Celtic Array offshore wind farm development (Economy_539)
- Areas of manufacturing / heavy industry that affect the coastal zone in the North West include Runcorn / Widnes; Ellesmere Port; Liverpool, Birkenhead; Ribble Valley; Grange Sands and Whitehaven. The main focus in these areas is the chemical and energy industries and car manufacture (Economy_551)
- Sea training is carried out within defined military practice and exercise (PEXA) training areas. The percentage of the marine plan area covered by PEXA is 14% (Economy_292)

Baseline/issues: South West Plan Area 8 9

- The main area in the South West for marine manufacturing is Avonmouth. Industries in Avonmouth employ a large number of people in a wide range of processes, from making pharmaceuticals to smelting zinc. The industries make vital products such as anaesthetics and agricultural fertilizers and provide important services such as gas storage (Economy_530)
- There are no ports in the South West area suited to Round 3 offshore wind farm development (Economy_534)
- Her Majesty's Naval Base Devonport and Dockyard as a major component of the UK's strategic defence capability (Economy_289). In Plymouth, the Devonport Naval base generates approximately 10% of the income for the city and employs 2,500 people and creates business opportunities for around 500 firms (Economy_317)
- The percentage of the marine plan area covered by PEXA is as follows: South West inshore: 60%, South West offshore: 94% (Economy_292)

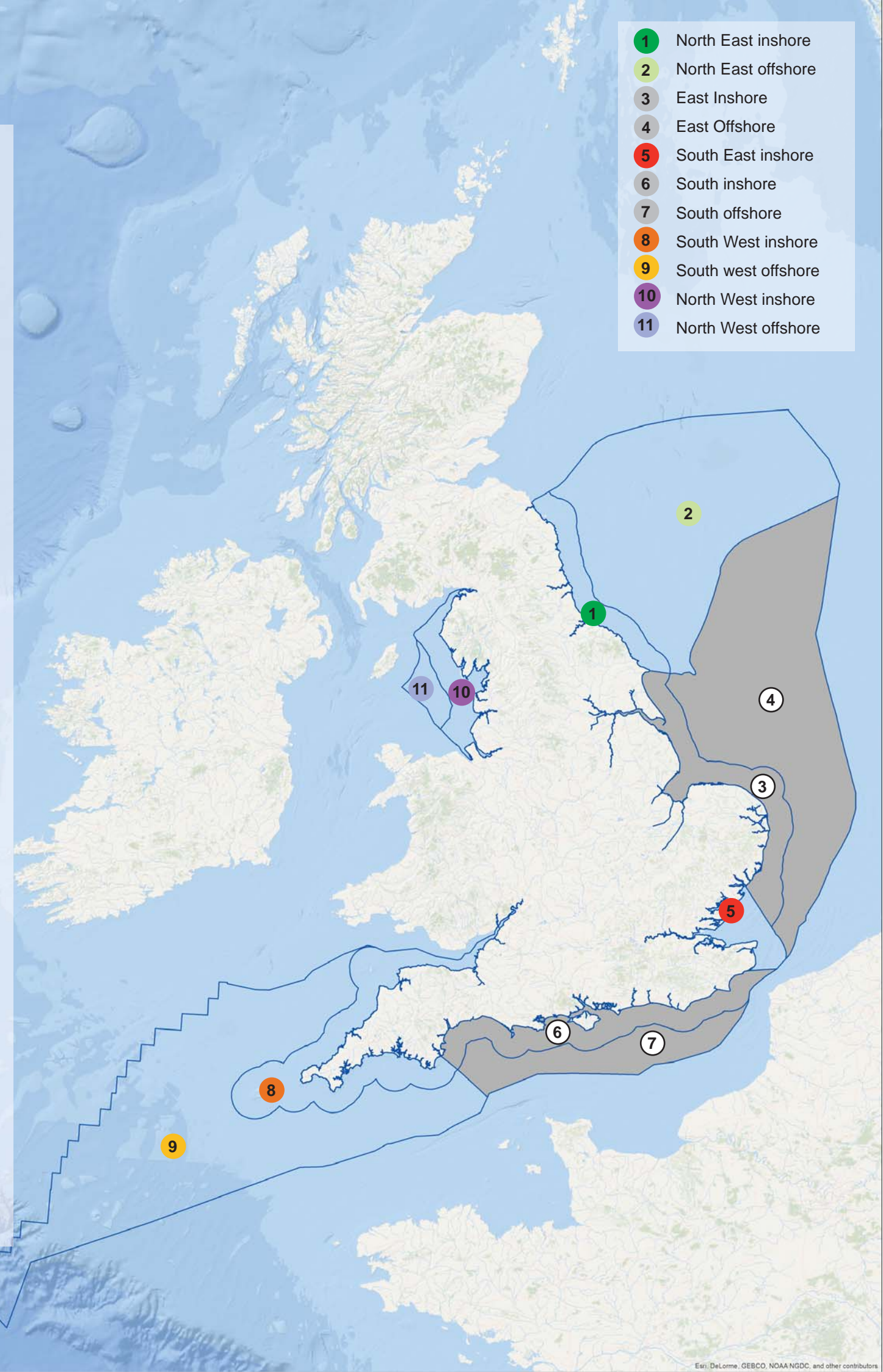
Baseline/issues: North East Plan Area 1 2

- Ports suited for Round 3 offshore wind farm development in the North East Plan area are Newcastle Upon Tyne and Hartlepool (Economy_532)
- Areas of manufacturing / heavy industry that affect the coastal zone in the North East include Teesport, Tyne and Wear, Redcar and Billingham. The main focus in this area is the chemical industry and energy industry (Economy_549)
- There is an objective for the north bank of the River Tyne to be the focus for advanced engineering, research and development particularly in renewable and marine off-shore manufacturing and sub sea technologies. The North East Local Enterprise Partnership (NELEP) Enterprise Zone has been given the status of one of five of the UK's dedicated CORE (Centres for Offshore Renewable Engineering) sites (Economy_550)
- There is a large Ministry of Defence PEXA area in the North East offshore area (Economy_525)
- The percentage of the marine plan area covered by PEXA is North East inshore: 39%, North East offshore: 54% (Economy_292)

Baseline/issues: South East Plan Area 5

- The only ports suited for Round 3 offshore wind farm development in the South East area are Ramsgate and Medway (Economy_534)
- The South East Plan area is not a significant area for marine manufacturing. Although Ports such as Port of London are key in exporting UK manufactured goods overseas (Economy_531)
- The percentage of the marine plan area covered by PEXA is South East: 17% (Economy_292)

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Economy - Marine Manufacturing and Defence

Summary of the legislative / policy context

- The primary objective of the Ministry of Defence (MoD) is to provide military defence and, where appropriate, security for the people of the UK and Overseas Territories. UK waters are a crucial environment in which MoD (including HM Armed Forces and the Royal Fleet Auxiliary) must maintain and deploy the operational capability required to achieve this. The MoD has the power to regulate sea areas and restrict their use either temporarily or permanently by making byelaws under the provisions of the Military Lands Acts 1892 and 1900 and the Land Powers Defence Act 1958. The Marine Policy Statement states that the construction and operation of offshore marine infrastructure, installations and activities, as well as policies on conservation designations and the health of the wider environment may impact on defence interests in certain areas. Marine plan authorities and decision makers should take full account of the individual and cumulative effects of marine infrastructure on both marine and land based MoD interests. Marine plan authorities, decision makers and developers should consult the MoD in all circumstances to verify whether defence interests will be affected.
- With regard to manufacturing, the Marine Policy Statement does not address the issue directly. It does discuss the issue in relation to offshore renewable energy development and states that "Expansion of the offshore wind supply is likely to require significant investment in new high-value manufacturing capability with potential to regenerate local and national economies and provide employment". There are other areas of manufacturing in the marine plan areas which have a coastal or estuarine location and these are discussed below.

Key cross cutting baseline / issues across all plan areas

- Defence activities that utilise the marine environment, directly or indirectly, in support of operational capability are diverse but include operational vessels and aircraft, HM Naval bases, surface and sub-surface navigational interests, underwater acoustic ranges, maritime exercises, amphibious exercises, coastal training ranges and coastal test and evaluation ranges (Economy_484)
- Sea training is carried out within defined military practice and exercise (PEXA) training areas. There are military practice areas in each of the plan areas (Economy_292)
- Land support for military training comes from training establishments: Britannia Royal Naval College (BRNC), HMS Raleigh, HMS Excellent, HMW Collingwood, HMS Sultan, HMS Temeraire. HMS Raleigh is in the South West plan area, the rest are in the South plan area. Naval bases in England include HMNB Portsmouth (South plan area) and HMNB Devonport (South West plan area). The Royal Navy employs approximately 38,600 people and 5,200 civilians, which benefits local coastal economies. In Plymouth, the Devonport Naval base generates approximately 10% of the income for the city and employs 2,500 people and creates business opportunities for around 500 firms (Economy_316)

The likely evolution of the environment over the plan duration

- The current strategy of the Ministry of Defence is to have an estate of fewer, larger sites in the UK, which better supports military capability. This will be through the development of defence communities, for example in Base Ports, Super Garrisons (SGs), Main Operating Bases (MOBs) or Permanent Joint Operating Bases (PJOBs). These will deliver efficiencies and either greater functional or formation coherence as well as offering greater stability to our personnel and increased integration with local economies and civil society. This will mean larger bases which could potentially have bigger impacts (both negative and positive)
- The future of the manufacturing sector is very much dependent on government subsidies and the performance of the UK and the global economy and this is uncertain.

Potential interactions with other topics

- The socio-economic benefits from the defence sector should be recognised particularly employment. In some coastal locations, the MoD is the major employer in the region. There are a variety of environmental benefits and risks associated with national defence and national security activities. These include range danger areas, protecting areas of sea bed from potentially damaging activities and concerns about noise and disturbance from maritime activities. MoD has well established systems to manage the risks arising from its activities. Non-defence activities in the marine area have the potential to impact the MoD elsewhere. Some onshore coastal defences such as aerodromes, transmitter sites and explosive stores have safeguarding zones extending over the marine area to regulate development that may otherwise affect their operation. There are potential effects of future wind turbines on radar interference. Military training can have negative effects on habitats and wildlife.
- With regard to manufacturing, heavy manufacturing which has a coastal or estuarine location can potentially have a number of impacts on the environment and impacts on the water environment is a key one. Developments can have adverse effects on transitional waters, coastal waters and marine waters. During the construction, operation and decommissioning phases of developments, there can be increased demand for water, discharges to water and adverse ecological effects resulting from physical modifications to the water environment. Most of the areas in UK seas where there are problems from contamination with hazardous substances are local in nature. These are particularly in industrialised estuaries and coasts and generally associated with historic discharges and emissions from industry. See also the Water report cards.

Potential transboundary issues

The future of the manufacturing sector is very much dependent on government subsidies and the performance of the UK and the global economy as a whole. There is influence from competing economies on the development of the UK manufacturing sector and stronger industrial bases in continental Europe may draw business abroad.

Key data gaps

None identified

Economy - Aggregate Extraction and Seabed Assets

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- 0.95% of the plan area is covered by an aggregate extraction licence (Economy_293)
- 0.4 km2 of the plan area was subject to extraction (2011 figures) (Economy_294)
- Aggregate wharves in the North West include Barrow, Eastham, Glasson, Heysham, Liverpool Wharves (Economy_559)
- The length of cable in the marine plan areas (km) is as follows: North West : 940 (Economy_297)
- The number of pipelines in the plan areas is as follows: North West: 369 (Economy_298)
- The Western Link project (high-voltage direct current line) will link Hunterston in Scotland with Deeside (Economy_415)
- There are several cables crossing the Irish Sea linking England with Ireland, Northern Ireland and a power interconnector to the Isle of Man (Economy_527)

Baseline/issues: South West Plan Area 8 9

- 0.03% of the plan area is covered by an aggregate extraction licence (Economy_293)
- 7 km2 of the plan area was subject to extraction (2011 figures) (Economy_294)
- The length of cable in the marine plan areas (km) is as follows: South West inshore: 1,939, South West offshore: 682 (Economy_297)
- Aggregate wharves in the South West include Plymouth, Appledore, Avonmouth and Bristol (Economy_560)
- The number of pipelines in the plan areas is as follows: South West inshore: 196, South west offshore: 0 (Economy_298)
- The South West Coast acts as a landing point for a substantial number of economically important cable connections across the Atlantic to North America (for example Cornwall is the landing point for one of the world's fastest high-speed transatlantic fibre optic cables) (Economy_528)

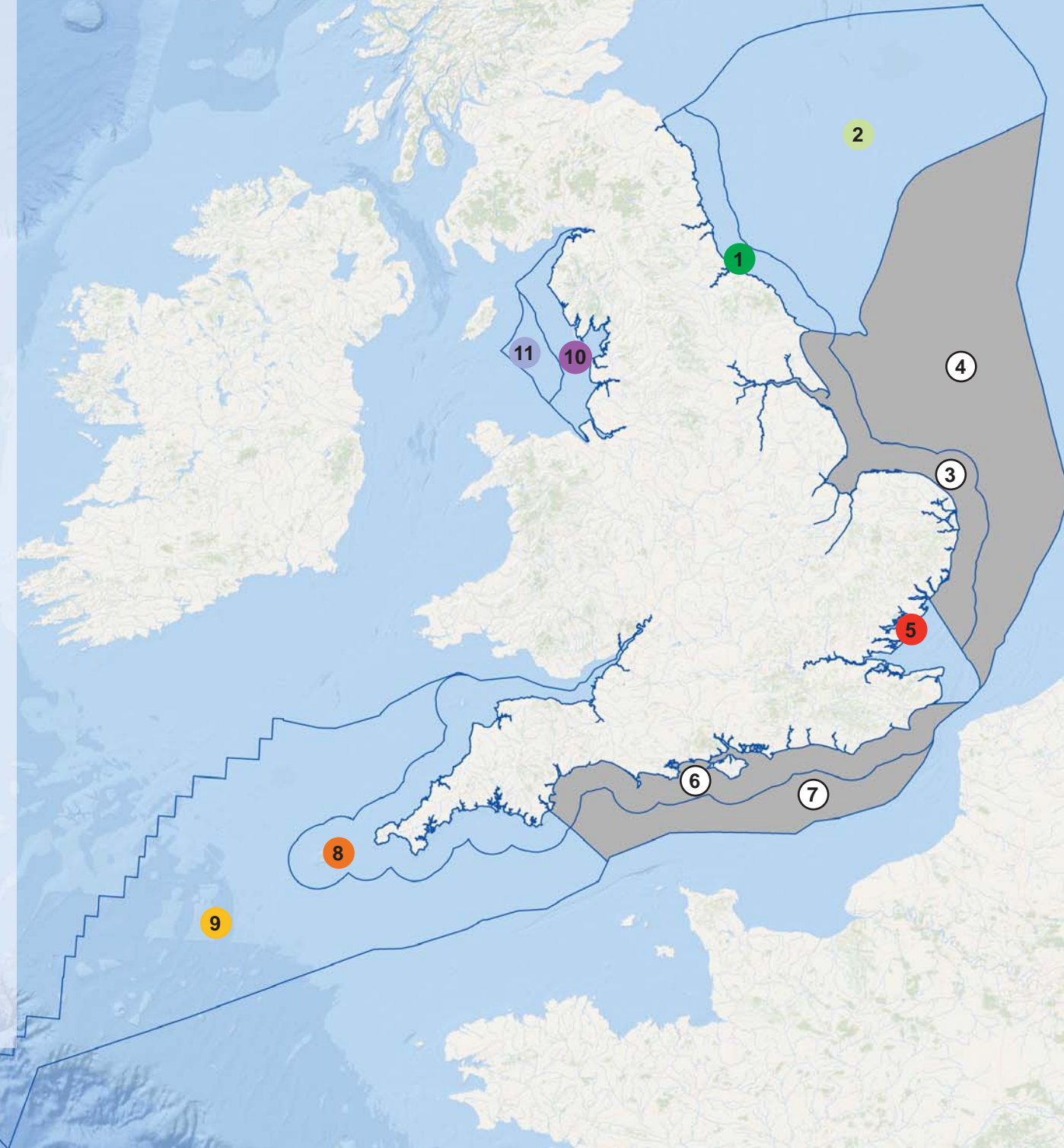
Baseline/issues: North East Plan Area 1 2

- 0% of the plan area is covered by an aggregate extraction licence (Economy_293)
- No aggregate extraction took place in 2011 (Economy_294)
- Aggregate wharves in the North East include River Tees, River Tyne and Sunderland (Economy_558)
- The length of cable in the marine plan areas (km) is as follows: North East inshore: 120, North East offshore: 6,096 (Economy_297)
- The number of pipelines in the plan areas is as follows: North East inshore: 140, North East offshore: 242 (Economy_298)
- There is a planned North Sea interconnector from Seaham to Sweden. This is part of the North Sea Offshore Grid Initiative (Economy_352)

Baseline/issues: South East Plan Area 5

- Data from 2011 suggests that no aggregate extraction took place. However, newer data from 2014 suggests that the Thames region has 4 production licences and during 2014, 0.59 million tonnes of construction aggregate were dredged from a permitted licensed tonnage of 1.76 million. In addition 0.37 million tonnes were dredged for reclamation fill and 0.48 million tonnes were dredged for beach nourishment (Economy_294)
- The length of cable in the marine plan areas (km) is as follows: South East: 520 (Economy_297)
- The number of pipelines in the plan areas is as follows: South East: 371 (Economy_298)
- There is a current installation of an interconnector from Kent to Belgium ('Nemo'). This has been designated as one of the European Commission's Projects of Common Interest as it will help create an integrated European energy market (Economy_325)
- There are a large number of aggregate wharves in the South East. These are mainly concentrated in the Thames Estuary (Barking, Cliffe, Dagenham, Denton, Erith, Greenhithe, and Greenwich Wharves) (Economy_522)

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Economy - Aggregate Extraction and Seabed Assets

Summary of the legislative / policy context

- The Marine Policy Statement states that the extraction of marine dredged sand and gravel should continue to the extent that this remains consistent with the principles of sustainable development, recognising that marine aggregates are a finite resource and in line with the relevant guidance and legislation.
- The Marine Policy Statement states that the importance of telecommunication and power cabling as vital infrastructure for the domestic and global economy should be recognised in Marine Plans.

Key cross cutting baseline / issues across all plan areas

- Marine sand and gravel makes a crucial contribution to meeting the nation's demand for construction aggregate materials (Economy_476)
- They are particularly important in England, accounting for 38% of the total regional demand for sand and gravel in the South East (80% in London), 46% in the North East and 22% in the North West. Land-based and marine-based construction aggregate resources are unevenly distributed and many regions are heavily dependent on supplies from other areas. Marine sand and gravel is delivered to specialised marine aggregate wharves in 35 ports around England and Wales for use by the construction industry (Economy_476)
- Submarine telecommunication cables carry more than 95% of the world's international traffic including telephone, internet and data, as well as many services for the UK's local communities, major utilities and industries. The transatlantic cables landing in the UK carry more than 70% of Europe's transatlantic internet traffic. The UK Government has established a new offshore electricity transmission regime to help ensure that the substantial investment required to connect offshore generation projects to the onshore grid is delivered in a cost effective manner to maximise the benefits to consumers and renewable energy developers. In addition, potential new sub-sea cabling to reinforce and better connect certain sections of the onshore grid is a key part of supporting the growth of renewable and low carbon generation (Economy_471)

The likely evolution of the environment over the plan duration

- The relative importance of dredging areas changes as reserves become depleted and new reserves are developed. For example, the Thames has declined in importance (as reserves have become depleted) but the East English Channel has become increasingly important (where large resources have been discovered) (Economy_556)
- Potential new sub-sea cabling to reinforce and better connect certain sections of the onshore grid is a key part of supporting the growth of renewable and low carbon generation. The UK has signed up to the European Supergrid plan (North Seas Offshore Grid Initiative). The UK is working with nine other European countries as part of the North Seas Offshore Grid Initiative

Potential interactions with other topics

Marine aggregates are required for the maintenance of coastal defences required for climate change adaptation. Marine aggregates can present reduced impacts on local communities compared to the extraction of land-won aggregates, in particular with regard to the extraction process and transportation. Substantial volumes of marine aggregates are landed on wharves close to where they are needed and locally distributed by rail, water (through barges) and road. Wider social and economic benefits include skilled, stable employment and the generation of income through the construction industry supply chain. Potential adverse impacts include changes to the hydrodynamic regime that may alter coastal processes; loss of seabed habitat and heritage assets; impacts on fisheries and secondary impacts to marine life and habitat associated with sediment plumes; disturbance of fish spawning, migration routes, nursery and overwintering areas; overflows from dredging vessels and impacts on geodiversity.

Potential new sub-sea cabling to reinforce and better connect certain sections of the onshore grid is a key part of supporting the growth of renewable and low carbon generation. Impacts from cable installations on the sea bed are low and spatially minor and tend to occur due to the physical disturbance involved during installation. The main impact will be where cable protection, for example, rock armour or concrete mattresses, is required where cable burial is not feasible and potentially in the intertidal area where the cable lands. Impacts may also occur if the cable runs through any site designated as being of national or international nature or cultural heritage conservation importance or other sensitive areas such as designated shell fisheries, spawning or nursery ground for economically important fish species. Other potential impacts could include disturbance to known or undiscovered archaeological sites.

