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Understanding Change in Seascape Character in the East Marine Plan Areas (MMO1369a)



MMO1369: Understanding Change in Seascape Character in the East Marine Plan Areas, April 2024



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List of Abbreviations

The following abbreviations are used throughout this report:

CCUS	Carbon capture, utilisation and storage
Defra	Department for Environment, Food and Rural Affairs
ICES	International Council for the Exploration of the Sea
IFCA	Inshore Fisheries and Conservation Authorities
JNCC	Joint Nature Conservation Committee
MCA	Marine Character Area
MMO	Marine Management Organisation
MPA	Marine Protected Area
MPS	Marine Policy Statement
MCZ	Marine Conservation Zone
NCA	National Character Area
NNR	National Nature Reserve
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SCA	Seascape Character Area
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
VRM	Visual Resource Mapping

1. Introduction

1.1 Background

MMO (Marine Management Organisation) is responsible for preparing Marine Plans and policies, which guide and inform decision-making in the marine environment. The Marine and Coastal Access Act 2009 sets out that public authorities making decisions that affect or might affect the marine environment must do so in accordance with Marine Plans. Marine Plans apply in areas that are below the mean high water spring tide mark, and as such are relevant to three kinds of change described in this report (land-based, coastal and inshore/offshore). The UK Marine Policy Statement (MPS) provides the policy framework and context for the marine planning system.

For all types of development, policies within the original East Inshore and Offshore Marine Plans, herein referred to as the 'East Marine Plans' (Department for Environment, Food and Rural Affairs (Defra), 2014), set out the importance of seascape. Seascape character within Marine Plans enables the inclusion of sense of place in the decision-making process.

In 2023, the Secretary of State for Environment, Food and Rural Affairs agreed with the MMO's recommendation to replace the East Marine Plans. The adopted East Marine Plans will be replaced with a new plan which will be the first of a second generation of plans for English waters and will be referred to as the 'East Marine Plan'. To assist the MMO in addressing the seascape requirements set out by the MPS, this report provides supplementary evidence on seascape change, to the 2024 updated seascape character assessment (SCA) for the east marine plan areas.

LUC was commissioned by MMO to carry out an analysis of change in the seascape character in the east marine plan areas. The work forms part of a commission to update the SCA for these marine plan areas. The updated SCA is presented in a separate report. The original SCA was published in 2012, and the change analysis therefore focuses on the period 2012 to 2024. Where there is a clear trajectory, the report also provides commentary on possible future change.

The changing character of the east marine plan areas is essential context in understanding spatial prioritisation decisions and work related to national priorities laid out in marine plans. Furthermore, understanding change in the seascape will help MMO understand how marine plans and their policies are performing.

1.2 The East Marine Plans

The current East Marine Plans, as of 2024 (prior to the replacement mentioned above), define policy in relation to seascape character. The overall vision for the East Marine Plans is set out below and remains in effect until the East Marine Plans are replaced.

“By 2034, sustainable, effective and efficient use of the East Inshore and East Offshore Marine Plan Areas has been achieved, leading to economic development

while protecting and enhancing the marine and coastal environment, offering local communities new jobs, improved health and well-being. As a result of an integrated approach that respects other sectors and interests, the East marine plan areas are providing a significant contribution, particularly through offshore wind energy projects, to the energy generated in the United Kingdom and to targets on climate change.” (Defra (2014), page 23)

The explanatory text accompanying the vision statement refers to seascape character as follows:

“As a result of effective planning across both land and sea, and an appreciation of the unique features of the East marine plan areas, key elements of the coastal landscape, adjoining seascape and heritage, including the character created by traditional activities such as fishing, have been conserved and enhanced.” (Defra 2014, page 24)

Objective 5 of the East Marine Plans is: *“To conserve heritage assets, nationally protected landscapes and ensure that decisions consider the seascape of the local area.” (Defra (2014), page 50).* This recognises the need to consider how developments may affect the character of the seascape. For all types of development, policy within the East Marine Plans sets out the importance of seascape. The connections between land and sea that contribute to seascape are clearly set out, with links to Natural England seascape guidance and the 2012 SCA report (Natural England, 2012). Policy specific to seascape character (Policy SOC3) sets out a mitigation hierarchy, for users of the Marine Plan, from no adverse impacts on terrestrial and marine character’, through minimising and mitigating impacts, to finally justifying impacts against other considerations.