Cables are buried deep in the sea bed where possible and installers and operators promote marine safety and protection. However, cable installations on the UK continental shelf and surrounding waters can be subject to damage. Although this can be through natural causes, human activity is the main cause of submarine cable faults due to damage caused by fishing trawlers and anchors. Given the increased activity in the UK marine area there is a risk that the number of incidents may increase.

Please also see the Ports and Shipping report card and energy report card.

Potential transboundary issues

- Wales is also highly dependent on marine-dredged sand for construction use and beach nourishment (Marine Policy Statement), which meets more than 80% of the demand. Decisions on aggregate extraction off the coast of South Wales are made in line with the Welsh Assembly Government's Interim Marine Aggregates Dredging Policy, which provides strategic area-based guidance. There is currently no marine aggregates extraction for construction in Scotland or Northern Ireland.
- Sand and gravel dredged in the UK is shipped to Europe. Marine sand and gravel is delivered to wharves in 17 ports on mainland Europe, where it is used by the construction industry. In 2014 about 20% of the total was shipped to Belgium, France and the Netherlands and 4.5 % was shipped to Wales. The rest was for use in England
- The UK has signed up to the European Supergrid plan (North Seas Offshore Grid Initiative). The UK is working with nine other European countries as part of the North Seas Offshore Grid Initiative

Key data gaps

- Aggregate resource mapping has not been undertaken for the remaining plan areas (Economy_557)

Economy - Energy

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- North West Plan area has five operational offshore wind farms: Barrow, Burbo Bank, Ormonde, Wal-ney I, Walney II and West of Duddon Sands. It also has two approved offshore wind farms: Burbo Bank extension and Walney III. The current combined offshore wind farm capacity for the North West plan area is 1086.2 MW (Economy_347)
- Tidal Lagoon Power has an early stage proposal to create tidal lagoon north of Workington on the west Cumbrian coast. There are also plans for a Wyre tidal energy barrage and a Mersey barrage (which is listed in the Liverpool Devolution Agreement) (Economy_379)
- There are no potential Carbon Capture and Storage (CSS) projects in this Plan Area (Economy_303)
- Heysham 1 and 2 power stations are in the North West plan area (Economy_361). NuGen's Moorside project aims to develop a new generation nuclear power station of up to 3.6GW on land in West Cumbria, North West England (Economy_548)
- In the North West plan area there is a gas terminal at Barrow-in-Furness, there are a number of gas and oil fields, predominantly gas fields. There are two significant oil discovery areas, and there are currently licenced 28th round award and 28th round provisional award areas, and there is a gas storage licence area (Economy_348)
- There is one area off the coast of the Wirral in the North West Inshore Plan Area subject to Coal Authority Underground coal gasification licenses (Economy_546)

Baseline/issues: South West Plan Area 8 9

- There are no operational or approved offshore wind farms in the South West plan area (Economy_321)
- There are tidal stream/lease agreements for lease sites in the South West inshore (Pulse Tidal Limited, Bristol Channel), North Cornwall Wave Demonstration Zone, North Devon Tidal; Demonstration Zone and Falmouth Bay Test Site (FabTest) (Economy_318)
- Tidal Lagoon Power are considering the potential of Bridgwater Bay, Somerset to develop a tidal lagoon (Economy_387)
- There are no potential CCS projects in this Plan Area (Economy_303)
- Hinkley point power station is in the South West plan area. Planning permission was granted for Hinkley Point C in 2013 but there is uncertainty surrounding the future of the development (Economy_361)
- In the South West plan area there are no oil or gas fields, no oil or gas terminals and no currently licenced areas. A large portion of this plan area is designated as a restricted area meaning that oil and gas development will not go ahead (Economy_322)

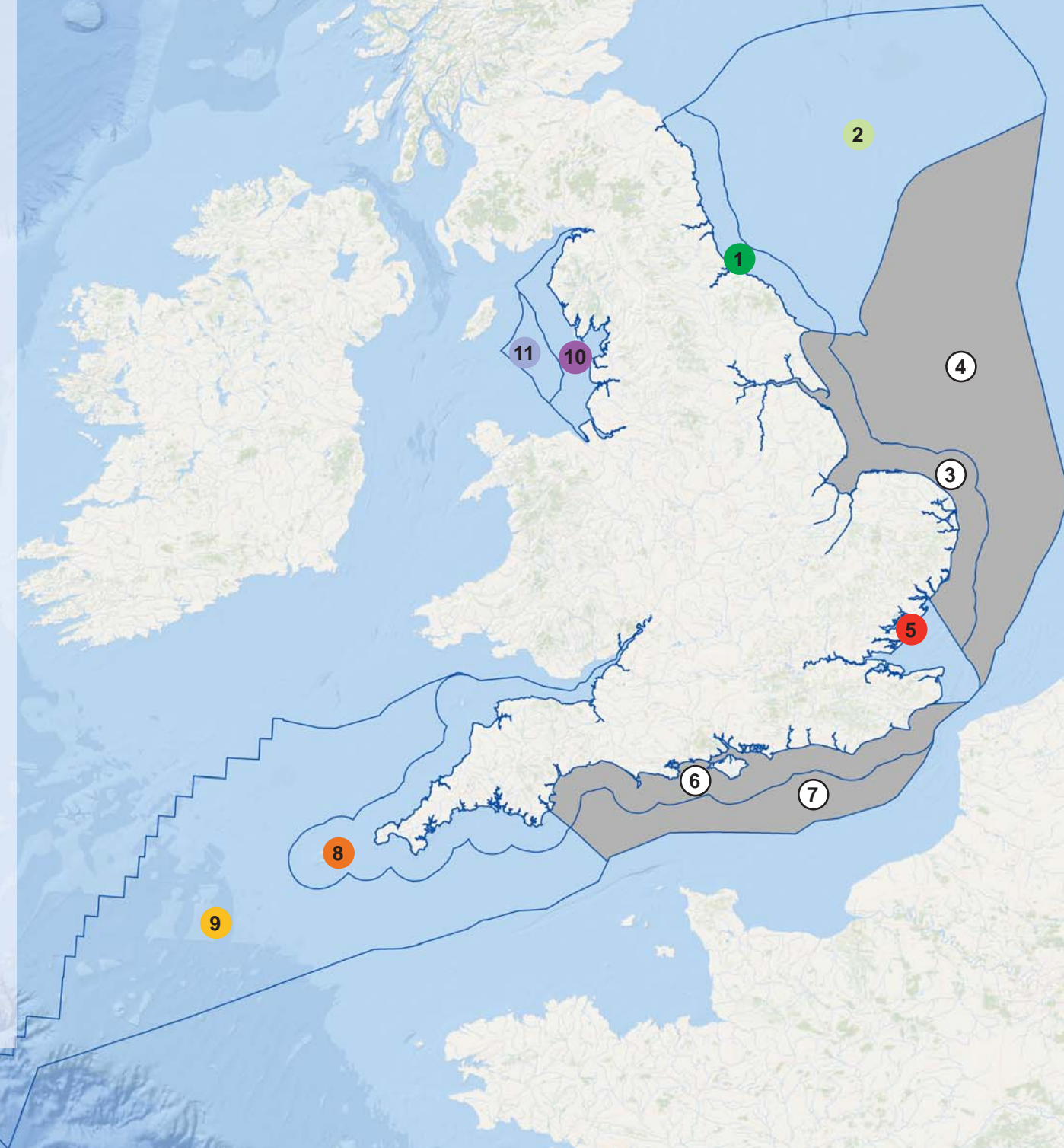
Baseline/issues: North East Plan Area 1 2

- North East Plan area has two operational offshore wind farms: Blyth and Teesside offshore wind farm. It also has three approved offshore wind farms: Blyth offshore demonstrator, Dogger bank (Teesside A and B), and Dogger Bank (Creyke Beck A and B) offshore wind farm. The current combined offshore wind farm capacity for the North East plan area is 66.1 MW (Economy_366)
- Wave and tidal demonstration facilities include: National Renewable Energy Centre (NAREC) (Economy_360)
- Potential Carbon Capture and Storage projects include the Teesside low carbon project (Economy_303)
- Hartlepool Nuclear Power station is in the North East plan area (Economy_361)
- There are a number of oil fields near to the east plan area boundary and a number of oil fields further offshore near to the Scottish border. There is an oil terminal and a gas terminal in Teesside. There are areas of currently licenced 28th round award, and 28th round provisional award in this plan area (Economy_368)
- There are a number of areas along the coast north of Sunderland subject to Coal Authority Underground coal gasification licenses (Economy_545)

Baseline/issues: South East Plan Area 5

- South East Plan area contains seven offshore wind farms, all of which are operational, including: Gunfleet Sands I, Gunfleet Sands II, Gunfleet Sands III, Kentish Flats I, Kentish Flats II, London Array and Thanet. The current combined offshore wind farm capacity for the South East plan area is 1254.3 MW (Economy_335)
- There are no potential CCS projects in this Plan Area (Economy_303)
- There are no nuclear power stations in the South East plan area (Economy_361)
- In the South East Plan area there are no oil or gas fields, no oil or gas terminals and no currently licenced areas. There is a small area of 28th round provisional award in this plan area (Economy_336)

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Economy - Energy

Summary of the legislative / policy context

- The Overarching National Policy Statement for Energy' (EN-1), provides the primary basis for decisions by the Infrastructure Planning Commission (IPC) on applications it receives. There are also a number of supporting documents - National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2); 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 Electricity Networks Infrastructure (EN-5); National Policy Statement for Nuclear Power Generation (EN-6).
- According to the Marine Policy Statement, a secure, sustainable and affordable supply of energy is of central importance to the economic and social well-being of the UK. The marine environment will make an increasingly major contribution to the provision of the UK's energy supply and distribution. The UK has a policy objective to maximise economic development of the UK's oil and gas resources reflecting their importance to the UK's economic prosperity and security of energy supply.
- The UK also has legally binding commitments entered into under the Renewable Energy Directive (Directive 2009/28/EC)

Key cross cutting baseline / issues across all plan areas

Renewables: A significant part of the renewable energy required to meet the UK's targets and objectives will come from marine sources. The UK is currently the leading country for offshore wind deployment and the potential sites identified for offshore renewables (including offshore wind, wave and tidal) show the huge exploitable renewable energy resource in UK waters (Economy_508). The technology to enable wave and tidal energy generation is at an earlier stage of development than offshore wind. However, it is anticipated that the amount of wave and tidal energy being generated will increase markedly up to and beyond 2020 (Economy_542)

Carbon capture and storage (CCS): In 2012 DECC's CCS commercialisation programme was launched to support the design and construction of selected CCS projects. The white Rose (Yorkshire – East Plan area) CCS demonstration site is England's only current large scale project being considered by the commercialisation programme. However, in the 2015 Chancellor's Autumn Statement, HM Government confirmed that the £1 billion ring-fenced capital budget for the Carbon Capture and Storage Competition is no longer available. This has left considerable uncertainty in the industry (Economy_303)

Nuclear: The following nuclear reactors are operational in the UK: Heysham 1 and 2, Hinkley point B, Hunterston B, Dungeness B, Hartlepool, Torness, Sizewell. Hartlepool Power station is in the North East plan area. Heysham 1 and 2 power stations are in the North West plan area. Hinkley point power station is in the South West plan area. There are no nuclear power stations in the South East plan area (Economy_361)

Fossil fuels: Offshore oil and gas is at present the largest source of UK energy supplies and satisfied about two thirds of primary energy demand in 2008 (91% of oil demand and 73% of gas demand). Although indigenous production is now in long-term decline oil and gas are expected to remain of central importance even as the country moves towards a low carbon economy. The majority of oil and gas fields on the UK Continental Shelf are located in the North Sea and the largest region of related employment in the UK is in Scotland. Some parts of the UK marine area are well explored and understood. However, in all areas it is likely that there are new discoveries still to be made and these resources need to be accessed to achieve the objective of maximum economic recovery. A range of offshore infrastructure is required to increase the UK's storage capacity. In addition to conventional oil and gas there are several areas in the marine plan areas covered by underground coal gasification licenses (Economy_513)

The likely evolution of the environment over the plan duration

Although the UK plans to reduce its reliance on fossil fuels, transition will take a significant time and gas will continue to play an important part in the UK fuel mix for years to come. The UK will remain heavily dependent on gas and is expected to rely on imports to meet around half of its net gas demand in 2020. Consequently, significant investment in new gas infrastructure will be required and unconventional fossil fuel technology will also start to contribute towards supply. EDF Energy is planning a seven year reactor life extension for Hinkley Point (November 2012), In February 2016 five-year life extensions were announced for Heysham I, to 2024 and seven year extension for Heysham II to 2030, In February 2016 five-year life extensions were announced for Hartlepool to 2024 (Economy_554)

The UK has some of the best wind resources in the world and offshore wind will play an important and growing part in meeting renewable energy and carbon emission targets and improving energy security by 2020, and afterwards towards 2050.. Initiatives like the Offshore Renewable Energy Catapult (a UK based innovation and research centre for offshore wind, wave and tidal energy) is playing its part in this development. The technology to enable wave and tidal energy generation is at an earlier stage of development than offshore wind. However, it is anticipated that the amount of wave and tidal energy being generated will increase markedly up to and beyond 2020.

Potential interactions with other topics

There are a number of environmental risks and potential impacts associated with oil and gas extraction, the most notable being the risk of oil spill, noise from exploration (e.g. seismic survey) and production, historical oil based cuttings piles, and inputs of exploration and production chemicals. Oil discharges in produced water have fallen in the UK and most oil spills are now of less than 1 tonne. Dependent upon the location, manner of installation and size of the pipeline there are potential impacts from pipeline installation on habitats. However, these are generally spatially minor with short-term noise and disturbance impacts. Use of existing storage features and infrastructure is likely to result in negligible additional impacts although the production of salt caverns may result in significant local impacts and interference with other users of the area. Decommissioning at the end of life can also cause impacts including ecological impacts and potential pollution impacts. Renewable energy developments can potentially have adverse impacts on marine fish and mammals, primarily through construction noise and may displace fishing activity and have direct or indirect impacts on other users of the sea, including mariners. Certain bird species may be displaced by offshore wind turbines, which also have the potential to form barriers to migration or present a collision risk for birds. Their foundation designs are likely to have an effect on hydrodynamics and consequent sediment movement. This includes potential scouring of sediments around the bases of turbines. Marine energy deployments, that is wave and tidal deployments, may pose potential risks to the environment if inappropriately sited. However, the level of risk and ecological significance is largely unknown since, in particular, tidal stream and wave technologies are at a relatively early stage of development. Studies of tidal range technologies, including barrages, have indicated that these structures can have adverse impacts on migratory fish and bird species and on the hydrodynamics of the estuarine environments in which they are situated. Decommissioning can also cause impacts but these impacts are less well understood because of the relative immaturity of some of the technologies. There are also potential issues with any other sector requiring open access to marine areas (fishing/shipping/aquaculture). However, please note that there are potential co-existence opportunities with compatible sectors. Please also see the Ports and Shipping report card for information regarding the effects of subsea infrastructure on shipping.

With regard to Carbon Capture and Storage, leakage from a properly selected storage site is extremely unlikely. Once injected into a formation, a number of physical and chemical trapping mechanisms will retain carbon dioxide within the formation. It is possible that leakage of carbon dioxide from the injection process could take place, for example through failure of infrastructure, such as pipelines and wellheads. This could have some localised impact on benthic marine communities and possibly cause minor localised seawater acidification. However, such impacts are unlikely to be either widespread or long-term, taking into account the dilution and buffering capacity of our oceans.

Potential transboundary issues

- There are no new nuclear sites planned for Scotland. Northern Ireland has no nuclear sites and none are planned.
- Marine plan authorities will need to liaise, as appropriate, with terrestrial planning authorities to ensure the development of any necessary on-shore infrastructure. This will include, for example sub-stations, to support offshore electricity generation and connection to the national grid; new gas and electricity import infrastructure, including conventional import pipelines, gas reception facilities and liquid natural gas (LNG) import facilities; appropriately developed and placed ports and harbours to support construction and maintenance as well as other infrastructure such as roads.
- Tidal Lagoon Power have plans to develop tidal lagoons at Cardiff, Newport and Swansea. Swansea is most advanced plan with consent granted by Secretary of State for Energy and Climate Change in June 2015. Although none of these developments not lie within SW Inshore Marine Plan area their development would impact SW Inshore seascape
- Robin Rigg was Scotland's first offshore windfarm and is in the Solway Firth

Key data gaps

Further research is needed to develop a better understanding of the potential impacts that newer renewable energy technologies might have on potentially sensitive environmental features (Economy_518)

Biodiversity, Habitats, Flora and Fauna - Protected Sites and Species

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- Special Areas of Conservation (SACs): There are five SACs in the plan area – Solway Firth SAC, Drigg Coast SAC, Morecambe Bay SAC, Shell Flat and Lune Deep SAC and Dee Estuary SAC (Biodiv_372).
- Special protection Areas (SPAs): There are eight SPAs in the plan area - Dee Estuary SPA, Liverpool Bay SPA, Mersey Estuary SPA, Ribble and Alt Estuaries SPA, Mersey Narrows and North Ribble Foreshore SPA, Morecambe Bay SPA, Duddon Estuary SPA and Upper Solway Flats and Marshes SPA (Biodiv_371). The Ribble Coast and Wetlands Regional Park includes part of the Ribble and Alt Estuaries SPA (Biodiv_370).
- The Morecambe Bay and Duddon Estuary possible SAC (pSPA) will be undergoing public consultation until 21 April 2016. The pSPA would combine and extend the area currently protected by the Morecambe Bay SPA and Duddon Estuary SPA (Biodiv_599).
- Sites of Special Scientific Interest (SSSIs): There are 24 Sites of Special Scientific interest (SSSI) in the North West inshore plan area (Biodiv_379).
- Marine Conservation Zones (MCZs): There are two MCZs in the inshore plan area – the Cumbria Coast MCZ (Biodiv_373) and Flyde MCZ (Biodiv_374). The West of Walney MCZ stretches across the inshore and offshore plan areas (Biodiv_363).

Baseline/issues: North East Plan Area 1 2

- SACs: There are two SACs in the plan area – the Berwickshire and North Northumberland Coast SAC, and the Flamborough Head SAC (Biodiv_334).
- The Southern North Sea pSAC for harbour porpoise (*Phocoena phocoena*) is currently undergoing public consultation (until 3 May 2016). Part of the pSAC is in the offshore plan area. The pSAC stretches across the North East offshore, East inshore and offshore and South East plan areas (Biodiv_595).
- SPAs: There are five SPAs in the plan area - Teesmouth and Cleveland Coast SPA, Coquet Island SPA, Lindisfarne SPA, St Abbs Head to Fast Castle SPA and the Farne Islands SPA (Biodiv_335).
- The Northumberland Marine pSPA is currently undergoing public consultation (until 21 April 2016). The pSPA would surround the Coquet Island SPA and the Farne Islands SPA. The pSPA would protect the foraging waters used by breeding seabirds (Biodiv_598).
- SSSIs: There are 37 SSSIs in the inshore plan area (Biodiv_361).
- MCZs: There are four MCZs in the inshore plan area - Allonby Bay MCZ, Coquet to St Mary's MCZ, Runswick Bay MCZ, Aln Estuary MCZ. There are three MCZs in the offshore plan area - the North East of Farnes Deep MCZ (Biodiv_590), Swallow Sand MCZ (Biodiv_375) and Fulmar MCZ (Biodiv_591). The Farnes East MCZ stretches across the inshore and offshore plan areas (Biodiv_365).
- Potential new waste development along the Tees Estuary and river corridor could adversely impact on the Teesmouth and Cleveland Coast SPA (Biodiv_516).

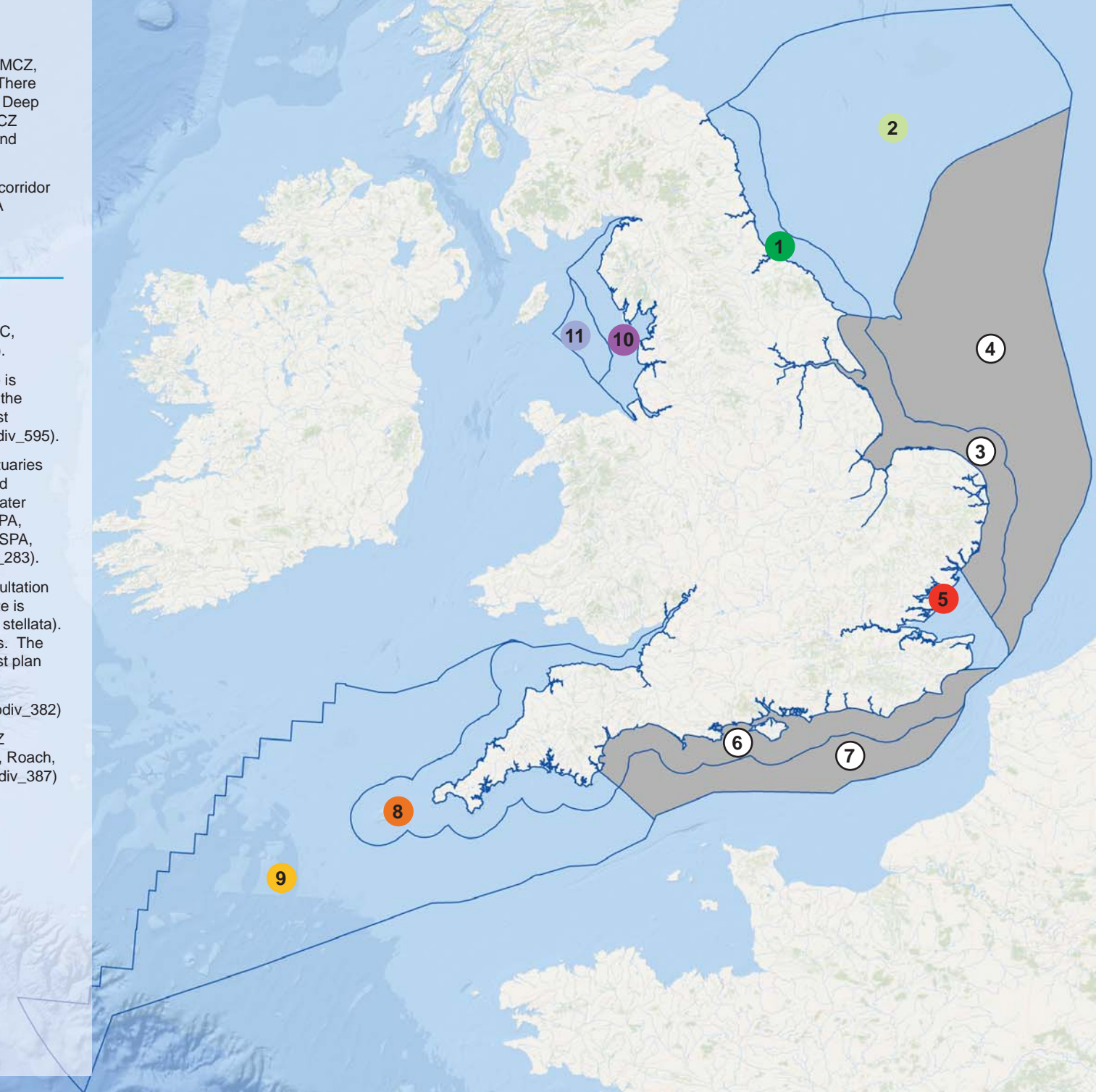
Baseline/issues: South West Plan Area 8 9

- SACs: There are eight SACs in the inshore plan area – Start Point to Plymouth Sound and Eddystone SAC, Plymouth Sound and Estuaries SAC, Fal and Helford SAC, Lizard Point SAC, Lands End and Cape Bank SAC, Lundy SAC, Severn Estuary SAC and Isles of Scilly Complex SAC (Biodiv_369). The Haig Fras SAC is in the offshore plan area (Biodiv_592).
- The Bristol Channel Approaches possible SAC (pSAC) for harbour porpoise is currently undergoing public consultation (until 3 May 2016). The pSAC stretches across the inshore and offshore plan areas as well as the Wales National Marine Plan area (Biodiv_594).
- SPAs: There are two SPAs in the plan area - the Tamar Estuaries Complex SPA and the Severn Estuary SPA (Biodiv_297).
- The Skokholm & Skomer SPA is currently undergoing public consultation (until 3 May 2016) on extending the boundaries of the site (which is currently exclusively in Welsh waters) in to the SW offshore plan area as well as adding protection for two new species, foraging Manx shearwater (*Puffinus puffinus*) and Atlantic puffin (*Fratercula arctica*) (Biodiv_597).
- SSSIs: There are 118 SSSIs in the South West inshore plan area (Biodiv_411)
- MCZs: - There are 13 MCZs in the inshore plan area – Bideford to Foreland Point MCZ (Biodiv_390), Hartland Point – Tintagel MCZ (Biodiv_392), Mounts Bay MCZ (Biodiv_393), Newquay and the Gannel MCZ (Biodiv_394), Runnel Stone MCZ (Biodiv_396), Isles of Scilly MCZ (Biodiv_400), Lundy MCZ (Biodiv_401), The Manacles MCZ (Biodiv_402), Padstow Bay and Surrounds MCZ (Biodiv_403), Skerries Bank and Surrounds MCZ (Biodiv_404), Tamar Estuary MCZ (Biodiv_406), Upper Fowey and Pont Pill MCZ (Biodiv_407), and Whitsand and Looe Bay MCZ (Biodiv_408).
- There are six MCZs in the offshore plan area – The Canyons (Biodiv_398), South West Deep (West) MCZ (Biodiv_405), North West of Jones Bank MCZ (Biodiv_395), Greater Haig Fras MCZ (Biodiv_391), East of Haig Fras MCZ (Biodiv_399) and the Western Channel MCZ (Biodiv_397).
- The River Fowey ferry/navigation channel maintenance may pose a risk to protected sites (Biodiv_482).
- There are several proposals for tidal lagoons in the inshore plan area, which could affect protected sites and species (Biodiv_507)

Baseline/issues: South East Plan Area 5

- SACs: There are three SACs in the plan area – Essex Estuaries SAC, Margate and Long Sands SAC and Thanet Coast SAC (Biodiv_381).
- The Southern North Sea possible SAC (pSAC) for harbour porpoise is currently undergoing public consultation (until 3 May 2016). Part of the pSAC is in the plan area. The pSAC stretches across the North East offshore, East inshore and offshore and South East plan areas (Biodiv_595).
- SPAs: There are 13 SPAs in the plan area: the Stour and Orwell Estuaries SPA, Hamford Water SPA, Outer Thames Estuary SPA, Benfleet and Southend Marshes SPA, Crouch and Roach Estuaries SPA, Blackwater Estuary SPA, Dengie SPA, Colne Estuary SPA, Foulness Estuary SPA, Thames Estuary and Marshes SPA, Medway Estuary and Marshes SPA, The Swales SPA and Thanet Coast and Sandwich Bay SPA (Biodiv_283).
- The Outer Thames Estuary SPA is currently undergoing public consultation (until 21 April 2016) on extending the boundaries of the site. The site is currently classified for non-breeding red-throated divers only (*Gavia stellata*). The extension will include little tern and common tern foraging areas. The pSPA stretches across the East inshore and offshore and South East plan areas (Biodiv_596).
- SSSIs: There are 31 SSSIs in the South East inshore plan area (Biodiv_382)
- MCZs: There are 5 MCZs in the plan area - The Swale Estuary MCZ (Biodiv_383), Dover to Deal MCZ (Biodiv_385), Blackwater, Crouch, Roach, and Colne Estuaries MCZ (Biodiv_386), Medway Estuary MCZ (Biodiv_387) and Thanet Coast MCZ (Biodiv_388).

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Biodiversity, Habitats, Flora and Fauna - Protected Sites and Species

Summary of the legislative / policy context

The main policy and legislative instruments relating to protected sites and species are:

- The Habitats (92/43/EEC) and Birds Directives (2009/147/EC) and national legislation that transposes these. These Directives help to implement the aims and objectives of several international conventions to which the EU is a signatory, including the Ramsar, Bonn, Bern and OSPAR Conventions and the Convention on Biological Diversity (CBD). The CBD and OSPAR Conventions specifically include a commitment to establish 'an ecologically coherent network of marine protected areas.' A network of protected sites (Natura 2000) has resulted, which includes Special Areas of Conservation (SPA) and Special Protection Areas (SPA). Ramsar sites are protected sites designated specifically under the Ramsar convention to protect wetlands of international importance, particularly for waterfowl. As a result, Ramsar sites are often contiguous with SPAs.
- Marine and Coastal Access Act (MCAA) 2009 - Provides the ability to establish Marine Conservation Zones (MCZs).
- Wildlife and Countryside Act (WCA) 1981 - Establishes the ability to designate and protect Sites of Special Scientific Interest (SSSI) and builds on the National Parks and Access to the Countryside Act 1949 in order to allow designation of National Nature Reserves (NNRs).
- Countryside and Rights of Way (CRoW) Act - Provides a duty on Government to have regard for the conservation of biodiversity and provides additional protection for SSSIs and for protected species.
- The EU Water Framework Directive includes consideration of effects on protected sites and species.
- Natural Environment and Rural Communities (NERC) Act 2006 - Contains statutory lists of priority habitats and species in need of conservation (including Biodiversity Action Plan (BAP) species and habitats). Helps to implement the CBD / Rio Convention. Includes duty on public bodies to protect biodiversity.

Under the Marine Strategy Framework Directive (MSFD), Good Environmental Status (GES), several Descriptors are relevant to protected sites and species, including D6 - Seafloor integrity is at a level that does not affect benthic ecosystems, D4 - Marine food webs are normal, D1 - Biological diversity is maintained and D3 - populations of commercially exploited fish and shellfish stocks are within safe biological limits. Arguably, all GES Descriptors are of relevance to the health of protected sites and species. The MSFD also requires the establishment of Marine Protected Areas (MPAs), which contribute to the creation of an ecologically coherent network of MPAs and help to meet the aims of international conventions to which the EU is party (e.g. OSPAR). It should be noted that other regulations also exist and cross reference to the other Biodiversity report cards should be made for a more full appreciation of legislation and policy relating to habitats and species. Sites that are protected for reasons other than biodiversity (e.g. geological importance, landscape, historic features) are covered in the relevant report cards.

The UK Marine Policy Statement (MPS) requires marine plan makers to consider protected areas and features into their plan development, including how plans and development decisions could (positively or negatively) affect legal obligations to protect sites and to halt biodiversity loss. This includes taking account of the effects of climate change on protected sites and species and how climate change should be incorporated into the selection / de-selection of protected sites.

Key cross cutting baseline / issues across all plan areas

Issues that affect protected sites and species are very site specific, making it difficult to identify cross cutting issues that affect all areas, sites and species. Protected sites in the marine plan areas that are protected by legislation include Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs) and Marine Conservation Zones (MCZs). SACs, SPAs and MCZs can be designated in both inshore and offshore plan areas, while SSSIs are only in inshore areas, with most confined to the intertidal area. As at 31 July 2015, over 4 million hectares of England's sea out to the limit of the UK continental shelf (over 17%) was covered by protected sites designations (SAC, SPA, Ramsar, SSSI, MCZ). It should be noted that there are several new and extended SACs and SPAs currently being consulted on (see information on specific plan areas below).

Protected species may be protected as features of these sites, or separately. Natural England has recently published updated conservation advice packages for Marine Protected Areas (MPAs), covering SPAs, SACs, Ramsar sites and MCZs. Some of the advice is still in draft and being consulted on, so may be subject to change (Biodiv_600).

There are 50 MCZs in English waters, which have been designated in two tranches, covering over 20,000km² seabed. 127 MCZs were recommended by the MCZ project in 2011. 27 sites were designated in November 2013 and a further 23 were designated in January 2016. There will be a consultation on a third tranche of MCZs in 2017, with the aim to designate further sites in 2018. MCZs along with other protected sites will contribute towards the aim of creating a network of ecologically coherent MPAs.

The MMO has produced draft site summary assessments for managing fisheries in MPAs for eight sites within the plan areas considered in this document - Flyde MCZ, Land's End and Cape Bank European Marine Site (EMS), Liverpool Bay EMS, Margate and Long Sands EMS, Outer Thames Estuary SPA, Shell Flat and Lune Deep EMS, Skerries Bank and Surrounds MCZ, Start Point to Plymouth Sound and Eddystone EMS (Biodiv_601). Impacts from fishing activity are very site specific, depending on the reasons for site designation (i.e. the features for which the site has been designated) and the type of fishing activity that takes place.

Reduction in sandeel stocks may affect the breeding and reproductive survival of protected seabirds, particularly in the North East (Biodiv_517).

Coastal squeeze resulting in loss of intertidal habitats and species (incl. birds) may affect the extent or quality of protected sites and / or the features for which they have been designated. This may require new compensatory habitat to be created and/or designated in coastal areas, particularly estuaries (Biodiv_526).

The likely evolution of the environment over the plan duration

Climate change: Climate change is an issue potentially affecting all areas in the future. Climate change could affect the geographic range / distribution of protected species directly, or alter the distribution of species that compete with or prey on protected species. Climate change could also alter the distribution or extent of protected habitats. Sea level rise and associated coastal squeeze may also alter the distribution or extent of protected sites or species. As a result of changes due to climate change, the boundaries of protected sites may need to be amended. Sites may need to be de-designated, or new sites designated, to take account of such changes to legally protected habitats and species. New sites and / or species may need to be included in the network of protected sites, or protected by legislation if they become rare, threatened or vulnerable as a result of climate change and its associated effects (e.g. coastal squeeze). Ocean acidification is linked to climate change and there has been an observed increase in seawater pH; this may have impacts to the food chain / marine food webs, with possible impacts to protected sites and/or species. Coastal squeeze is likely to continue to affect the extent or quality of protected sites, with knock on impacts to species that depend on such sites.

Development and increased use of the marine area (on the coast, in the inshore or offshore plan areas) has the potential to affect protected sites and / or species either through isolated large-scale or inappropriate development/activity or through cumulative effects. Activities such as dredging, aggregate extraction, energy generation (tidal power, windfarms (Biodiv_532), nuclear and conventional power stations and associated power cables), shipping and water use (abstraction and discharges) may affect protected sites via a range of pathways such as damage / destruction of habitat, sedimentation, changes in coastal processes, noise, electromagnetic fields, intakes, outfalls, barriers to migration, collision with vessels / structures (wind or underwater turbines), disturbance from the presence of people / watercraft.

Improvements to water quality in inshore areas and estuaries have been beneficial to species and habitats. Water quality improvements in these areas may also have benefited species that use these areas for spawning and as nursery area. These improvements are expected to continue as actions to achieve WFD and MSFD objectives are implemented.

Potential interactions with other topics

There are links to other areas of the Biodiversity topic, as several species of fish, birds and marine megafauna are protected species and / or are protected as part of the protected sites network. Protected sites incorporate benthic and intertidal areas and many sites rely on the maintenance of geological and / or coastal and metocean processes so links to the Water and Geology, Substrates and Coastal Processes topics are also directly relevant. Activities far inland may affect protected species, particularly birds and migratory fish, if they affect migration, breeding or feeding areas or water quality.

There is the potential for invasive species to directly impact protected sites and species (Biodiv_531) by competing with native species for habitat, food sources or directly through predator-prey, disease or parasite interactions.

Marine litter has widespread implications for fish, birds, marine mammals, turtles and other protected species in terms of ingestion and entanglement. The impact of microplastics on marine food webs and the marine environment in general is also an increasing concern.

Potential interactions with climate change and associated physical changes (including coastal processes, sea level rise and coastal squeeze) is a key interaction potentially affecting sites and species. Climate change could have a number of impacts including altering predator and prey dynamics due to a change in the timing of key life cycle events (Biodiv_473) or the distribution of species. Changes in the geographic range / distribution of species may affect competition for food and habitat, as more southerly species move northwards. Climate change may alter the distribution or extent of key habitats or alter food webs. Ocean acidification is linked to climate change and there has been an observed increase in seawater pH; this may have impacts to the food chain / marine food webs, with possible impacts to shellfish biology (shell formation) (Biodiv_478). Coastal squeeze may affect the extent or quality of protected habitats and / or the species that rely on them (Biodiv_423-424, Biodiv_526).

Many protected species are highly mobile and / or widespread and may interact with a wide variety of economic activities at the coast and in inshore and offshore plan areas (e.g. dredging, aggregates, energy, shipping, commercial fishing). Protected sites provide resources for a variety of economic activities such as fishing (commercial and recreational), birdwatching, diving, eco-tourism (e.g. whale watching), recreational sea uses (boating, surfing, wind surfing, etc.). Designated sites may have implications for access to heritage assets and/or the conduct of archaeological investigations.

Biodiversity, Habitats, Flora and Fauna - Protected Sites and Species

Potential transboundary issues

- Many protected species are highly mobile and / or widespread, including marine mammals, turtles, birds and protected fish species, such as sharks. Populations of these species may spread beyond individual plan boundaries, as well as beyond UK administrative boundaries (England, Wales, Scotland, Northern Ireland) and UK borders (EU and non-EU countries), requiring co-ordination between plan areas, with devolved administrations, other EU countries and beyond, often via international organisations / convention (e.g. OSPAR).
- Connectivity and the creation of a coherent network of protected sites is a key aim of national and international legislation and conventions that requires cross-border co-operation across marine plan and national / international boundaries.
- The Severn and Dee estuaries contain several protected sites that overlap with the Wales National Marine Plan area (Biodiv_602).
- The Solway Firth and Tweed estuary contain protected sites that overlap with Scotland's Marine Plan area (Biodiv_603).
- The Bristol Channel Approaches pSAC and the Southern North Sea pSAC for harbour porpoise cross several marine plan area boundaries. The Bristol Channel Approaches pSAC overlaps with the Wales National Marine Plan area (Biodiv_594).
- The Skokholm & Skomer SPA proposed extension would stretch across the South West offshore plan area and the Wales National Marine Plan area (Biodiv_597).
- The Outer Thames pSPA. The pSPA stretches across the East inshore and offshore and South East plan areas (Biodiv_596).

Key data gaps

- Underwater noise impacts on some protected species are recognised as a concern, particularly marine mammals (Biodiv_438-445) and fish (Biodiv_472) (see Marine Megafauna and Fish & Shellfish topics).
- The extent of marine litter within the UK seas and the effects of such litter on the marine environment are not robustly characterised (Biodiv_476).
- Lack of understanding of the effects of climate change on protected sites and species, including the distribution and abundance of protected species, their use of sites, potential movement to other sites, reproductive timing, migration, food sources and population dynamics (Biodiv_593, Biodiv_423-424, Biodiv_612).
- Information relating to the effects of electromagnetic fields on sharks and other fish is lacking and impacts are uncertain (Biodiv_561) (see also Marine Megafauna).
- Information on the condition of protected sites and species is not readily available at marine plan area spatial scale. Published data on SSSI condition amalgamates terrestrial and intertidal sites (UK Biodiversity Indicators, 2015). Information on the condition of SAC/SPA is available by feature (habitat and species) at a national level (Biodiv_621).
- Information on the condition of protected sites and species may not be up to date. Legislation requires regular assessments to be carried out but there are several years between assessments.

Biodiversity, Habitats, Flora and Fauna - Benthic and Intertidal Ecology

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- A variety of habitats are present in this plan area, ranging from extensive areas of sediment (e.g. Morecambe Bay) and sand (e.g. Solway Firth) to rocky coasts. A small number of species Features of Conservation Importance (FOCI) include maerl (*Phymatolithon calcareum* - syn. *Lithothamnion corallioides*) and ocean quahog (*Arctica islandica*). Habitat FOCI include large areas of subtidal sands and gravels with sheltered muddy gravels (e.g. Morecambe Bay), mud habitats in deep water (e.g. offshore of the Cumbrian Coast), saline lagoons, seagrass beds and large areas of intertidal mudflats (e.g. around the Mersey Estuary) (Biodiv_306). UK BAP habitats include extensive areas of coastal saltmarsh (Biodiv_648). Offshore a small number of species FOCI include native oyster (*Ostrea edulis*) and fan mussel (*Atrina fragilis*). Habitat FOCI include subtidal sands and gravels and subtidal mixed muddy sediment (Biodiv_301).
- Potential for impacts from large scale coastal development including tidal lagoon (Workington, West Cumbria) and nuclear power station (Moorside) developments. Impacts in the inshore plan area may include habitat loss or change, introduction of hard substrate as artificial reefs and changes in hydrodynamics affecting marine organisms (Biodiv_501, 514).
- Disturbance or shift in the range of native species due to habitat loss through sea level rise and coastal squeeze and storm events linked to climate change. These impacts will increasingly lead to effects such as submergence or erosion of intertidal rocky habitats (Biodiv_535).