MMO monitors progress in relation to marine plan objectives. The most recent detailed three-year monitoring report (Defra, 2020) includes a summary of progress in relation to Objective 5. Indicators for Policy SOC3 focus on the number of development proposals within areas characterised as ‘less developed’, and the number within defined visibility thresholds. It is concluded that: *“...the intended effects of the policy are being realised.”* Monitoring indicators are very high level and do not fully reflect the diversity of influences on seascape character. The present study is intended to expand on these high-level indicators by providing a fuller account of change, and mapping this back to the vision for the east marine plan areas.

1.3 Structure of the Report

This report has been structured as follows:

- Section 1, this section, provides initial introduction and context
- [Section 2](#) describes the methodology and approach to understanding change.
- [Section 3](#) sets out the analysis of change within each of the Marine Character Areas (MCAs) in the east marine plan areas.
- [Section 4](#) presents the summary and conclusions of the study.
- [Annex 1](#) contains a general methodology for understanding seascape change.

2. Methodology

This section sets out the approach taken to describing and analysing changes that have affected the seascape (land-based, coastal and offshore) and explores the causes of changes.

The present study represents an opportunity to analyse change as part of the provision of an updated SCA. More generally, analysis of seascape change could become a regular requirement, informing monitoring of indicators. As such, a methodology for analysing seascape change has been developed in tandem with this report. The full methodology, available in [Annex 1](#), includes recommended methods that were not applied in this report based on time constraints, but could be utilised for future projects. The following sections describe the approach to the present work.

2.1 Describing Change in the Seascape

The seascape is a dynamic environment, changing on a daily and a seasonal basis with tides and weather. Longer-term changes in the coastal and marine environment can take many forms.

Change in the landscape and/or seascape is typically measured using both quantitative and qualitative methods. The former involves identifying measurable change using consistent datasets collected over time. The latter focuses on change as observed through field surveys, which needs to be done consistently over time, using standard recording methods.

It is important to consider a baseline to better understand the change over a particular period of time. It is also necessary to consider changes in the methodology used to collect seascape character information, in case it introduces differences in survey results that do not relate to seascape change.

2.1.1 Baseline

The baseline, against which change in seascape character is being assessed, is the [2012 Seascape Character Assessment for the east marine plan areas](#) (‘the 2012 East SCA’), which was based on the [pilot study by Natural England \(NECR106\)](#), (‘the 2012 East SCA Pilot’). The 2012 East SCA Pilot aimed to “*test and refine the emerging methodology for assessing the character of seascapes*” (page 12). The background to SCAs throughout the English marine plan areas can be found in the east marine plan areas 2024 SCA.

For the 2012 East SCA, site visits were undertaken including completion of field survey forms at several specific locations. Survey forms, (included in an Annex to the 2012 East SCA Pilot), provide observations of aesthetic, physical and human influences on the seascape.

A stakeholder validation exercise was carried out by LUC together with MMO and the key characteristics of marine character areas were subsequently refined to finalise the 2012 East SCA.

2.1.2 Changes in methodology

The methodology developed by Natural England in '[An Approach to Seascape Character Assessment](#)' (NECR105) was applied to produce the 2012 East SCA. The guidance has not been updated since 2012 so in theory, a consistent methodological basis is in place across both the original and updated SCAs. When comparing the 2012 East SCA with more recent SCA reports published by MMO, including the 2024 updated SCA, the following differences are noted:

- **Boat-based surveys** were undertaken for the 2012 East SCA but have only been carried out in one subsequent SCA (the South). No boat-based surveys were undertaken for the 2024 updated SCA. While this limited the surveyors' ability to fully explore all aspects of each MCA, this is not considered to significantly limit the comparison of change.
- The detail in **key characteristics** lists has increased. The importance of key characteristics has been increasingly recognised, as these are the means by which the essence of seascape character can be communicated. Since publication of the 2012 East SCA, subsequent MMO studies have focused on more detailed lists of key characteristics, with only the South SCA presenting narrative text in addition to characteristics.
- The 2012 East SCA Pilot refers to '**seascape character areas**'. MMO have since preferred the term '**marine character areas**', and the latter is used in the 2024 updated SCA, and in this report.

Significant changes in SCA methodology could affect the robustness of seascape character change analysis. Limitations on the analysis of change are discussed further in [2.3 Limitations](#).