Baseline/issues: South West Plan Area 8 9

- The inshore plan contains numerous records of species FOCI, including lagoon sand shrimp (*Gammarus insensibilis*), starlet sea anemone (*Nematostella vectensis*), lagoon sea slug (*Tenellia adspersa*), pink sea fan (*Eunicella verrucosa*), maerl (*P. calcareum*), short-snouted seahorse (*Hippocampus hippocampus*), peacock's tail algae (*Padina pavonica*), European spiny lobster (*Palinurus elephas*), sunset cup coral (*Leptopsammia pruvoti*), stalked jellyfish (*Lucernariopsis campanulata*), giant goby (*Gobius cobitis*), lagoon sea snail (*Paludinella littorina*) and ocean quahog. Habitat FOCI include subtidal sands and gravels, tide-swept channels and seagrass beds (e.g. Plymouth), intertidal mudflats (e.g. Tamar Estuary, coast of Somerset), blue mussel beds and estuarine rocky habitat (e.g. Tamar estuary), maerl beds and seagrass beds (e.g. around Falmouth Bay) saline lagoons (e.g. north coast of Cornwall) and areas of potential *Sabellaria spinulosa* reef (e.g. north coast of Devon) (Biodiv_262). UK BAP habitats included extensive areas of coastal saltmarsh (Biodiv_648). Species FOCI for the offshore plan area include ocean quahog and fan mussel. Habitat FOCI are largely made up of subtidal sands and gravels (Biodiv_259).
- Deep sea habitats (e.g. biogenic reefs, boulder habitats or sponge aggregations) are vulnerable to impacts such as habitat loss or damage from mobile fishing gear (bottom trawling) and smothering of sediment or habitat damage from marine litter (mainly discarded nets). Expansion of deep sea fisheries will increase the likelihood of such impacts (Biodiv_487).
- Potential for impacts from large scale coastal development including tidal lagoons (i.e. Bridgwater Bay, Somerset). Impacts in the inshore plan area may include habitat loss or change, introduction of hard substrate as artificial reefs and changes in hydrodynamics affecting marine organisms (Biodiv_501, 514).
- Impact of shellfisheries on intertidal and subtidal rocky and estuarine habitats within the inshore plan area, including removal of non-target species and habitat damage or loss, including sensitive reefs and maerl beds (Biodiv_562-564).
- Coastal lagoons within the inshore plan area have been particularly impacted by infilling and marine construction (Biodiv_574).

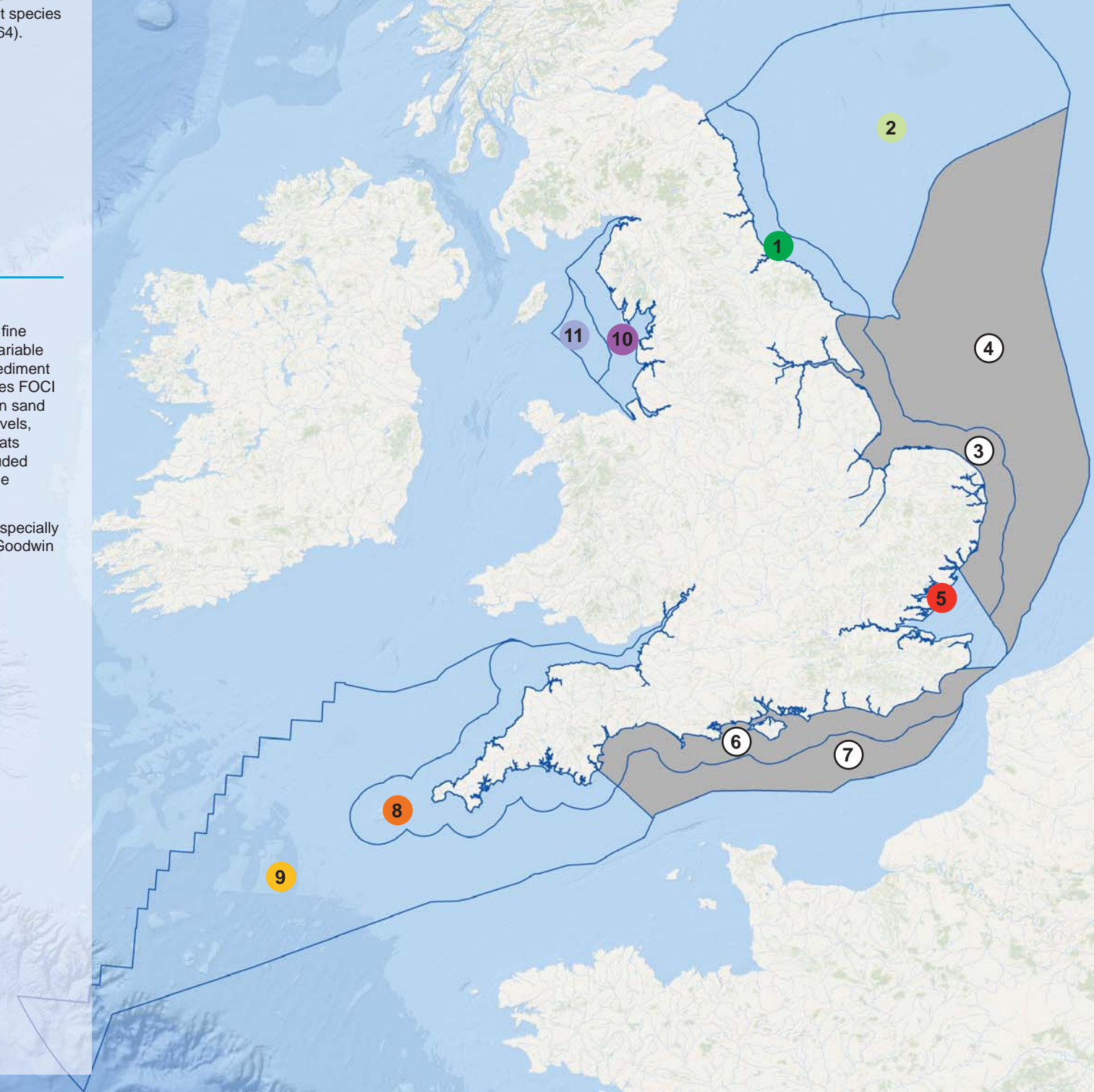
Baseline/issues: North East Plan Area 1 2

- Within this plan area, habitat types typically ranging from fine muds and sands to mixed and coarse sediments, with deeper coarse sediment and mud offshore, and muddy sands and rock along coastal areas. Within the inshore plan area species FOCI include red seaweed (*Cruoria cruroiaformis*) and stalked jellyfish (*Haliclystus auricula*). Habitat FOCI include large areas of subtidal sands and gravels and smaller areas of tide-swept channel and seagrass beds (Biodiv_336). UK BAP habitats included small areas of coastal saltmarsh (Biodiv_648). Within the offshore area, species FOCI include ocean quahog and northern hatchet shell (*Thyasira gouldi*) (Biodiv_328).
- Disturbance or shift in the range of native species due to habitat loss through sea level rise and coastal squeeze and storm events linked to climate change (Biodiv_535).
- Impact of shellfisheries on intertidal and subtidal rocky and estuarine habitats within the inshore plan area, including removal of non-target species and habitat damage or loss, including sensitive reefs (Biodiv_562-564).

Baseline/issues: South East Plan Area 5

- A variety of habitat types are present in this plan area, ranging from fine muds and sands, mixed and coarse sediments and large areas of variable salinity along the Thames Estuary, with patches of deeper coarse sediment and rock extending further away from the coast (Biodiv_288). Species FOCI include St John's jellyfish (*Lucernariopsis cruxmelitensis*) and lagoon sand shrimp. Habitat FOCI include a large area of subtidal sands and gravels, with an area of subtidal chalk around Ramsgate and intertidal mudflats in much of the Thames Estuary (Biodiv_289). UK BAP habitats included extensive areas of coastal saltmarsh (e.g. within the Medway / Swale estuarine complex and numerous Essex estuaries) (Biodiv_648).
- Pressures on subtidal sediments from activities such as dredging (especially Thames Estuary) but also potentially other future locations such as Goodwin Sands (Biodiv_542).

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Biodiversity, Habitats, Flora and Fauna - Benthic and Intertidal Ecology

Summary of the legislative / policy context

Benthic and intertidal species and habitats are protected through a range of international and national legislation including:

- Habitats and species of principal importance in England, under the Natural Environment and Rural Communities (NERC) Act 2006, including the stalked jellyfish, St John's jellyfish and pink sea fan;
- Species and habitat Features of Conservation Interest (FOCI) and broad-scale habitats referred to in the Ecological Network Guidance as MCZ features following the Marine and Coastal Access Act, 2009;
- Habitats such as biogenic reefs, estuaries, coastal lagoons, mudflats and sandbanks are listed under Annex I of the EC Habitats Directive;
- Habitats or species listed as threatened and/or declining by OSPAR, including ocean quahog, intertidal mudflats, maerl beds and Sabellaria reefs;
- Species listed under Schedule 5 of the Wildlife and Countryside Act (1981), such as fan mussel, lagoon sand shrimp and northern hatchet shell;
- Priority species under the UK BAP (and subsequent UK Post-2010 Biodiversity Framework), such as maerl, fan mussel and native oyster; and
- Priority habitats under the UK BAP (and subsequent UK Post-2010 Biodiversity Framework), such as Sabellaria reefs, mudflats, saltmarsh, seagrass beds, maerl beds and saline lagoons.

The area, range, distribution and condition of listed and predominant habitat types are included in the Marine Strategy Framework Directive under the Good Environmental Status Descriptors 1 and 6, while the Water Framework Directive boundaries includes areas of sensitive benthic invertebrates and habitats such as saltmarsh and seagrass. Within the seven plan areas, there are numerous protected sites designated for, or in part for, the presence of particular benthic or intertidal habitats or species, including Special Areas of Conservation (SACs), Sites of Special Scientific Interest (SSSIs) and Marine Conservation Zones (MCZs) which are discussed in the Protected Sites and Species section. In addition, several local plans within the inshore areas include conservation policy for sensitive habitats or seascapes with Local BAPs also in place.

Key cross cutting baseline / issues across all plan areas

Effects of pollution from marine activities (aquaculture, shipping, O&G, marine construction) on benthic and intertidal habitats and species, including cumulative impacts from increasing levels of contaminants. Intertidal and estuarine species and habitats are at particular risk from a variety of pollutants entering the marine environment through point discharges, diffuse atmospheric and riverine pathways and accidental spillages. Contaminants such as heavy metals, pesticides and organochlorines (such as PCBs) can reach sublethal to lethal effects in marine organisms and lead to bioaccumulation in higher trophic levels. Persistent contamination can reduce biodiversity, resulting in impoverished communities composed of pollution-tolerant organisms (Biodiv_420).

Reduced prey availability for some benthic and intertidal organisms due to impacts of ocean acidification on plankton increasingly affecting food webs (Biodiv_421-422).

Change in habitat condition and habitat loss through sea level rise, coastal squeeze, storm events from climate change and creation of coastal defences. This is particularly a concern in sensitive intertidal areas, such as the Severn Estuary which is facing significant habitat loss due to coastal squeeze. Risk also includes insufficient habitat creation (Biodiv_423-424).

Impacts to subtidal sediments from mobile fishing gear (bottom trawls and dredges) such as damage and disturbance resulting in loss of benthic habitats and species (Biodiv_425-427).

Impacts on subtidal sediments from offshore industry (e.g. aggregate extraction, oil and gas production, dredging) is an issue for the NE, SE and NW plan areas (with further detail provided below for SW and SE plan areas). At various locations near large ports, subtidal rocky habitat has been lost due to construction, infrastructure (mainly coastal) or via smothering from dredged deposits. Additionally concerns relate to seabed damage from aggregate extraction in the NW plan area (Biodiv_542).

Broad-scale changes in habitats and species are increasingly likely, resulting from rising sea temperatures due to climate change. Effects include loss of habitat, declining biodiversity and increasing abundance of non-indigenous species, ultimately altering the structure of communities and ecosystem processes (Biodiv_428-430).

Increasing levels of pollution and nutrient enrichment within benthic and intertidal sediments, particularly in the NW, SE and SW plan areas (Biodiv_571-572).

In some areas of the NW, SE and SW plan areas, invasive species such as common cordgrass (*Spartina anglica*) have led to widespread changes to saltmarshes and mudflats (Biodiv_511-512).

Deteriorating intertidal sediment habitats in all inshore plan areas due to cumulative effects associated with historical land claim, presence of coastal structures, the presence of non-native species and beach litter (Biodiv_470-471).

The likely evolution of the environment over the plan duration

Increasing anthropogenic CO2 levels will result in changes in plankton abundance and distribution, having negative consequences for higher trophic levels, including to benthic and intertidal ecology, as the distribution and reproduction of benthic and intertidal species is often linked to plankton either due to a planktonic larval stage or because plankton forms a significant part of their diet.

Increasing pressure from climate change - most notably changes in sea temperature influencing species distribution (although it is still unclear how this will affect subtidal habitats in particular). As temperature increases, some warm-water, rocky shore species will continue to advance northwards and native cold-water species will be lost from southern areas where their upper thermal tolerance levels are exceeded, such as the warm-water limpet *Patella depressa* which is now more common than the cold-water species *Patella vulgata* at many locations in southern England. This may also be linked to other effects - for example, the honeycomb worm *Sabellaria alveolata* has become re-established on the north Wales coast after a long absence, possibly partly in response to warmer waters, and therefore a return to the NW of England is possible.

Establishment of non-indigenous species which are likely to further expand their range in UK waters, such as the barnacle *Elminius modestus* and wireweed *Sargassum muticum* colonising intertidal rocky habitats and the invasive common cordgrass *Spartina anglica*, which changes the habitat structure of saltmarsh and mudflat habitats.

High levels of coastal erosion and the resulting construction of hard coastal defence structures have led to reduced sediment input and intertidal sediment habitats being increasingly confined in estuarine areas. Such coastal squeeze is likely to increase as climate change results in increasing rates of sea level rise. Intertidal habitats such as saltmarsh, mudflats and rocky habitats continue to be at risk.

Impacts from mobile demersal fishing activities, such as trawling, have severely impacted (and continue to impact) subtidal and shelf habitats as well as rocky habitats to a lesser extent. Such activities have caused damage to these habitats and led to the disappearance of many large slow-growing and/or fragile invertebrate species, including biogenic reefs such as horse mussel beds and *Sabellaria* reefs.

There is continued pressure on marine habitats (although the intensity and likely distribution of anthropogenic effects are not clear) - e.g. bottom trawling and aggregate extraction, in addition to current and predicted levels of construction in the offshore renewable energy sector.

Biodiversity, Habitats, Flora and Fauna - Benthic and Intertidal Ecology

Potential interactions with other topics

- One of the key controlling factors in the formation of benthic and intertidal habitats is the underlying sediment composition. Sediments are discussed more fully in the geology, substrates and coastal processes section.
- There are wide-reaching implications of climate change driving changes in habitat range and species distribution, including effects of increasing sea surface temperature and changing coastal processes influencing habitat conditions, plus sea level rise and coastal squeeze.
- Indirect impact of ocean acidification as a result of climate change on plankton causing issues with prey availability for all higher trophic levels.
- Marine pollution, nutrient enrichment and other changes to water quality (both positive and negative) could have widespread implications for benthic and intertidal habitats and knock-on effects on higher trophic levels including fish, birds and marine mammals.
- Effects from pollution and marine activities (e.g. fishing, dredging etc.) are closely linked to levels of economic activity and wider market forces. Benthic and intertidal areas provide important goods and services that support a wide range of economic activities, including fishing, aquaculture, tourism etc. Economic activities such as fishing, dredging, drilling, offshore development, flooding and erosion risk management may also adversely affect benthic and intertidal habitats and ecology through, for example habitat damage or loss, pollution, etc.
- Areas of landscape importance may include intertidal areas whilst underwater seascapes interact with benthic habitats and ecology.
- Historic and cultural assets may be located in benthic or intertidal areas. Efforts to protect and conserve benthic and intertidal areas may have benefits for historic assets (and vice versa).
- Invasive species have an impact on species abundance and distribution as they can out-compete native species.
- Benthic and intertidal ecology interact with fish, shellfish, marine megafauna, birds and other biological factors through food webs and the provision of habitats for all life cycle stages. Inshore areas may be particularly important during key life cycle stages for certain species of fish, shellfish, birds and marine megafauna (e.g. during periods of migration, breeding, calving etc.).
- Some benthic and intertidal areas are contained within protected sites as part of the Marine Protected Area (MPA) network and reference should be made to this report card for further information.

Potential transboundary issues

- Impacts on inshore and offshore habitats in the NW, NE and SW plan areas from large scale transboundary offshore development and fishing activity, such as those from Welsh or Scottish waters (most notably the Solway Firth) or waters around the Isle of Man or the Celtic Sea.
- Some protected or designated sites including Special Areas of Conservation (SPAs), Sites of Special Scientific Interest (SSSIs) and Marine Conservation Zones (MCZs) cross boundaries into other UK plan areas, most notably within estuaries that form boundaries between England, Scotland and Wales (i.e. Solway, Tweed, Dee and Severn).

Key data gaps

- The extent of marine litter within the UK seas and the effects of such litter on the marine environment are not presently robustly characterised.
- There is still a lack of understanding of the long term national habitat and population (species) level effects of climate change.
- Charting Progress 2 reports that only 10% of the UK continental shelf has been mapped and indicates that many of the available habitat descriptions have been modelled rather than directly observed/ground truthed. Greater accuracy, resolution and scope are needed for future habitat mapping to reduce uncertainty and better describe habitat extent, distribution and status. Tools are being developed to assist with this, such as MSFD Habitat Area Indicator Development (ME5318).
- The level of vulnerability and recoverability of habitats will differ and are not always fully known, so worst case scenario is generally employed for conservation policy and in site-specific impact assessment.
- Some uncertainty over which habitats are at risk from fishing methods which physically affect the seabed, including gaps in data on where fishing activity takes place.
- Over the longer term there will be a need to understand the energy flows within food web and the structure of food webs (size and abundance), development of detailed baseline information and understanding of natural variation, for assessing the quality/condition of benthic habitats as well as habitats resilience towards pressures exerted upon them.
- Thresholds for habitat and population level (species) quality status should be regularly reviewed and adapted at a strategic level to contribute to meaningful targets for good environmental status under the Marine Strategy Framework Directive (MSFD).
- There is an unknown potential for carbon capture and storage within the NE and NW plan areas, the impacts of which are likely to be similar to those from other offshore industry activities, such as oil and gas.
- There is a wealth of benthic and intertidal ecological data collected and held within the private sectors e.g. ports and harbours, oil and gas and marine aggregate sectors or detailed in statutory Environmental Statements for marine/coastal developments that could also be used at a strategic level.
- More work is needed to understand the ecological value of areas in order to make strategic policy level and individual development level decisions.

Biodiversity, Habitats, Flora and Fauna - Fish & Shellfish

Baseline/issues: North West Plan Area 10 11

Fish stocks: Commercial fish stocks are not at Maximum Sustainable Yield (MSY) or are not harvested sustainably for all stocks except plaice, although stocks are improving (except for cod *Gadus morhua*; and flounder *Platichthys flesus*). There is evidence of a shift towards smaller sized fish as a result of fishing pressure (Biodiv_308).

Climate change: There is some evidence of climate change, with species previously found further south becoming more common in the plan area e.g. Black seabream (*Spondyliosoma cantharus*), John Dory (*Zeus faber*) and anchovy (*Engraulis encrasicolus*) (Biodiv_509).

Migratory fish: There are several important salmon estuaries in the plan area. The Wyre, Leven, Crake and Calder are classed as 'failing' conservation limits (set by the Environment Agency and Cefas). Conservation limits in the Lune, Esk, Kent and Caldew are uncertain (Biodiv_323).

Shellfish: There are important shellfish beds for cockles (*Cerastoderma edule*) in Morecombe Bay (Biodiv_324) and mussels (*Mytilus edulis*) in Heysham flat, New Brighton and Lytham (Biodiv_325). Morecombe Bay, Barrow and Lune are designated for native oyster (*Ostrea edulis*) and Pacific oyster (*Crassostrea gigas*) production. The Solway Firth is also designated for Pacific oyster production (Biodiv_643).

Spawning and nursery areas: The whole plan area is important for spawning cod (*Gadus morhua*), whiting (*Merlangius merlangus*) (Biodiv_310) and sole (*Solea solea*) (Biodiv_312). Liverpool Bay is an important sandeel (*Ammodytes*) spawning area (Biodiv_304). Both inshore and offshore NW plan areas are important nursery grounds for herring (*Clupea harengus*), cod and whiting (Biodiv_309). The plan area south of Lancaster is an important sole nursery area (Biodiv_311), while the offshore plan area is an important plaice (*Pleuronectes platessa*) nursery area (Biodiv_299). The Solway, northern part of the Irish Sea and the area to the north east of Anglesey are important nursery grounds for spurdog (*Squalus acanthias*) (Biodiv_303).

Baseline/issues: South West Plan Area 8 9

Fish stocks: Commercial fish stocks are not at MSY or are not harvested sustainably for all stocks except sole (Biodiv_486). There is evidence of a shift towards smaller sized fish as a result of fishing pressure (Biodiv_486). Poaching and/or overfishing have been identified as issues in the South Devon AONB (Biodiv_483).

Migratory fish: There are several important salmon estuaries in the plan area. The Erme, Yealm, Plym, Torridge and Tavy are failing conservation limits; the Avon (Devon), Fowey and Camel are passing conservation limits, while the conservation limits for salmon in the Tamar, Lynher, Taw and Lyn are uncertain (Biodiv_254). The Severn Estuary / Bristol Channel is also important for salmon and several other migratory fish, namely: European eel (*Anguilla Anguilla*); Allis (*Alosa alosa*) and Twaite (*Alosa fallax*) shad; sea (*Petromyzon marinus*) and river (*Lampetra fluviatilis*) lamprey; and sea trout (*Salmo trutta*) (Biodiv_255).

Spawning and nursery areas: The Severn Estuary / Bristol Channel is an important nursery and spawning area in general (Biodiv_255) and specifically important for spawning cod and whiting (Biodiv_257). The offshore area is an important spawning and nursery area for mackerel (*Scomber scombrus*) (Biodiv_298). There are also several important bass nursery areas in Salcombe Harbour, River Avon (Devon), River Yealm, Plymouth rivers, Rover Fowey, Fal Estuary, Percuil River, Helford River, River Camel, River Torridge and River Taw (Biodiv_256).

Shellfish: The area around Truro, Tresillian and the Fal Estuary are designated for mussel, native oyster and Pacific oyster production (Biodiv_645). The River Fal is one of the few places where large beds of native oyster (*Ostrea edulis*) are still found. Threats to native oyster beds include pollution, parasites and invasive species, particularly the slipper limpet (*Crepidula fornicata*) (Biodiv_499), American oyster drill (*Urosalpinx cinerea*) (Biodiv_573) and the Pacific oyster (Biodiv_504) (see Invasive species report card). The National Lobster Hatchery is based in Padstow. It released over 50,000 juvenile lobsters in 2014 to support wild lobster stocks (Biodiv_640).

There are several proposals for tidal lagoons in the inshore plan area, which could affect fish (migratory species and those sensitive to noise / physical damage as a result of changes in pressure or passing through turbines e.g. Herring) (Biodiv_508).

Baseline/issues: North East Plan Area 1 2

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

Fish stocks: Commercial fishing is impacting on fish stocks with evidence of a shift towards smaller sized fish. Stocks for haddock (*Melanogrammus aeglefinus*) and saithe (*Pollachius virens*) are not improving (Biodiv_340). There are high levels of discarding in the Farne Deep Nephrops fishery (Biodiv_341) and the adult stock size is too small (Biodiv_345). Scallop (King; *Pecten maximus* and Queen; *Aequipecten opercularis*) (Biodiv_342) and edible crab (*Cancer pagurus*) (Biodiv_343) stocks are in poor condition in the area and whelk (*Buccinum undatum*) stocks are also declining (Biodiv_339).

Shellfish: There are several important shellfish beds (mussels and winkles; *Littorina littorea*) in this plan area, including those at Flamborough Head, Scarborough, Cayton Bay, Scalby, Cloughton, Whitby, Kettleness, Redcar and Sunderland (Biodiv_333). The area around Holy Island is a designated native and Pacific oyster shellfish production area (Biodiv_644).

Migratory fish: Important salmon estuaries in the plan area are the Tees, Coquet, Wear, Tyne and Tweed. The Tyne is classed as 'failing' conservation limits, while the Tees, Coquet and Wear are all 'passing' (Biodiv_332).

Spawning and nursery areas: The area contains important nursery areas for cod, herring and whiting (Biodiv_344).

Baseline/issues: South East Plan Area 5

Fish stocks: Commercial fishing is impacting on fish stocks, although stocks are improving (except for haddock and saithe). There is evidence of a shift towards smaller sized and opportunistic fish dominating the fish community (Biodiv_276).

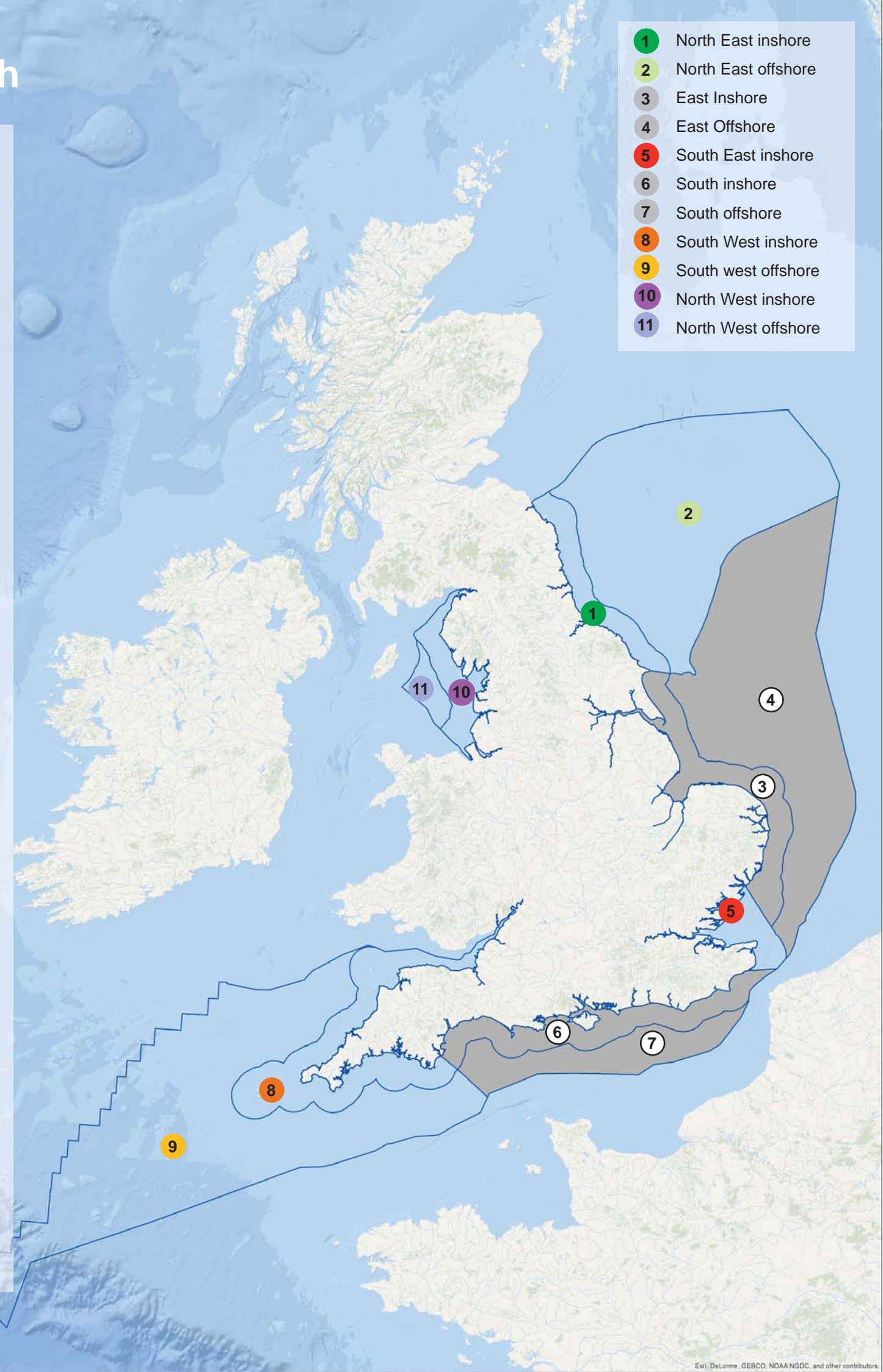
Migratory fish: The Thames Estuary is important for migratory fish (Twaite shad stock is improving (Biodiv_279), but salmon and sea trout numbers are declining (Biodiv_277). In general, salmon and eel populations in estuaries in this plan area are deteriorating (Biodiv_639).

Spawning and nursery areas: The whole plan area is an important spawning and nursery area for sole (Biodiv_281), while the Thames Estuary is important for herring (spawning and nursery) (Biodiv_280). The Thames Estuary also contains breeding smelt stock (Biodiv_278). There are also important sea bass (*Dicentrarchus labrax*) nursery areas in this plan area at Bradwell power station, Grain power station and Kingsnorth power station (Biodiv_282).

Shellfish: A significant proportion of the plan area is covered by designated shellfish waters. Species that are cultured include mussel, Manila clam (*Venerupis philippinarum*), native oyster and Pacific oyster (Biodiv_642). The Thames estuary is one of the few places where large beds of native oyster are still found. Threats to native oyster beds include pollution, parasites and invasive species, particularly the slipper limpet (Biodiv_499), American oyster drill (Biodiv_573) and the Pacific oyster (Biodiv_504) (see Invasive species report card). Native oysters are a feature of the Blackwater, Crouch, Roach and Colne Marine Conservation Zone (MCZ) (Biodiv_386) (see Protected sites and species report card).

Electric (pulse) beam trawling is a novel and increasing fishing technique, mainly used by Dutch vessels at present which operate in this plan area. The technique is very efficient and may adversely affect inshore fish stocks (target and non-target species), as well as benthic habitats and species, however the gear is lighter than 'traditional' trawls (Biodiv_492).

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Biodiversity, Habitats, Flora and Fauna - Fish & Shellfish

Summary of the legislative / policy context

Please note that information related to the economic activity of commercial fishing is found under 'economics' with this section relating to fish and shellfish ecology/populations/health only. The main policy and legislative instruments for managing fish stocks include:

- Common Fisheries Policy (CFP) (EU 1380/2013) for managing commercial marine fish stocks
- Council Regulation 1100/2007 on establishing measures for the recovery of the stock of European eel (*Anguilla anguilla*). This Regulation aims to manage the whole stock to ensure a 40% return rate.
- The Salmon Act (1986) and the Habitats Directive and the Convention for the Conservation of Salmon in the North Atlantic Ocean (1983) (NASCO) protect and manage salmon (*Salmo salar*) stocks.
- The Habitats Directive also protects other migratory fish species (Annex II species) - sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*) and Allis (*Alosa alosa*) and Twaite (*Alosa fallax*) shad – while the Water Framework Directive (WFD) aims to remove or prevent barriers to migratory fish passage.
- The Wildlife and Countryside Act (1981) protects certain vulnerable fish species (basking shark (*Cetorhinus maximus*), angel shark (*Squatina squatina*), and white skate (*Rostroraja alba*)
- The Tope (prohibition of fishing) Order 2008 protects the tope shark (*Galeorhinus galeus*)
- Local byelaws protect and manage fish and shellfish stocks in Inshore Fisheries Conservation Authority areas, in response to local conditions

Fish stock health is mainly monitored for commercially fished species, with little information on non-target species. The UK provides information to support the stock assessments carried out by ICES (International Council for the Exploration of the Sea), which formulates scientific advice the European Commission on the management of fish stocks, including fish stock health. Under the Marine Strategy Framework Directive (MSFD), Good Environmental Status (GES) Descriptor 3 relates to commercial fish and shellfish stocks. Arguably, all GES Descriptors are of relevance to the health of fish and shellfish by supporting marine ecosystem health and marine food webs.

Key cross cutting baseline / issues across all plan areas

Fish stocks: Many UK fish stocks are not fished sustainably (Biodiv_477). In 2013, only 31% of indicator fish stocks around the UK were in full reproductive capacity and were being harvested sustainably (Biodiv_587). 48% of Atlantic fish stocks are being fished above Maximum Sustainable Yield (MSY) and Total Allowable Catch (TAC) is being set on average 7% higher than ICES advice (Biodiv_475). All European eel belong to a single stock, which is severely depleted (Biodiv_472) (Biodiv_479). Sea bass stocks in all areas are in a poor and declining state as a result of fishing pressure (Biodiv_480). Action is being taken at an EU level to attempt to reverse the poor state of both these stocks.

Sharks: Portuguese dogfish (*Centroscymnus coelolepis*), gulper shark (*Centrophorus granulosus*), leafscale gulper shark (*Centrophorus squamosus*), basking shark (*Cetorhinus maximus*), porbeagle (*Lamna nasus*), spurdog (*Squalus acanthias*), and Angel shark (*Squatina squatina*) are listed as threatened and/or declining by OSPAR (Biodiv_588). In the UK, tope fishing is only permitted using rod and line and catch limits are in place, due to the poor state of the stock. Tope is listed as 'vulnerable' on the IUCN Red List.

The likely evolution of the environment over the plan duration

Climate change is an issue potentially affecting all areas in the future. Climate change could have a number of impacts including altering predator and prey species dynamics due to a change in the timing of key life cycle events (Biodiv_473) or the distribution of species. Changes in the geographic range / distribution of fish species may affect competition for food and habitat, as more southerly species move northwards. Climate change impacts to habitats and species may directly or indirectly affect fish (Biodiv_543) by altering the distribution or extent of key habitats or by altering food webs. Ocean acidification is linked to climate change and there has been an observed increase in seawater pH; this may have impacts to the food chain / marine food webs, with possible impacts to shellfish biology (shell formation) (Biodiv_478). Coastal squeeze may affect the extent or quality of important inshore nursery and spawning areas, such as estuaries (Geo_179).

Developments in estuaries, on the coast and further offshore may affect fish species, particularly during vulnerable life cycle stages (migration, spawning, nursery). Activities such as dredging, aggregate extraction, energy generation (tidal power, windfarms, nuclear and conventional power stations and associated power cables), shipping and water use (abstraction and discharges) may affect fish through generation of sedimentation, changes in coastal processes, noise, electromagnetic fields, intakes, outfalls and barriers to migration.

Improvements to water quality in inshore areas and estuaries have been beneficial to many fish species, including migratory species, which have returned to estuaries and rivers from which they have been absent. Water quality improvements in these areas may also have benefited species that use these areas for spawning and as nursery area. These improvements are expected to continue as WFD and MSFD aims are implemented.

Potential interactions with other topics

Fish and shellfish most directly interact with the fishing industry (commercial and recreational) and aquaculture. Fishing relies on fish stocks, while fish stock health (target and non-target) is related, to a greater or lesser extent on fishing activity for commercial species. Other economic activities also interact with fish and shellfish (dredging, aggregates, energy, shipping – see above). Aquaculture may lead to the escape of invasive species that interact with native shellfish (see below). Aquaculture of native species may also affect wild populations through, for example production of pseudofaeces, smothering of benthic habitats and through competition for habitats and food (Biodiv_641).

Fish and shellfish also interact with benthic and intertidal ecology, which provide food sources and important habitats for all life cycle stages; and with plankton, which provide food sources (directly or indirectly). Fish and shellfish eggs, larvae and early life stages also make up an important component of the plankton assemblage. Inshore areas may be particularly important during key life cycle stages (migration, breeding). Some protected sites are important to fish stocks, while specific fish species are protected under legislation that protects a wide range of marine species.

Water quality may directly affect fish and shellfish health, or indirectly affect prey species or habitat quality. Improvements to water quality will have beneficial impacts.

Fish may ingest marine litter, or impacts from marine litter may affect prey species.

Invasive species may affect fish and shellfish directly through competition, predation or by bringing disease / parasites, or indirectly by affecting food sources or the availability of habitat. Potential interactions with climate change are set out above.

Potential transboundary issues

Fish and fisheries are highly mobile. Management is not carried out at plan level and stocks may spread beyond individual plan boundaries, as well as beyond UK administrative boundaries (England, Wales, Scotland and Northern Ireland) and UK borders (EU and non-EU countries).

Key data gaps

- Data relating to MSY or stock health / status is only normally available for commercially fished species (unless species is also a protected species e.g. some sharks)
- Underwater noise impacts on fish are recognised as a concern, but information on impacts (and on background noise levels) is lacking. Noise may affect migration, communication, reproduction, foraging, with knock on effect to populations
- The extent of marine litter within the UK seas and the effects of such litter on the marine environment are not robustly characterised. Ingestion of or with entanglement marine litter may lead to damage or death of individuals and possible reproduction / population impacts
- Lack of understanding of the effects of climate change on fish and shellfish stock distribution, spawning, reproduction and populations
- Information relating to the effects of electromagnetic fields on fish is lacking and impacts are uncertain
- Electric beam trawling is a novel and increasing fishing technique, mainly used by Dutch vessels at present within the South East plan area. The impacts to target and non-target fish and shellfish, as well as impacts to benthic habitats and species are not well understood and further research and control may be required.

Biodiversity, Habitats, Flora and Fauna - Marine Mega Fauna

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- Leatherback turtles (*Dermochelys coriacea*) are a summer visitor to this marine plan area, preying on jellyfish (Biodiv_313). Harbour porpoise (*Phocoena phocoena*) are widely distributed throughout the Irish Sea, including NW inshore/offshore plan areas - notably around the Solway Firth and between Luce Bay and the Isle of Man. Other cetacean species that are occasionally observed in the Irish Sea and may enter the NW Plan area include bottlenose dolphin (*Tursiops truncatus*), short-beaked common dolphin (*Delphinus delphis*), pilot whale (*Globicephala melas*), killer whale (*Orcinus orca*) and minke whale (*Balaenoptera acutorostrata*), with a small Risso's dolphin (*Grampus griseus*) population around the Isle of Man (Biodiv_314-316). A small population (5-7,000 animals) of grey seals (*Halichoerus grypus*) utilises all but the very NW Irish sea for foraging, pupping (October to late November) and moulting (February to April) (Biodiv_317). The NW plan area is an important area for basking sharks, particularly between May and September, with numbers / sightings reported to be increasing (Biodiv_318).
- There is an issue of bycatch from inshore pot (shellfish and mollusc) fisheries which is commonly observed as a cause of turtle mortality in the inshore area (Biodiv_566-568).
- There is a trend of leatherback turtles being observed at increasing northern latitudes due to increased sea surface temperature and food abundance, resulting in increased interactions with human activity in such areas. During 1985-2002 leather back turtles experienced a northwards shift in their distribution of 330km (Biodiv_569-570).
- Impacts on basking sharks (*Cetorhinus maximus*) from fisheries (including entanglement) and marine eco-tourism have been recorded. Anecdotal evidence of vessel collisions is available off Cornwall and may also apply in other locations that the species is present (Biodiv_502-503 and Biodiv_649).

Baseline/issues: South West Plan Area 8 9

- Leatherback turtles are a summer visitor to this marine plan area preying on jellyfish (Biodiv_264). The most common cetaceans in the area around the Celtic Sea and Western Channel are the common dolphin, harbour porpoise and bottlenose dolphin, with minke whale regularly observed in the area, in addition to occasional sightings of Atlantic white-sided dolphin, Risso's dolphin, killer whale and long-finned pilot whale (*Globicephala melas*) (Biodiv_265-267). Small colonies of grey seals can be found around the SW coast, and around Lundy and the Isles of Scilly. Pupping occurs October to December, and moulting occurs February to March (Biodiv_268). The SW plan area is an important area for basking sharks, particularly between May and September (Biodiv_269).
- There is an issue of bycatch from inshore pot (shellfish and mollusc) fisheries which is commonly observed as a cause of turtle mortality in the inshore area (Biodiv_566-568).
- There is a trend of leatherback turtles being observed at increasing northern latitudes due to increased sea surface temperature and food abundance, resulting in increased interactions with human activity in such areas. During 1985-2002 leather back turtles experienced a northwards shift in their distribution of 330km (Biodiv_569-570).
- Impacts on basking sharks (*Cetorhinus maximus*) from fisheries (including entanglement) and marine eco-tourism have been recorded. Anecdotal evidence of vessel collisions is available off Cornwall (Biodiv_502-503 and Biodiv_649).

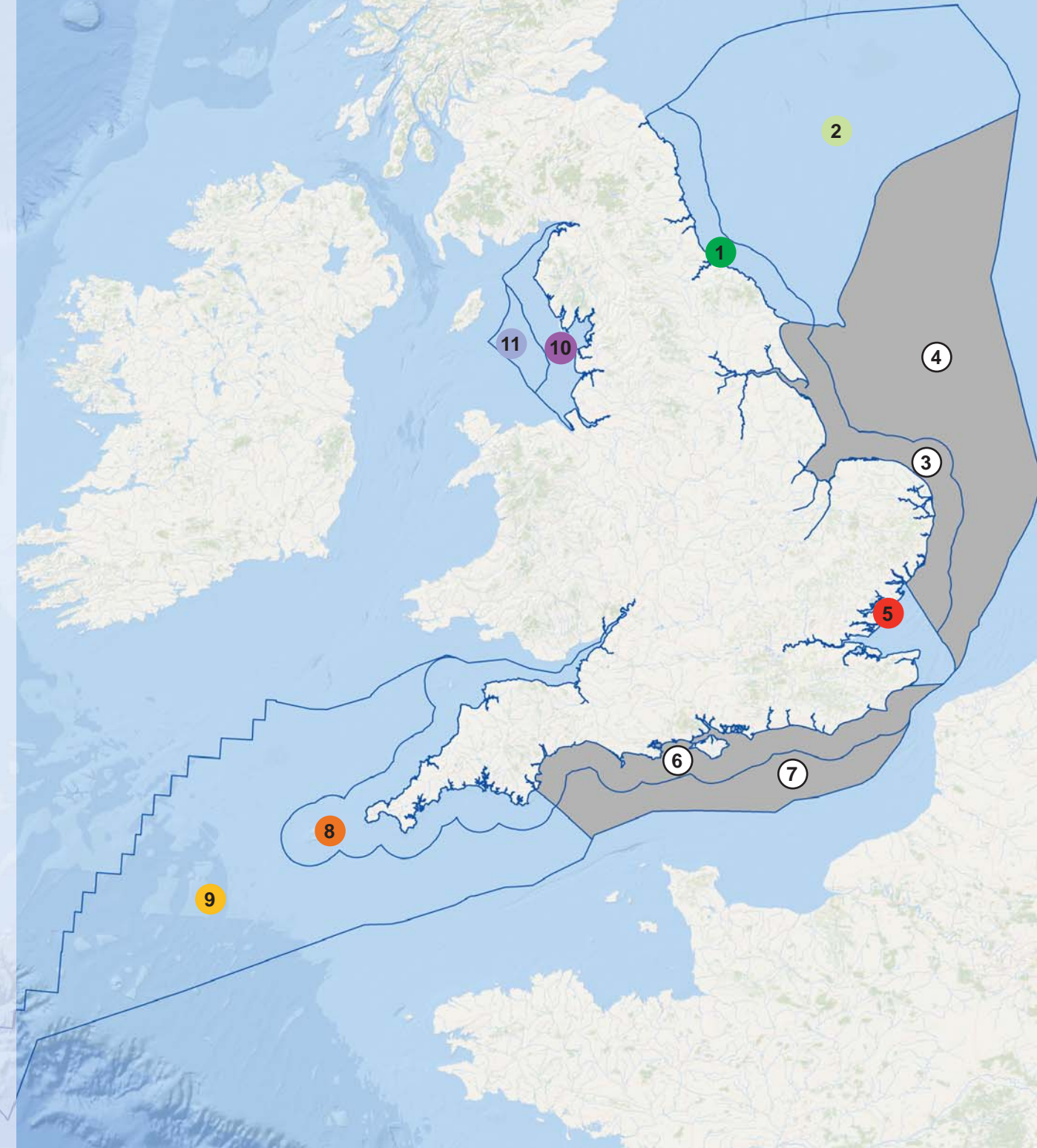
Baseline/issues: North East Plan Area 1 2

- Three cetacean species are regularly found in the NE Plan area - harbour porpoise, white-beaked dolphin (*Lagenorhynchus albirostris*) and minke whale. Other species occurring occasionally in the NE Plan area include bottlenose dolphin, Atlantic white-sided dolphin (*Lagenorhynchus acutus*) and killer whale, along with rare sightings of vagrants including sperm whale (*Physeter microcephalus*) and humpback whale (*Megaptera novaeangliae*) (Biodiv_347 and Biodiv_348). One grey seal colony is located in the NE plan area, with an established population of c.3,600 grey seals around the Farne Islands. Pupping takes place between October and December, and moulting between February and March. There are only two known haul-out locations for harbour seals in the NE inshore plan area, at Holy Island and in the Tees Estuary, with distribution of the species throughout this region. Pupping occurs June to July, and moulting occurs August to September (Biodiv_349 and Biodiv_350). Turtles are only occasionally sighted in this plan area (Biodiv_355).
- There are no specific issues affecting this plan area that do not affect some or all other plan areas.