2.1.3 Approaches to understanding change

Field work

As part of the field work for the updated East SCA in January 2024, each of the field survey locations from the 2012 East SCA was revisited and the same field survey form completed, with an additional section recording any changes. This ensures consistency in surveying locations and method, despite long periods between surveys. Comparison of these forms allows an evaluation to be made of any key changes that could be seen from a given viewpoint. Advantages and disadvantages of this approach include:

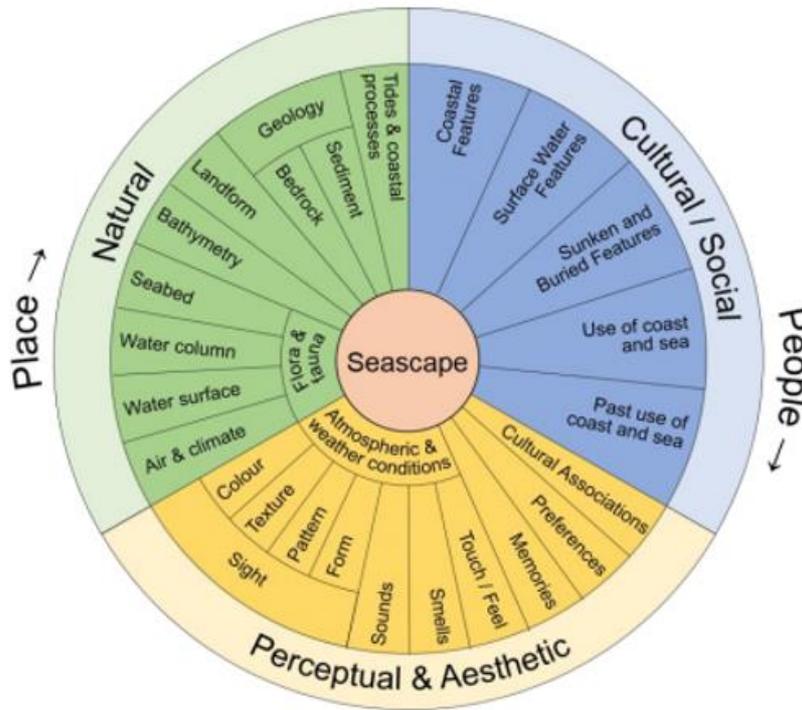
Key characteristics

The updated SCA is presented with a more detailed list of key characteristics, building on the brief statements included in the 2012 East SCA. This makes a side-by-side comparison difficult, but observations have been drawn from qualitative analysis.

The MCA descriptions are informed by the following qualitative information:

Comparison of site-specific field survey forms from 2012 and 2024, where available for the MCAs; and
 Comparison of the 2012 seascape descriptions, and updates made to the 2024 key characteristics.

Figure 1: The Seascape Wheel (adapted from Natural England, 2012)



Data Analysis

A large number of datasets that correspond to key themes of the [Seascape Wheel](#) (Figure 1) were assembled to inform the updated SCA (Annex 2 of the updated East SCA, 2024). Where possible, the same datasets as those used in the first East SCA were obtained to allow comparison across time. Many of the datasets relate to aspects of seascape that are unlikely to change over the timescale of this study, including geology and bathymetry. In other cases, datasets may have changed as a result of knowledge or data collection methods, rather than a physical change in the baseline. For example, current data on shipwrecks provides more features than the equivalent dataset from 2012 which indicates the addition of previously unrecorded shipwrecks, rather than an increase in new shipwrecks. The aim is to determine what has physically changed and what is a result of increased data quality and availability.

Locations of offshore development (above surface features), particularly offshore wind farms and Marine Protected Area (MPA) extents within each MCA were used to analyse seascape change.

Analysis of aerial photography

For coastal change, including land use change and coastal processes, aerial mapping, available in Google Earth, enables direct comparisons to be made over time. The software includes historical aerial imagery dating back to the 1980s, and

includes photography captured in or around 2012 for most areas, alongside more recent imagery. For each coastal MCA, Google Earth data was reviewed, and key changes summarised.

2.1.4 Stakeholder engagement

The original SCA in NECR106 did not include stakeholder engagement. However, this was rectified with the [publication of the updated 2012 East SCA by MMO](#).

As part of the 2024 SCA update, two online stakeholder workshops were held on 19 and 20 March 2024. The aim of the workshops was to facilitate engagement and collaboration to exchange information and capture regional expertise. Stakeholders were presented with the MCA descriptions and changes that had been identified prior to the workshop. During the workshop, stakeholders contributed to the key characteristics within MCAs according to their specific areas of technical expertise or geographical knowledge.