Baseline/issues: South East Plan Area 5

- The harbour porpoise is the only cetacean species that may regularly be found in the SE plan area, although white-beaked dolphin and minke whale can occasionally be found this far south, along with rare sightings of vagrants (Biodiv_285 and Biodiv_286). Grey seals are present in the plan area and use Goodwin Sands as a haul out site, although this species is not known to breed in the area. Harbour seals are believed to be resident in the Greater Thames Estuary, with wide-spread foraging distribution in this region (Biodiv_287). Turtles are only occasionally sighted in this plan area (Biodiv_284).
- Considering the relatively lower importance of this marine plan area for marine mega fauna there are no specific issues affecting this plan area that do not affect some or all other plan areas.

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Biodiversity, Habitats, Flora and Fauna - Marine Mega Fauna

Summary of the legislative / policy context

Marine megafauna are protected through a range of international and national legislation. For the regularly observed species, these include:

- The leatherback turtle and basking shark are both listed as vulnerable on the IUCN Red List;
- The grey seal, harbour seal, harbour porpoise and bottlenose dolphin are listed under Annex II of the EC Habitats Directive;
- All UK cetaceans, seals and the leatherback turtle are listed under Annex IV of the Habitats Directive as animal species of community interest in need of strict protection;
- The harbour porpoise, leatherback turtle and basking shark are on the OSPAR List of Threatened and/or Declining Species;
- All cetaceans, all turtles and the basking shark are listed under Schedule 5 of the Wildlife and Countryside Act (1981);
- Seals are protected under the Conservation of Seals Act (1970); and
- All cetaceans and seal species observed in these plan areas are listed as priority species under the UK BAP, with the exception of the grey seal.

The distribution and abundance of marine mammals are included in the Marine Strategy Framework Directive under the Good Environmental Status (Descriptors 1 and 4). In addition, the protection of migratory species are considerations of the Agreement on the Conservation of Small Cetaceans in the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). There are currently no designated protected areas for any cetacean species within any of these plan areas, although consultation is underway on pSACs for harbour porpoise (NE, SE and SW plan areas). The grey seal is a primary qualifying species for the designation of the Berwickshire and North Northumberland Coast SAC (NE plan area), and is a qualifying feature for the designation of the Lundy SAC and Isles of Scilly Complex SAC (both SW plan area).

Key cross cutting baseline / issues across all plan areas

Physical damage to cetaceans and seals through collision with vessels and other recreational activities. Reports of propeller strikes on small cetaceans and seals from small vessels within all offshore areas, but little data available to estimate frequency of such events (Biodiv_559-560).

Cumulative noise impacts on marine megafauna e.g. seismic survey (mainly NE and NW areas), piling (mainly SE and NW areas), dredging (mainly NE, SE and NW areas), defence (mainly SW area), shipping and potentially wave and tidal devices. Each plan area has its own noise profile that varies according to the types of development and activity (Biodiv_438-445).

Accidental capture of cetaceans in fishing gear. Bycatch in trammel nets and static (gill and tangle) nets is a significant cause of mortality for harbour porpoises in the North Sea, Western English Channel and Celtic Sea (NE, SW and NW plan areas in particular), with entanglement in fishing gear responsible for c.17% of stranded harbour porpoise deaths in 2000-2004. Accidental capture of white-beaked dolphin, white-sided dolphin and harbour porpoise have also been reported in salmon drift nets, Dutch mid-water trawls, purse seine nets and longlines (Biodiv_549-551).

Interaction (competition for food resources) occurs between marine mammals and commercial fishing activity; shifting populations and changes in targeted fish could have future impact on marine mammal populations (Biodiv_536-538). Additionally, entanglement and bycatch of seals in active fishing nets and discarded or storm-damaged (ghost) nets is an issue (Biodiv_553-554) in the NE, SW and NW plan areas.

There is increased disturbance to seals from sightseeing and pleasure boats visiting breeding/haul-out sites (Biodiv_555-557). There is also disturbance to cetaceans from vessel activity (including propeller or engine noise), which may result in vessel avoidance and increased dive time. This can cause increased energy expenditure, reduced resting time and could cause cetaceans to abandon or not use ideal habitats, potentially resulting in a reduction of energy reserves which could affect foraging efficiency, overall fitness and reproductive capacity (Biodiv_546, Biodiv_547) (NE, SW, NW plan areas in particular). Ingestion of or entanglement in marine litter is a potential issue for marine mammals and turtles. Ingestion of plastic has been recorded in cetaceans however, it is not considered to be a significant pressure at this time in UK waters. Post-mortem examinations of turtles commonly reveal the presence of plastic debris in the gut but data are insufficient to assess the impact of this adequately. Beach litter is present in all plan areas but is most prevalent in the SW plan area. Litter may include that produced by aquaculture and commercial fishing and plastics. More information is provided in the water section (Biodiv_467-469 and Biodiv_650).

Indirect effects on marine mammals from increased temperature due to climate change. Increasing numbers of sightings of fin and minke whales and a southwards shift in harbour porpoise populations are likely to be a result of increasing sea surface temperature and food abundance (e.g. sandeels) affecting species distribution (Biodiv_435-437). Reduced prey availability for marine megafauna due to impacts of ocean acidification on plankton (Biodiv_431). Impacts to cetaceans due to habitat degradation from pollution. Persistent organic pollutants such as PCBs and flame retardants can disrupt endocrine (hormone) systems resulting in susceptibility to disease and reduced reproductive success (Biodiv_432-434).

Increasing risk of disease affecting seals as abundance and distribution shifts from the Atlantic to the Irish and North Seas (Biodiv_544-545).

Lack of MPAs designated for large mobile marine megafauna, including cetaceans and basking shark. There is increasing evidence that MPAs in areas of high productivity can be important for specific life stages such as mating, pupping or nursing, or activities such as feeding, and if they fit into a framework of ecosystem-based management, they can contribute to the protection of wide-ranging species (Biodiv_447).

The likely evolution of the environment over the plan duration

- Noise mitigation measures for individual developments prevent physical damage and minimise disturbance, but cumulative impacts and widespread increase in cumulative noise will have an impact, which is likely to be particularly an issue for the most widespread species, such as harbour porpoise and harbour seals.
- In the absence of a regional or national code of conduct and with increasing numbers of eco-tourism vessels, damage from collisions with cetaceans is likely to increase. Similarly increased levels of disturbance are expected from sightseeing and pleasure boats visits to seal haul-outs.
- If the observed trend of increasing sea temperatures continues in line with climate change projections it is expected that the range of some species (e.g. Bottlenose dolphin) will continue to change this could also lead to a change in predator and/or prey abundance due to a mis-match between predator and prey species as a result of a change in the timing of key life cycle events. Similarly, it is expected that turtle range will move further northwards which would result in increased leatherback turtle sightings, strandings and bycatch incidences along the southern coast of the UK and up through the Celtic and Irish Seas.
- Increasing anthropogenic CO2 levels will result in changes in plankton abundance and distribution, having a knock-on effect on higher trophic levels.
- The number of harbour porpoises (1400 to 1700) and common dolphins (276) taken as bycatch in UK fishing nets in 2014 is an increase from that recorded in 2010. Total estimated mortality from Danish and UK fishing in the North Sea alone is c.5,500 porpoises per year which already exceeds sustainable levels. Therefore over plan period these cetacean numbers may decrease in the North Sea.
- Unsustainable commercial fisheries that deplete fish stocks will have an influence on seal populations, causing a change in distribution and/or changes in targeted prey species.
- Phocine Distemper Virus (PDV) outbreaks are likely to recur in the future but it is not possible to predict the proportion of the seal population that might be affected, which populations are most vulnerable (besides eastern England) or precisely when outbreaks will occur.

Potential interactions with other topics

- Wide-reaching implications of climate change driving changes in marine megafauna distribution, including effects of increasing sea surface temperature on habitat conditions and prey availability, such as plankton and fish (e.g. declining sandeels).
- Indirect impact of ocean acidification on plankton causing issues with prey availability for all higher trophic levels.
- Marine litter also has widespread implications for fish and birds in terms of ingestion and entanglement.
- Effects from underwater noise on cetaceans is closely linked to economic activity in coastal and marine areas.
- Organic pollutants also have implications for fish and birds.
- There are social and economic interactions with marine megafauna, including economic and wellbeing benefits from wildlife tourism and recreation. The benefits of experiencing the natural world on peoples' wellbeing and mental health ('ecotherapy') is endorsed by a number of organisations and the ability to watch cetaceans and seals can be seen within this context, bringing people in to contact with both the sea in its broadest context whilst observing impressive marine mammals and providing niche local income and employment opportunities. Commercial fisheries has a direct impact on marine megafauna through entanglement and bycatch in fishing nets and collisions with commercial fishing vessels. There are also indirect impacts through competition for food resources between marine megafauna and commercial fish species.

Biodiversity, Habitats, Flora and Fauna - Marine Mega Fauna

Potential transboundary issues

- Several marine mammal species, along with leatherback turtle and basking shark are migratory, and therefore may also be found in Welsh, Scottish, Irish, other European waters, and waters outside of Europe where they will be exposed to similar and additional pressures.
- In addition there will be connectivity with protected areas outside these plan areas, such as bottlenose dolphin in the Cardigan Bay and Moray Firth SACs, and with policies that give other protection, e.g. the Marine Scotland Act (2010) protects seals from harassment at haul outs in the Solway Firth.
- PDV entered the UK seal populations from Europe (Wadden Sea) and outbreaks are not restricted to within the marine plan areas.

Key data gaps

- The extent of marine litter within the UK seas and the effects of such litter on marine megafauna are not robustly characterised (Biodiv_604).
- Population level effects of persistent organic pollutants on cetaceans, although there is a lot of high profile research underway after an increase in stranding events over the past decade (Biodiv_605).
- A lack of understanding of the long term population level effects of climate change (Biodiv_606).
- Lack of information on current distribution and abundance of leatherback turtles in UK waters (Biodiv_607).
- Need for more evidence of disturbance to cetaceans and seals from vessel activity in terms of severity and longevity of behavioural changes (Biodiv_608).
- Uncertainty over the nature of any impacts highlights the need to evaluate potential interactions between seals and cetaceans and various tidal, wind and wave devices. Studies in the Wash during wind farm construction suggest that seals were not excluded from the vicinity during this phase, and that half of the seals exceeded published auditory damage thresholds during piling. Analysis of tagged seals in proximity to tidal operations at Strangford Narrows suggests no statistically significant change in behaviour during operation, although there may be potential for collision risk. However, there is minimal data on interactions between seals and wave energy devices, with no commercial scale developments yet planned to date (Biodiv_609).
- Uncertainty surrounding the spread of PDV amongst seal populations (Biodiv_610).
- A lack of understanding of impacts from background noise and cumulative noise impacts on marine megafauna (Biodiv_647).

Biodiversity, Habitats, Flora and Fauna - Plankton

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

The plankton in the North West plan area are warm-temperate Atlantic species that are influenced by the hydrological regime in the region which is characterised by a seasonal thermocline, whereby the water is stratified in the summer and mixed in the winter (Biodov_376). Some coastal areas in the North West plan area, for example Liverpool Bay, have elevated phytoplankton biomass that has been attributed to nutrient enrichment from anthropogenic sources (Biodiv_377)

Baseline/issues: North East Plan Area 1 2

The northern North sea was a cold temperature province until a regime shift in the 1980s, after which the area became a warm temperature province (Biodiv_359). Since the late 1980s the coastal North Sea has experienced an increase of 21% in phytoplankton biomass and the open North Sea has increased by 13%. These changes are linked to increases in sea surface temperature, water transparency, and changes in inflow from the Atlantic (Biodiv_357). The northern North Sea phytoplankton community prior to 1990 was more influenced by the monthly North Atlantic Oscillation (NAO); however since 1990, biodiversity appears to be more influenced by local sea surface temperature (Biodiv_360). There has been an influx of oceanic species into the North Sea (Biodiv_358).

Baseline/issues: South West Plan Area 8 9

The Western Channel plankton community is dominated by decapod larvae (Biodiv_409). In the Western Channel and Celtic sea region a multi-decadal oscillation known as the Russell Cycle has been observed (Biodiv_410). The western channel region is more temperate than the North Sea and the regime shift in the 1980s was less pronounced in this region (Biodiv_359).

Increases in sea temperature may facilitate the introduction or expansion of harmful species into UK waters from more southerly areas, via shipping activity, drifting debris or natural range expansion. Such species may include *Gymnodinium catenatum*, a paralytic shellfish poisoning (PSP) toxin producer from Spanish waters, and *Ostreopsis*, a toxin-producing species known to be expanding outside of the Mediterranean. Instances of the growth of *Coolia monotis*, *Prorocentrum lima* and toxic *Amphidinium* species may also be expected to increase, most likely in the SE and SW plan areas (Biodiv_624).

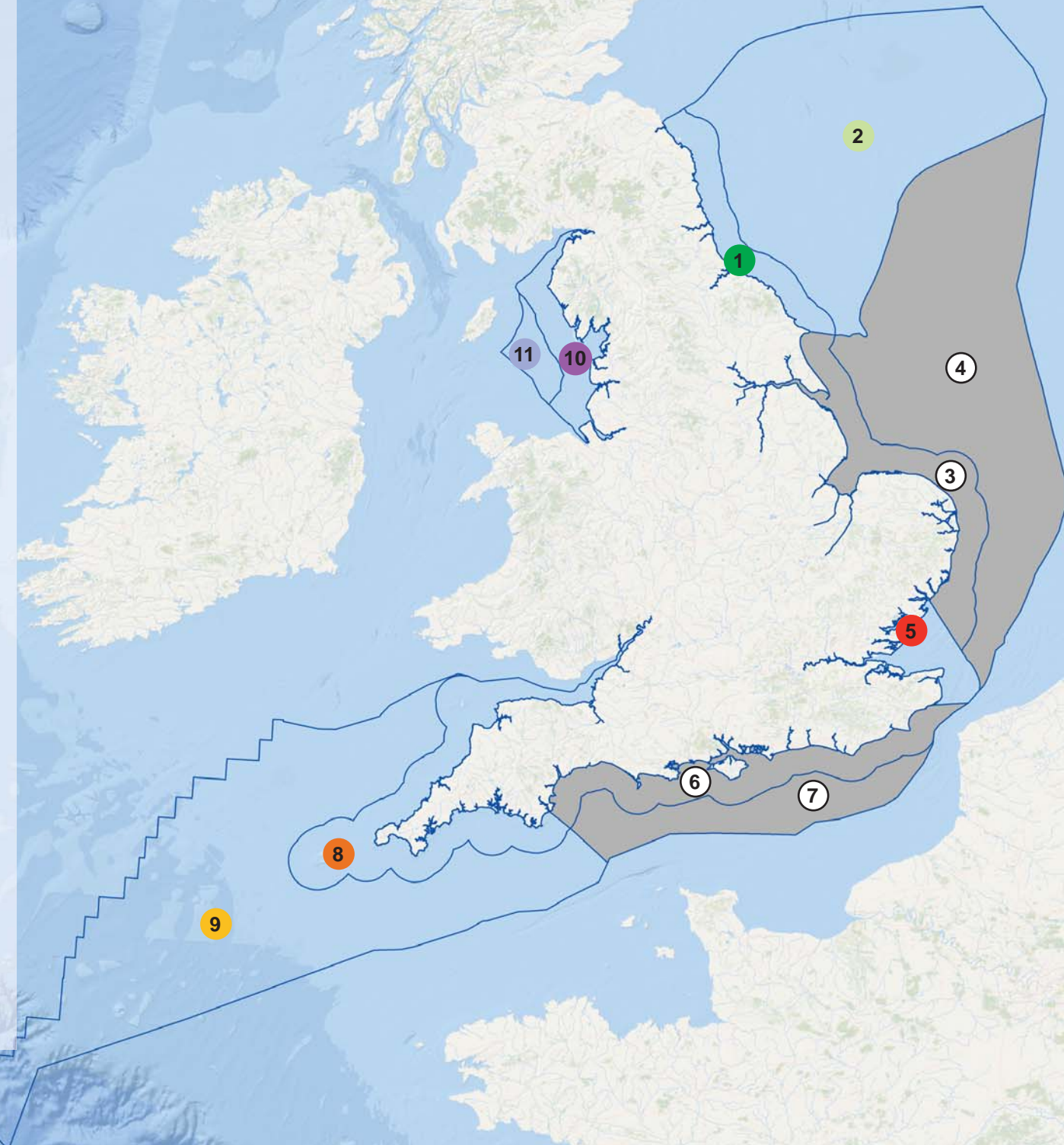
An increase in tendency for, and longer duration of, stratification of the water column could influence the development of offshore harmful algal blooms. Some harmful algal blooms (e.g. *Karenia mikimotoi*), have been associated with mortality of benthic invertebrates and fish in south western coastal waters (Biodiv_625).

Baseline/issues: South East Plan Area 5

The southern North Sea plankton community consists of coastal and neritic species which are suited to the mixed water in this region. Decapod larvae and copepod species including *Centropages hamatus* and *Calanus helgolandicus* are commonly found in this region (Biodiv_389). Changes in plankton in the southern North Sea are driven by climatic variability. Climate-driven warming in the southern North Sea has been faster than the northern North Sea which has been reflected in their differing phytoplankton communities (Biodiv_356). Phytoplankton biomass is greater in the southern North Sea than in the northern North Sea (Biodiv_236). There has been an influx of oceanic species into the North Sea (Biodiv_358).

Increases in sea temperature may facilitate the introduction or expansion of harmful species into UK waters from more southerly areas, via shipping activity, drifting debris or natural range expansion. Such species may include *G. catenatum*, a paralytic shellfish poisoning (PSP) toxin producer from Spanish waters, and *Ostreopsis*, a toxin-producing species known to be expanding outside of the Mediterranean. Instances of the growth of *C. monotis*, *P. lima* and toxic *Amphidinium* species may also be expected to increase, most likely in the SE and SW plan areas (Biodiv_624).

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Biodiversity, Habitats, Flora and Fauna - Plankton

Summary of the legislative / policy context

Long-term observations suggest that plankton as a whole are subject to few anthropogenic pressures and are healthy. Plankton abundance regulates larval fish development and survival, and thus the success and failure of recruitment for adult fish stocks. At a regional scale, climate is the main driver of change in zooplankton and phytoplankton communities. In the North East Atlantic zooplankton have been decreasing in biomass. The North Atlantic Oscillation (NAO) has positive correlations with sea surface temperature and phytoplankton biomass in the North Sea, and negative correlations with sea surface temperature and phytoplankton biomass north west of the European Shelf.