2.2 Understanding Causes of Change

Causes of change in the seascape's character can be related to natural processes or human influence, or a combination of the two. Preliminary analysis suggested that changes can be grouped into three key themes:

Land use change along the landward part of the coast. This could include:

- built development such as settlement expansion, caravan parks, ports and harbours;
- new industries resulting in a change of emphasis or activities within existing built-up areas;
- land use change to benefit wildlife and habitats, and associated visitor infrastructure; and
- changes in the character of coastal settlements, driven by socio-economic changes.

Coastal change arising from erosion and depositional processes. This could include:

- coastal erosion, with the east marine plan areas containing some of the most rapidly eroding coastlines in the UK;
- the knock-on effects of erosion on coastal land use;
- responses to erosion, such as sea walls and other defences, as well as accommodation of change through managed realignment;
- areas of deposition and accretion; and
- coastal squeeze¹, i.e. the loss/deterioration of natural habitats arising from man-made structures that prevent the natural landward transgression of those habitats.

Inshore and offshore change. This could include:

¹ Coastal squeeze is defined as “the loss of natural habitats or deterioration of their quality arising from anthropogenic structures or actions, preventing the landward transgression of those habitats that would otherwise naturally occur in response to sea level rise in conjunction with other coastal processes. Coastal squeeze affects habitat on the seaward side of existing structures.” (Environment Agency, 2021b).

- new above-water development within the marine environment, such as wind turbines or oil and gas platforms;
- other new activities, or changes, taking place above water within the marine environment, such as patterns of shipping or fishing practices; and
- changes in species populations, or changes to the extents of marine protected areas.

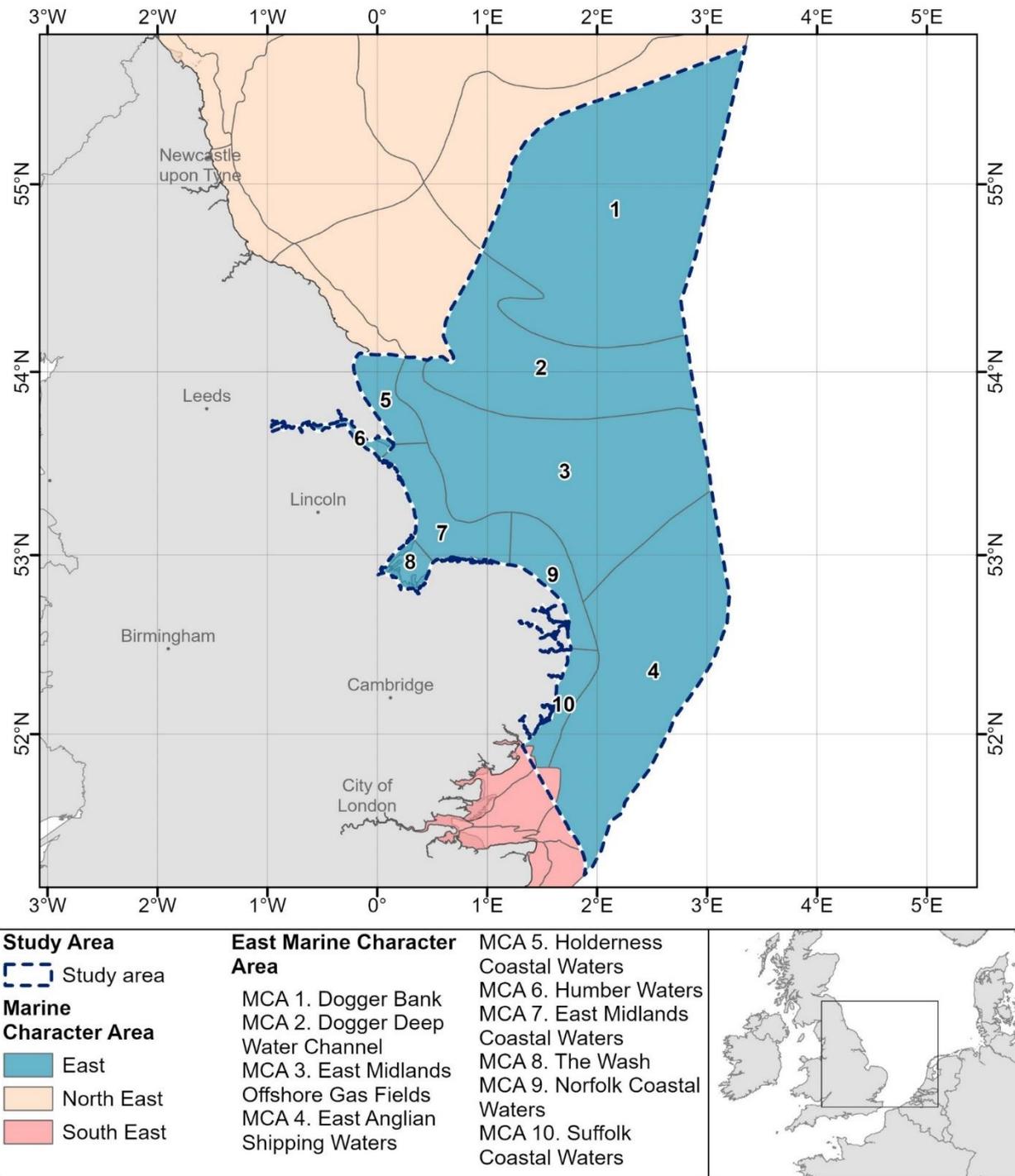
The analysis of change presented in [Section 3](#) separates all the observed changes into these three themes. Where other types of change have been identified these generally have a more limited influence on seascape character and are discussed in [Section 4](#).

2.3 Limitations

The main identified limitations of this study to understand change within the east marine plan area are summarised as follows:

- Continuous monitoring of change has not occurred since the previous SCA was carried out. As such, a comparison between point-in-time surveys in 2012 and 2024 has been carried out. This impacts on the level of detail available from MCA to MCA.
- The surveys were carried out by different surveyors, although the same methods were followed as far as possible, and the same approach to field recording used.
- Boat-based surveys were not undertaken in 2024 although they were in 2012. This limited the ability of the surveyors to consider visual change in the offshore environment.
- Future changes are noted where these are considered likely to occur (e.g. consented development), though the extent of change to seascape character is not known.
- The study does not include full examination of the interaction of socio-economic factors with seascape character.

Figure 2: Marine Character Areas in East England



Date of Publication: 10/06/2024
 Coordinate System: WGS 1984 Web Mercator
 Auxiliary Sphere
 Projection: Mercator Auxiliary Sphere

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3. Analysis of Change

This section presents an analysis of change within each of the ten MCAs in the east marine plan areas. Under each MCA title, high-level information on change in seascape character is presented under the three themes described in Section 2.2: land use change along the coastal edge; coastal change; and inshore and offshore change. For MCAs 1 to 4, which are entirely offshore, the 'land use change' and 'coastal change' themes are omitted. 'Inshore and offshore change' is used to describe all change that is not related to the coast, including in inshore waters such as the Humber estuary (MCA 6). MCAs are illustrated in Figure 2.

3.1 MCA 1 Dogger Bank

3.1.1 Inshore and Offshore change

Dogger Bank Wind Farm is currently under construction and split into three phases. When complete it is set to be the largest offshore wind farm in the world, containing approximately 277 wind turbines and producing enough power to supply 6 million homes (Dogger Bank Wind Farm, 2019).

In 2017 Dogger Bank was designated as a Special Area of Conservation (SAC) for its sandbanks; it remains submerged at all times. Changes to fisheries regulations in 2024 include the closure of the sand eel (*Ammodytidae*) fishery in the UK, including within the MCA. In 2022 the UK Government introduced a bylaw which banned bottom trawling in four MPAs including the Dogger Bank MPA, which reportedly saw a 98% drop in fishing activity within the area (Marine Conservation Society, 2022).

Infrastructure associated with hydrocarbon extraction remains a prominent feature toward the southern boundary of the MCA, however, there has been significant decommissioning of oil and gas infrastructure since 2018 (JNCC, 2022).

Continued decommissioning of hydrocarbon extraction infrastructure is likely to have a visual impact on the landscape, potentially decreasing industrial character.

3.2 MCA 2 Dogger Deep Water Channel

3.2.1 Inshore and offshore change

A new Marine Conservation Zone (MCZ) has been implemented in the MCA. Markham's Triangle MCZ is an area of shallower sea to the east of the MCA (contiguous with Dutch waters) that covers approximately 200km². The zone provides habitat for a wide variety of invertebrates including bristleworms (Polychaetes), venus cockles (*Austrovenus stutchburyi*), sea cucumbers (Holothurians), sea stars (*Asteroidea*), sea urchins (Echinoderms) and crabs (Brachyurans), as well as flatfish species (*Pleuronectiformes*).