There are no specific targets in existing national or international legislation for pelagic habitats. However, EU member states must monitor and assess plankton as a proxy for pelagic habitats as part of the Marine Strategy Framework Directive (MSFD) Good Environmental Status (GES) Descriptors 1, 4 and 6. Targets and indicators in the MSFD are designed to examine changes in plankton and meroplankton (plankton with a benthic life phase) distribution, structure, condition and abundance to ensure communities are not significantly adversely affected by anthropogenic impacts. Additional targets proposed under Descriptors 3 and 5 are likely to support the achievement of GES for pelagic habitats.

The abundance and composition of phytoplankton is one of the key tools in defining Ecological Quality Status for the Water Framework Directive, particularly in relation to biodiversity and the impact on the ecology of coastal and transitional waters by anthropogenic inputs of nutrients. The Water Framework Directive does not require zooplankton to be assessed.

Key cross cutting baseline / issues across all plan areas

- Rising sea temperature has caused a number of changes in plankton communities including a large increase in phytoplankton populations in the NW and SW plan areas; a shift to earlier blooming of surface species in the northern North Sea; northerly movements of warmer-water plankton and retreat of colder-water plankton. Zooplankton taxa have moved forward in their seasonality; but the marine growing season has been extended, particularly in the summer months and to a lesser extent during winter, resulting in the seasonal occurrence of food for zooplankton and fish larvae being out of synchrony. This could lead to a trophic mismatch and failure of fish recruitment, one example being between cod and the base of its food chain which has affected cod recruitment in the North Sea. There has also been a notable decline in the abundance of total copepods and a change from a cold boreal community dominated by holoplankton to one characterised by warm temperate species with a predominance of meroplankton (Biodiv_412-413). An increase in sea surface temperature could lead to more diversity but reduced overall biomass (Biodiv_414).
- The abundance and distribution of a key zooplankton group *Calanus* sp. has changed in many regions around the British Isles and in the North Sea. The abundance of warm water copepod *C. helgolandicus* has increased, as has its northward range. Conversely, the abundance of the cold water copepod *Calanus finmarchicus* has decreased, as has its southward range. This northward movement of these copepods is only seen along the continental shelf where deeper water is warming much more rapidly. The cold water copepod (*C. finmarchicus*) has a higher energy content than the warm water copepod (*C. helgolandicus*) therefore their changes in abundance have influenced the growth, recruitment and survival of other trophic levels such as seabirds and fish. (Biodiv_415-416). Plankton can ameliorate or increase the rate of climate change through positive and negative feedbacks to greenhouse gases. Plankton can be a sink of CO₂, (during photosynthesis), and a source of CO₂ (during calcification). These feedbacks are complex as plankton have differing sensitivities to CO₂ concentration and have a variety of mechanisms for carbon utilisation. Additionally processes such as ocean acidification and increased sea surface temperature also impact these positive and negative feedbacks (Biodiv_417 and Biodiv_646). Copepods are an important component of the zooplankton community transferring energy from primary producers to higher trophic levels and a decrease in their abundance may have unknown consequences on higher trophic levels. There has been a notable decline in the abundance of copepods in the waters around the British Isles and in the North Sea since the 1950s (Biodiv_418).
- Ocean acidification reduces the availability of carbonate ions necessary for marine calcifying organisms to produce their calcium carbonate skeletons. Calcifying planktonic organisms such as coccolithophores, foraminifera and pelagic molluscs can be impacted by these changes. Increased CO₂ will influence the abundance of pH sensitive species, where lower pH has the potential to influence the speciation of nutrients important for phytoplankton growth. In addition phytoplankton groups have varying tolerance for CO₂ therefore increasing concentrations of CO₂ could lead to changes in phytoplankton community structure and diversity (Biodiv_419 and Biodiv_622). Risk of harmful plankton / algal blooms due to the influence of climate change and anthropogenic nutrient enrichment of coastal waters. Harmful plankton / algal blooms are noted by excessive growth of phytoplankton in the water column, changes in plankton community composition or excessive growth of opportunistic macroalgae (green weed) on intertidal sediments / rock or excessive growth of epiphytic algae (algae growing on other plants), particularly on seagrass and macroalgae (Biodiv_623).

The likely evolution of the environment over the plan duration

There is increasing pressure from climate change - most notably with changes in sea temperature and increasing anthropogenic CO₂ levels influencing plankton species abundance and distribution. As temperature increases, it is expected that species with warmer-water tolerance / affinity (such as *C. helgolandicus*) will continue to advance northwards to replace the previously dominant and nutritionally important cold-water species *C. finmarchicus*.

The seasonal timing of plankton production will also alter in response to climate change, which has consequences for plankton predator species (hypothesised as exacerbating the decline of North Sea cod stocks).

Changes in offshore circulation will continue to influence the abundance and diversity of phytoplankton as has already been observed with the late 1970s influx of polar water into the North Sea resulting in a decrease in phytoplankton abundance, with one species *Ceratium macroceros* being lost from the North Sea dinoflagellate community.

Potential interactions with other topics

- Changes in plankton abundance and distribution are directly linked to rising sea temperatures, resulting in effects on higher trophic levels including benthic and intertidal ecology, fish, birds and marine mammals. Effects may be linked to changes in fish distribution and potential fish breeding / foraging success.
- Changing fish abundance and distribution due to impacts on plankton may lead to socio-economic issues such as changes in fishing effort or location.
- Future warming is likely to alter the geographical distribution of primary and secondary pelagic production, affecting ecosystem services such as oxygen production, carbon sequestration and biogeochemical cycling.
- The impact of ocean acidification on plankton will also reduce or change prey availability for higher trophic levels, increasingly affecting food webs.
- Harmful plankton / algal blooms may in turn change ecosystem food web and nutrient cycling dynamics, with possible impacts including oxygen depletion in the water column arising from stimulation then die-off of phytoplankton blooms, which could have lethal and sub-lethal impacts on fish and invertebrates, and increased turbidity in the water column leading to reduce photic zone and shading out other plants or reduction of oxygen in surface sediment leading to anoxia, which could have lethal impacts on invertebrates and higher trophic levels, such as birds.
- Nuisance or potentially toxic species (e.g. Dinophysis) that form harmful algal blooms can lead to increasing ecotoxicity in shellfish, which can cause widespread mortality for birds and can lead to health issues among human consumers of shellfish.
- Harmful algal blooms can have a direct commercial impact on the aquaculture industry (shellfish and fish farms) and this is likely to become more of an issue as these food sources become of increasingly greater importance in the future. This may also lead to strengthening of shellfish toxin regulatory levels which will have a large impact on shellfish harvesting activities.

Potential transboundary issues

The transient nature of the pelagic environment means that plankton are influenced by factors operating outside of the marine plan areas. International and transboundary legislation (such as the WFD and MSFD) will be of key importance for cooperation and collective action with regard to maritime resource conservation, including maintaining a healthy pelagic environment.

Key data gaps

There are major gaps in the coverage of physical, chemical and biological measurements in pelagic ecosystems in the global oceans (Biodiv_626). The MSFD has identified the need for more information regarding zooplankton in inshore areas (Biodiv_627). Better understanding is needed of the links between warming, plankton and fisheries (and other higher trophic levels such as seabirds) to form a predictive capacity for rapid and abrupt ecosystem shifts relating to climate change (Biodiv_628).

The understanding of climate effects on nutrient concentrations and eutrophication in the North Sea, and its resulting effects on plankton, is poor. There are insufficient data on changes in nutrients with time and over sufficiently large areas. More information is needed on the consequences of changing climate (rainfall and temperature) and riverine input for nutrient discharge to the sea to better understanding nutrient cycling (Biodiv_629 and Biodiv_630).

Increased storminess will increase concentrations of nutrients at the ocean surface, but insufficient research has been carried out in this area, predominantly using models with few direct observations (Biodiv_631).

The majority of harmful algal bloom monitoring is in coastal areas, leaving offshore areas with sparse data. There is a need for more information on the role of wind and density driven transport at the boundary between the coastal and offshore regions, which is likely to be affected by climate change, leading to a greater frequency of coastal blooms (Biodiv_632).

Charting Progress 2 is now 6 years old and many of the feeder reports are older. Information within CP2 has been used in lieu of any more recent robust data so support a number of baseline and issues statements. However, consideration should be made at a later stage in the SA and marine planning process to review this document to ensure each statement is still valid and/or obtaining other more recent data that may be available through grey literature especially in relation to key issues that emerge through the process (Biodiv_585).

Biodiversity, Habitats, Flora and Fauna - Ornithology

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

- Liverpool Bay SPA is one of the UK's largest SPAs supporting over 50,000 wintering birds including red-throated diver and common scoter. The plan area also includes Morecambe Bay, which supports over 200,000 wintering waders and wildfowl and 60,000 breeding seabirds. Also important are Duddon SPA/SAC, Solway SPA/SAC and the Ribble and Alt Estuaries SPA. There are several National Nature Reserves on the NW Coast inc Cabin Hill (Sefton), Ribble (West Lancs) North Walney (Barrow). North West estuaries particularly the Ribble / Mersey / Dee tend to act as a common resource with birds moving freely between them (Biodiv_320)
- Natural England is currently consulting on Morecambe Bay and Duddon Estuary pSPA (Biodiv_510)
- RSPB reserves in this area include Dee Estuary (2 reserves important for wading birds and wildfowl); Ribble Estuary (the most important single river estuary in the UK, which attracts over 270,000 birds each year); Hesketh Out Marsh (realigned marshland); Leighton Moss (the largest reedbed in the north-west); Campfield Marshes (Solway); Merseyside (Southport) and St Bees Head (largest seabird colony in north-west). St Bees Head is home to the only breeding colony of black guillemots in the UK (Biodiv_378)
- The North West Plan Area has also been targeted for the further development of offshore wind, and oil and gas activities, with a risk of disturbance and displacement to the movement of species through the area. This is particularly relevant to the movement of wintering and passage waders, seabirds and terns. There are several proposals for estuarine barrages and coastal lagoons across the North West Marine Plan Area coastline (Biodiv_515)

Baseline/issues: South West Plan Area 8 9

- The area includes the Isles of Scilly SPA/SSSI and Lundy SSSI - the South West's most important seabird colonies and England's only nesting sites for British storm petrels and Manx shearwaters (Biodiv_271)
- Other designated sites include Gerran's Bay to Camel Cove SSSI, Godrevy to St Agnes SSSI, Pentire Peninsula SSSI and West Exmoor Coast and Woods SSSI (Biodiv_271)
- The plan area is also important for passage and wintering waterbirds, including sites acting as cold weather refuges. This includes nationally and internationally important wintering populations of waders and wildfowl (Severn Estuary SPA) divers and grebes (Fal Bay to St Austell Bay pSPA), wintering bittern and aquatic warbler (Marazion Marsh SPA), and internationally important wintering waterbirds (Tamar complex SPA). Nationally important sites include Malpas Estuary SSSI, Upper Fal Estuary SSSI, Looe Pool SSSI, Hayle Estuary to Carrack Gladden SSSI, Amble Marshes SSSI (Biodiv_271)
- Includes important foraging areas for shag and other seabirds around Isles of Scilly and a range of seabirds to the west of Lundy. Nationally important numbers of breeding shag along the Cornwall coast, regionally important populations of breeding auks at Tintagel Cliffs SSSI and six kittiwake colonies in Cornwall. Plan area also supports internationally important migration routes for the critically endangered Balearic shearwater and potentially important migration routes or inshore non breeding aggregations for other seabirds including Manx shearwater (St Ives to Porthgwarra), auks (St Ives to Porthgwarra), gannet and great skua (Biodiv_296)
- There are omissions within the protected site network including the protection of aggregations or migration routes of non-breeding seabirds (e.g. Balearic shearwater and Manx shearwater), seaward extensions of many nationally important (SSSI) seabird colonies and breeding season foraging areas (relevant to inshore and offshore) (Biodiv_272)
- RSPB reserves in this area include Marazion Marsh, Hayle Estuary and Labrador Bay (Biodiv_275)
- Includes waters targeted for offshore renewables, mineral extraction, dredging and aggregate extraction. A number of important foraging areas for seabirds have been identified as potential areas for tidal power including Land's End area and Hartland Point (Biodiv_489)

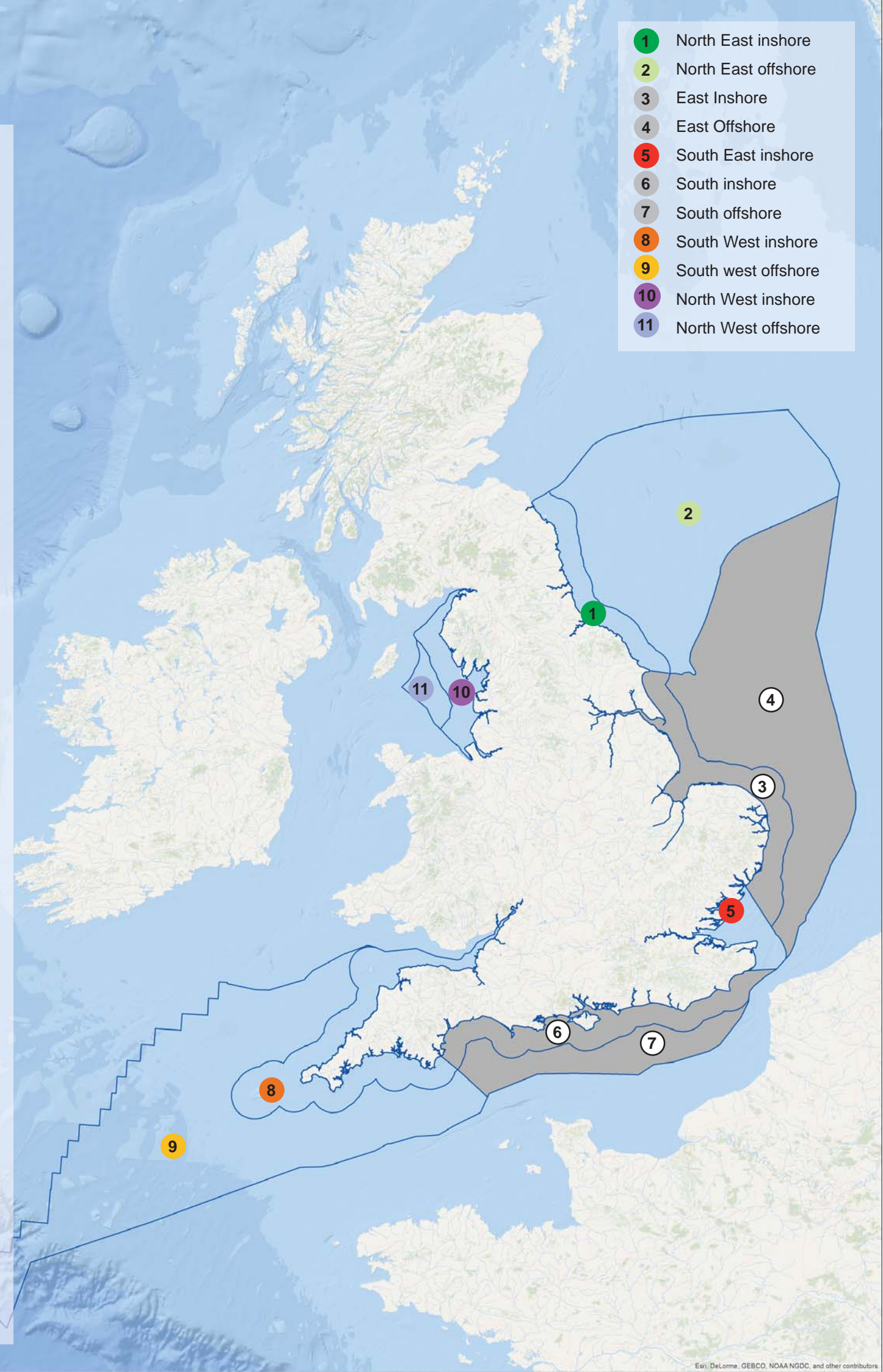
Baseline/issues: North East Plan Area 1 2

- The area is incredibly important for seabirds including England's largest UK's largest mainland gannetry (Flamborough and Filey Coast pSPA). The area hosts more than 90% of the UK's breeding population of roseate terns (Coquet Island Site of Special Scientific Information (SSSI), SPA and Bird Sanctuary), with several little tern strongholds (Northumberland including Lindisfarne SPA/SSSI and Teesside). This area also includes the Farne Islands SSSI and SPA and important foraging and roosting areas for pas-sage and wintering waders and wildfowl (e.g. Northumberland Shore SSSI, Northumbria Coast SPA, Teessmouth and Cleveland Coast SPA) (Biodiv_352)
- There are several proposed new SPAs including the Flamborough and Filey Coast pSPA, Northumber-land Marine pSPA and the Teessmouth and Cleveland Coast possible SPA extension (Biodiv_353)
- The area include waters targeted for offshore renewables, oil and gas exploitation, dredging and ag-gregate extraction. These activities have the potential to be damaging to the marine environment in-cluding possible adverse effects on seabirds. Within this plan area, several large offshore windfarms are either proposed or under development which could have significant impacts on the Flamborough and Filey Coast pSPA's seabirds and other species such as seaducks (e.g. common scoter and red-throated diver) through collision and displacement inshore and offshore (Biodiv_354)

Baseline/issues: South East Plan Area 5

- The estuaries and intertidal areas support important wintering waders and waterfowl populations, as well as breeding tern colonies. These SPAs comprise Stour and Orwell Estuaries SPA, Hamford Water SPA, Colne Estuary SPA, Blackwater Estuary SPA, Benfleet and Southend Marshes SPA, Crouch and Roach Estuaries SPA, Thames Estuary and Marshes SPA, Medway Estuary SPA, the Swale SPA and Thanet Coast and Sandwich Bay SPA. The area also includes the Outer Thames SPA, designated for its wintering red-throated diver population. Natural England is currently consulting on a proposal to add foraging terns to the Outer Thames SPA citation (Biodiv_293)
- RSPB reserves in this area include: Stour Estuary; Old Hall Marshes; Wallasea Island Wild Coast project; Cliff Pools; Nor Marsh and Motney Hill (Biodiv_291)
- The non-intertidal area is currently only designated for one species in a single season, red-throated divers in winter (Biodiv_294)
- The majority of estuaries are designated as internationally important sites reflecting their use by wintering water birds; however these areas are sensitive to sea level rise and coastal squeeze (Biodiv_295)
- The South East Plan Area has a number of consented and proposed offshore wind farms. (Biodiv_498).
- The South East Plan Area has several important ports, with London Gateway the largest of several within the Thames. Others include Sheerness Port in the mouth of the Medway and Thamesport in the Medway. The associated pressures that will need consideration within the plan include, pressure for port expansion and its impacts on coastal habitats and maintenance dredging to support the shipping channel (Biodiv_498)

- 1 North East inshore
- 2 North East offshore
- 3 East Inshore
- 4 East Offshore
- 5 South East inshore
- 6 South inshore
- 7 South offshore
- 8 South West inshore
- 9 South west offshore
- 10 North West inshore
- 11 North West offshore



Biodiversity, Habitats, Flora and Fauna - Ornithology

Summary of the legislative / policy context

Most of the legislation and international conventions that the UK is a signatory of are designed to protect bird habitat and species. Examples include the Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat (1971, 1982); Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention, 1979); Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive); Directive 2009/147/EC on the Conservation of Wild Birds (Birds Directive); and The Conservation (Natural Habitats &c.) Regulations 2010 as amended (Habitats Regulations).

The Wildlife and Countryside Act provides protection for sites containing important aggregations by notifying them as bird Sites or Areas of Special Scientific Interest (SSSIs/ASSIs). The boundaries of these SSSIs/ASSIs extend to Mean Low Water Mark. The health of seabird populations, in terms of their distribution, abundance and condition, forms a key part of the targets for achieving Good Ecological Status within the Water Framework Directive.

Key cross cutting baseline / issues across all plan areas

- The issue of birds should not be taken out of the context of the ecosystems they form part of. Thirty-eight species of seabird regularly occur in the seas around the UK and fifty-seven species of waterbird regularly use UK seas for at least part of their lifecycle. Some species occur in large numbers, but other species are only present during the breeding season, over winter or during migration. Species present all year in low numbers, or seasonally present in low numbers may still be important (Biodiv_239).
- Waterbird and seabird species listed in Annex 1 to the EU Birds Directive that regularly breed in, over winter in or migrate through the UK include: White fronted goose; Barnacle goose; black throated diver; eurasian spoonbill; great northern diver; little egret; red-necked phalarope; red throated diver; slaonian grebe; arctic tern, Balearic shearwater; black tern; common tern; cory's shearwater; European storm petrel; leach's storm petrel; little gull; little tern; Mediterranean gull; roseate tern; sandwich tern (Biodiv_249)
- Birds that regularly use the UK seas occur in large aggregations where food is abundant, for example in and around estuaries. Most internationally important aggregations occur during spring and autumn migrations or during winter. Of those waterbird species that breed in internationally important numbers in the UK, only five predominantly forage in the marine environment during the breeding season (red-throated diver, common shelduck, common eider, ringed plover and pied avocet) (Biodiv_241).

The likely evolution of the environment over the plan duration

- There is a complex and mixed picture regarding trends in bird numbers with geographical variations and variations in species. It is not possible to set out a simple picture of the evolution of this aspect of the environment. However, some of the trends highlighted in the baseline data are:
- Recent downward trends in breeding success of seabirds in the Greater North Sea and the northern Celtic Seas are of concern. Of the seabirds breeding in the UK, only northern gannet and great skua have sustained a positive trend in population size since 1969. The biggest declines have been in herring gulls and roseate terns – by more than 50% and 90% respectively since 1969 (Biodiv_240)
- Some species of diving duck and estuarine wader have recently declined - in 2006/07 there were 43% fewer goldeneye, 54% fewer dunlin and 28% fewer bar-tailed godwit than in 1975/76 (Biodiv_243)
- Since the mid-1970s, numbers of waterbirds wintering in or migrating through marine areas in the UK increased on average by 106% up until the mid-1990s and have since declined slightly (Biodiv_246)
- Seabird and waterbird populations in the UK have increased in size over the past century as a direct result of increased protection from hunting and persecution. Since around the mid-1990s, declines in numbers both of wintering waterbirds and breeding seabirds indicate that pressure is once again being exerted on marine bird populations (Biodiv_247)
- According to Charting Progress 2, the trend for birds in Region 4 (Western Channel and Celtic Sea) is favourable. The overall trend has attained its all-time peak in the most recent winters at 80% above the level of the 1975/76 base year although the sharpest rise was during the late 1970s and early 1980s since when it has climbed only gradually. Most of that early increase was due to increases in wildfowl species. One species (goldeneye) has shown a more recent decline beginning during the late 1990s (Biodiv_240)
- Numbers of waders and wildfowl in Region 2 (Southern North Sea - South East Marine Plan Area) have both been relatively stable since the beginning of the 1990s, although numbers of wildfowl have declined sharply over the most recent four winters. Overall the indices for waterbirds, wildfowl and waders are currently all higher than in the 1975/76 base year by 173%, 129% and 194% respectively (Biodiv_292)
- Waterbird trends in Region 5 (Irish Sea) largely reflect those of the UK. The overall trend now stands at 64% above the level of the 1975/76 base year, having peaked at 114% above that level during 1996/97. The 1996/1997 turning point corresponds with that for wildfowl which peaked at 268% above the level of the 1975/1976 base year and now stands 178% above that level. The sustained decline in the wader trend began following a peak 23% above the level of the 1975/1976 base year during 1989/1990 and now stands at 13% below that level (Biodiv_319)
- The trends in the multi-species indices in Region 1 (Northern North Sea) were similar to those for the UK, except that the decline in the wader trend has been more pronounced since peaking during the mid-1990s: 69%, 77% and 38% for waders, wildfowl and waterbirds respectively, but in the mid-1990s they were 105%, 107% and 89% higher than in the mid-1970s. The trends for 17 of the contributory species were either stable or had increased. However, the abundance of eight species has been declining since at least the early 1990s and seven of these are now at the lowest levels on record (Biodiv_351). In addition, changes to climate are likely to play a large part in changing, the distribution of habitats and bird species (see box below: potential interactions with other topics).

Potential interactions with other topics

There are key inter-relationships with water and coastal processes, economic and recreational activities and climate change. As the climate around the UK changes, the distribution of habitats and bird species is likely to change. Climate change has already led to a substantial shift in the distribution of waders, for example, with clear evidence of a south-westward to north-eastward shift in the centres of abundance of some wader species. Seabird breeding failure in the North Sea has been linked to variations in food availability as a result of increased sea temperatures. Changes in salinity may also affect waterbirds using estuaries (Biodiv_548). There are key interactions with coastal processes including flooding. There is likely to be loss of intertidal feeding resource through coastal squeeze. Shorebirds such as waders which feed on mudflats, sandy beaches and rocky shores are at risk of negative changes from modification of coastal processes. Additionally breeding common terns (for example, on the Isles of Scilly) are sensitive to flooding as they nest on rocky islets that can be flooded out during thunder storms or storm surges (Biodiv_273)

There are also clear inter-relationships between economic activity and bird habitat and species. Examples include potential threats from seabird bycatch from driftnet and gillnet fisheries in southern England, effects of bait digging on food chain (Biodiv_523 and 524) and habitat disturbance and effects on birds due to depletion of prey species. Positive examples include marine birds providing an important source of income for local economies since many species have a wide appeal to people e.g. Atlantic puffins draw visitors. There are also negative interactions with relation to aquaculture with marked reductions in waterbird survival being shown to occur as a result of shellfish harvesting (Biodiv_452). In addition, most species of waterbird, but especially waders, can be expected to be affected by habitat loss due to activities such as coastal defence, land claim, construction of tidal barrages, and the construction and extension of marinas or harbour developments. Activities associated with leisure and recreation can impact on some seabird species, largely through disturbance to nesting sites or disturbance to feeding birds by recreational boat traffic. This is probably greatest in the South East plan area. Little terns are particularly susceptible to disturbance from people as this species nests on beaches used for recreation (Biodiv_495)

Potential transboundary issues

Commercial sandeel fishing in the western North Sea has a negative impact on seabirds breeding nearby. Falls in breeding success have been acute in black-legged kittiwakes that feed offshore on sandeels, especially on the coast of the North Sea and recently have been seen in seventy other offshore species such as common guillemot. Declines have also been seen in inshore species such as arctic skua. Declines in the availability of sandeels have also been linked to changes in sea temperatures which alter the composition of zooplankton populations (Biodiversity_455).

The UK Marine and Coastal Act, Scottish Marine Act and legislation in development in Northern Ireland have implications for the conservation of marine bird populations by (i) regulating activities that create pressures that have significant impacts on marine birds; and (ii) by establishing a network of Marine Protected Areas (specifically Marine Conservation Zones, or MCZs) (Biodiv_456)

Movements between marine plan areas can include seabird foraging trips from terrestrial nest sites to marine foraging areas (e.g. for Manx shearwater from their internationally important breeding grounds on Welsh islands), wintering wildfowl and wader movements between estuaries and intertidal areas and seasonal movements of seabirds including Balearic shearwater, gannet and great skua along the coast. In order to safeguard birds at all stages of their lifecycle, the Marine Plans should consider these movements. Consideration should also be given to marine species moving to and from devolved marine plan areas (Biodiv_464). Natural Resources Wales, with JNCC are currently consulting on a cross border SPA in the seas off Pembrokeshire. The proposed SPA includes the islands of Skomer and Skokholm, the waters immediately surrounding them and a large sea area extending from the coast of Pembrokeshire westwards into the Celtic Sea, including UK waters outside the 12 nautical mile limit of Welsh Territorial Sea. In the Severn SPA, the plan must ensure there are sufficient refuge areas within the Estuary, particularly in relation to wildfowling and general human disturbance, including bait diggers, dog walkers and recreational craft. Similar areas exist around other sites of international importance such as the Inner Humber (Biodiv_488). Within the English Severn, an overarching plan is needed for renewable energy generation the Estuary, seeking to encourage a mix of sustainable technologies and projects which minimise impacts on the European Marine Site and other features. This should be considered in relation to the development of the Welsh National Marine Plan to ensure a consistent approach for transboundary sites and features (Biodiv_489)

Key data gaps

Since 2012 the RSPB have been developing their seabird tracking work through the FAME and STAR projects. The final results are due to be published this year and these results and the tracking data should be used to inform the development of the marine plans.

There is need to consider data deficient areas within the North West marine plan area and the importance for seabirds. For species such as wintering Common scoter, Eider and Red throated diver modelled spatial data exists, and following the precautionary principle, these modelled areas should be considered in the development of marine plan areas (Biodiv_321) Seabird breeding success and survival have reduced due to food shortages possibly caused by fishing and climate change. There is as yet no data on how many seabirds from UK colonies are killed as a result of becoming entangled in fishing nets or taking the baited hooks of long-line fisheries operating within and outside UK waters (Biodiv_565)

Biodiversity, Habitats, Flora and Fauna - Invasive Species

Baseline/issues: North West Plan Area 10 11

(Please note that the figures in brackets refer to the SA scoping database. This is available on the MMO website)

The following invasive species that could lead to fouling of marine structures (marinas, intakes/outfalls, aquaculture) are known to be present in this area - Orange sheath tunicate (*Botrylloides violaceus*) (Biodiv_506), Orange tipped sea squirt (*Corella eumyota*) (Biodiv_528), Acorn barnacle (*Amphibalanus improvises*) (Biodiv_529) and Green sea fingers (*Codium fragile*) (Biodiv_530). Green sea fingers although present in this plan area are not yet at nuisance density anywhere in the UK (Biodiv_530).

The Leathery sea squirt (*Styela clava*) is also present in this plan area. However, the impact of this species is unclear; it can become the dominant species but provides secondary substrate for others (Biodiv_505).

Wireweed (*Sargassum muticum*) has been identified in this area, which could potentially become widespread (see South West) (Biodiv_500).

Sea temperature increases / climate change could lead to breeding populations of Pacific oyster (*Crassostrea gigas*) becoming established (Biodiv_504).

There have been several sightings of Mitten crab in the Dee estuary (Biodiv_527).

Baseline/issues: North East Plan Area 1 2

The North East plan area has relatively few invasive species that could lead to fouling of marine structures (marinas, intakes/outfalls, aquaculture) present but those that are known to be present are - the Orange tipped sea squirt (Biodiv_528), Acorn barnacle (Biodiv_529) and Green sea fingers (Biodiv_530) which although present in this plan area are not yet at nuisance density anywhere in the UK (Biodiv_530).

There have been a few sightings of Mitten crab in the Tyne Estuary (Biodiv_527).

Baseline/issues: South West Plan Area 8 9

A relatively large number of invasive species that could lead to fouling of marine structures (marinas, intakes/outfalls, aquaculture) are known to be present in this area - Orange sheath tunicate (Biodiv_506), Orange tipped sea squirt (Biodiv_528) Acorn barnacle (Biodiv_529), Green sea fingers (Biodiv_530), Wireweed (Biodiv_500), and Japanese kelp (*Undaria pinnatifida*) (Biodiv_485). Wireweed is widespread in this plan area. Green sea fingers although present in this plan area are not yet at nuisance density anywhere in the UK.

Leathery sea squirt (*Styela clava*) is also present in this plan area. However, the impact of this species is unclear; it can become the dominant species but provides secondary substrate for others (Biodiv_505).

There are established populations of Pacific oyster in estuaries in this plan area (Biodiv_504) and Carpet sea squirt (*Didemnum vexillum*) is found in Plymouth Sound and the Kingsbridge, Falmouth and Dart estuaries. There is also a record from the Watchet area of Somerset (Biodiv_484).

American oyster drill / American sting wrinkle (*Urosalpinx cinerea*) is present and may impact on native oyster stocks by preying on native oyster. Natural dispersal of these species is limited but local populations can increase rapidly. Wider dispersal is thought to be as a result of transportation with oysters (Biodiv_573).

Slipper limpet (*Crepidula fornicata*) is well established; it outcompetes native species for seabed space and can lead to smothering and disturbance to water flows if large colonies develop (Biodiv_499).

There have been a few sightings of Chinese Mitten crab (*Eriocheir sinensis*) in the Tamar estuary (Biodiv_527).

Baseline/issues: South East Plan Area 5

The Orange sheath tunicate (Biodiv_506) is present in this plan area and can lead to fouling of marine structures (marinas, intakes/outfalls, aquaculture).

Chinese Mitten crab is established in the Thames and Medway estuaries with distribution throughout fresh, brackish and marine waters dependent on life stage (Biodiv_493). There is potential for a fishery to develop. Pelagic larvae may spread over large distances or via ballast water (Biodiv_493).

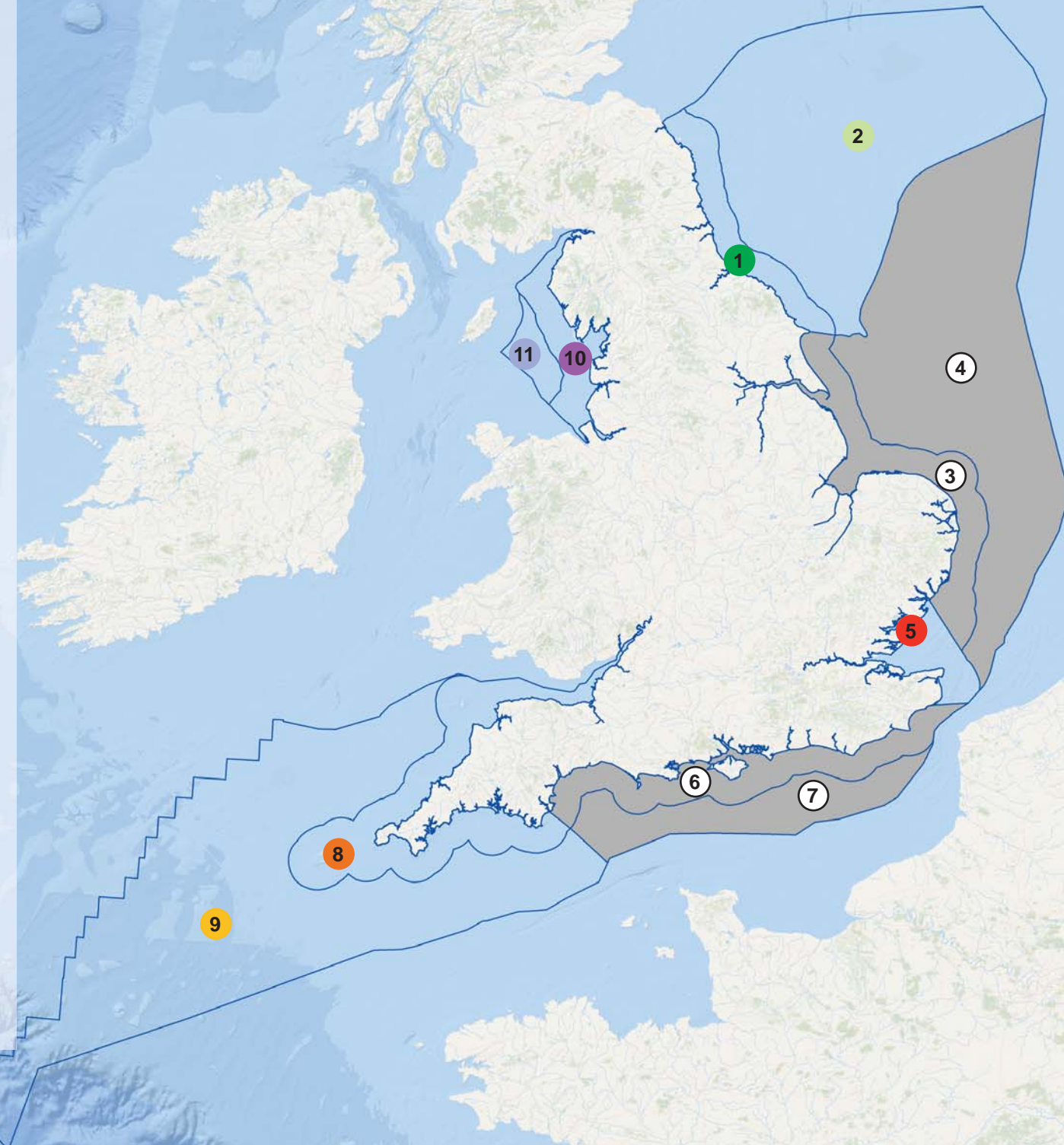
Leathery sea squirt is also present in the South East plan area. The impact of this species is unclear; it can become the dominant species but provides secondary substrate for others (Biodiv_505).

There are established populations of Pacific oyster in a number of estuaries in this plan area (Biodiv_504).

American oyster drill / American sting wrinkle may impact on native oyster stocks. Natural dispersal of these species is limited but local populations can increase rapidly. Wider dispersal is thought to be as a result of transportation with oysters (Biodiv_573).

Slipper limpet is well established; it outcompetes native species for seabed space and can lead to smothering and disturbance to water flows if large colonies develop (Biodiv_499).

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Biodiversity, Habitats, Flora and Fauna - Invasive Species

Summary of the legislative / policy context

The main policy and legislative instruments for managing non-native invasive species include:

EU Regulation on the Prevention and Management of the Introduction and Spread of Invasive Alien Species (1124/2014)

Wildlife and Countryside Act (1981) as amended – includes measures to prevent the spread of non-native species

International Maritime Organization (IMO) International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Ballast Water Management Convention) (2004) provides a structure to address the issues of ballast water and the spread of non-native species. The convention provides two performance standards for the discharge of ballast water. The UK has not ratified the convention but it is due to come into force in 2017.

Marine Strategy Framework Directive (MSFD), Good Environmental Status (GES) Descriptor 2 specifically relates to invasive species (termed 'non-indigenous species' (NIS)) and their impact on the marine environment. To achieve GES, invasive species introduced by human activities need to be at levels that do not adversely alter the ecosystems.

The GB Non-native Species Secretariat (NNSS) is responsible for helping to coordinate the approach to invasive non-native species in Great Britain. It provides a single point of information on non-native species, identification, records and measures, such as action plans and policies to control non-native species, such as the 'Check, Clean, Dry' campaign for recreational anglers and boat users.

Key cross cutting baseline / issues across all plan areas

Invasive species can have a range of impacts on the marine environment. They may compete with native species for habitat or food, reducing their availability for native species, or may prey directly on native species. Invasive species may bring disease or parasites or may act as parasites on native species, which may not be well-adapted to defend against them. These impacts can affect individuals or act at a population level, with knock-on impacts to marine food webs and ecosystems. Some invasive species can reproduce and spread rapidly, smothering the seabed, marine structures or native species. Where large numbers of invasive species colonise marine structures, this can adversely affect their operation, or cause direct damage e.g. reducing or blocking intakes / outfalls, affecting a number of marine industries, or adding costs, through having to clean, repair or replace structures (Biodiv_635).

Monitoring and management of invasive species on the coast of Great Britain and Ireland poses significant challenges given the length of coastline and the different ways in which invasive species can be introduced and spread (Biodiv_637).

Key introduction pathways for invasive species are commercial shipping, recreational boating, aquaculture stock imports and natural dispersal. Changes in the type, distribution and frequency of pathways can affect the risk of introduction and spread of invasive species (Biodiv_636).

Potential for invasive species to increase – both through more species and in more areas as a result of climate change (Biodiv_558).

An 'Alarm List' of species thought to pose a risk to achieving WFD GES has been identified by the UK Technical Advisory Group Alien Species Group. Species on the current list are *Schizoporella errata* (bryozoan), *Celtodoryx ciocalyptoides* (sponge), *Ocenebra inornata* (Asian oyster drill), *Theora lubrica* (Asian semele), *Megabalanus coccopoma* (Titan acorn barnacle), *Paralithodes camtschaticus* (Red King crab), *Mnemiopsis leidyi* (warty comb jelly), *Proterorhinus marmoratus* (Tubenose goby), *Neogobius fluviatilis* (Monkey goby) and *Neogobius gymnotrachelus* (Racer goby). The species listed are those thought to pose a risk to surface waters and their ecological status under the WFD, but whose presence has not yet been recorded in Great Britain (Biodiv_576).

The likely evolution of the environment over the plan duration

- Slipper shell (*Crepidula fornicata*) distribution is likely to continue spreading northwards from the south (Biodiv_634).
- Pacific oyster may establish breeding / resident populations further north, with sea temperature rise / climate change, as reproduction seems to be linked to water temperature.
- In areas where invasive species have been identified, their populations are likely to increase / spread.

Potential interactions with other topics

- Invasive species can have adverse environmental, economic and social impacts by competing with native species for habitat, food sources or directly through predator-prey, disease or parasite interactions; this can impact on aquaculture / fishing (commercial or recreational). Invasive species may also cause fouling of marine structures (ports, marinas, intakes / outfalls).
- Economic and social activities are also pathways for the introduction / spread of invasive species (e.g. marinas, angling, and ballast water).
- *Gyrodactylus salaris* (a leech-like parasite of salmon, trout and other freshwater fish). The UK is currently recognised as being free from this parasite although evidence exists to suggest that this species presents one of the biggest threats to the wild salmon population – there are links to fish & shellfish and economy (recreation, aquaculture), as the likely sources of introduction are via aquaculture (through imported fish) and on vessels or gear used by recreational anglers and / or boaters that have visited infected areas (Biodiv_575).

Potential transboundary issues

- Controlling the spread of invasive species to / from other UK marine plan areas and beyond is a key issue. At a UK level this is co-ordinated through the GB Non Native Species Secretariat (NNSS).

Key data gaps

- There is a lack of data and understanding on the effects of climate change on the risks from invasive species. Climate change may enable more southerly species to move into more northern waters, allowing invasive species to colonise areas that in which they could not previously have survived. Climate change may also affect other factors making native species more susceptible to competition or predation by invasive species (e.g. altering food webs, increase in pH, change in predator-prey interactions, timing of reproduction, availability of habitat, etc.).
- There is no unified routine survey programme for invasive species that targets locations at high risk of introduction of invasive species (e.g. ports and marinas) – information is currently gathered from statutory and non-statutory (and volunteer) sources.
- The NNSS database (BG NNSIP – GB Non Native Species Information Portal) may not always be up to date, as information from several databases is used to populate it (e.g. Marine Recorder).
- More research is needed as to the distribution, abundance and pathways for introduction