Historically the MCA has been a hub for beam trawling (a form of bottom trawling) for fish such as cod and whiting. Currently North Sea cod populations are declining, which may have further impact on the fishing industry in the future (ICES, 2022).

There has been a major shift in energy production within the MCA, transitioning from hydrocarbon extraction to renewable energy and carbon capture. Hornsea 1 and 2 offshore wind farms are already in their operational phases, with Hornsea 1 starting operation in 2020, and Hornsea 2 in 2022. In 2020 Hornsea 3 was granted a Development Consent Order (DCO) and in 2023 Hornsea 4 was also granted consent. Carbon storage licences have been granted for areas within this MCA. Additional infrastructure within the MCA may impact the character of the area, with more of an artificial aesthetic within an otherwise remote and isolated area.

Infrastructure associated with hydrocarbon extraction remains a prominent feature of the MCA despite several offshore gas platforms being or continuing to be decommissioned since the 2012 assessment. For example, gas production from the Windemere gas platforms within the MCA ceased in 2016, but the removal of the platform and subsea infrastructure is still underway.

3.3 MCA 3 East Midlands Offshore Gas Fields

3.3.1 Inshore and offshore change

The Holderness Offshore Marine Conservation Zone (MCZ) is a new marine protected area located within the MCA. The MCZ is located along the north-western boundary of the MCA approximately 21km from the Holderness coast, is relatively shallow (ranging in depth from 5m to 50m) and covers an area of 1,176km². The MCZ contains a wide range of species within and on top of the sediment such as mussel beds, sponges (*Porifera spp.*) and sea stars (*Asteroidea spp.*). The site also acts as a spawning ground for fish species including lemon sole (*Micostomus kitt*), plaice (*Pleuronectes platessa*) and European sprat (*Sprattus sprattus*) (Defra, 2019a).

Infrastructure associated with hydrocarbon extraction remains a prominent feature of the MCA despite several offshore gas platforms being decommissioned since the 2012 assessment. For example, gas production from the Audrey gas platforms within the MCA ceased in 2016 but the removal of the platform and subsea infrastructure is still underway (Spirit Energy, 2018).

Industrial features within the MCA are changing; once characterised for its hydrocarbon stores the MCA is now recognised for producing renewable energy. Triton Knoll, Inner Dowsing, and Dudgeon Offshore Wind Farms are all located in this area, along with the projected Outer Dowsing and Dudgeon Extension which were granted development consent in April 2024.

Carbon storage licenses have been granted in the area which may further add to the industrial character of the MCA, should above-water infrastructure be required to facilitate this.

3.4 MCA 4 East Anglian Shipping Waters

3.4.1 Inshore and offshore change

A new MCZ designated in 2019 has been implemented in the MCA. The Orford Inshore MCZ lies east across the 12 nautical mile territorial sea limit of the Suffolk coast. The zone contains subtidal mixed sediments, these sediments are important as nursery and spawning grounds for many fish species, including Dover sole (*Solea solea*), lemon sole and sand eels (*Ammodytes spp.*). Species of anemones, sea cucumbers and starfish can also be found at the site, alongside several nationally important shark species (JNCC, 2020).

Offshore wind farms are a prominent feature of the MCA, including East Anglia One, Greater Gabbard and Galloper. Future wind farm development in the area includes East Anglia Two and Three, Five Estuaries, Norfolk Boreas, North Falls and Vanguard.

Further developments also include subsea electricity connections between the UK and Europe such as LionLink and Sea Link, all of which may have an impact on the seascape character of the MCA, e.g. at cable landing sites.

3.5 MCA 5 Holderness Coastal Waters

3.5.1 Land use change along the coastal edge

Caravan and holiday parks are a characteristic feature of the MCA and many of them have already lost significant areas to erosion. Ongoing coastal processes may put many of these parks, as well as other settlements and infrastructure, at risk. Examples include parks at Aldbrough, Ulrome and Skirlington.

The ongoing loss of caravan plots, agricultural land and homes may have a negative impact on the local population in the future, which in turn could further affect character. Socio-economic factors likely to be impacted were not in scope for this study.

Recreational impacts from coastal erosion: access to beaches, car parks and areas of coastal paths has either already been lost, or these amenities are becoming potentially hazardous to use. Additional erosion may impact general recreational access along much of the unprotected coastline.

New onshore coastal wind farms (including Fraisthorpe) are a distinctive feature in the skyline and are visible along much of the MCA.

Numerous offshore wind farms are planned or under-construction (such as the Hornsea Project and Dogger Bank), and onshore connections may impact the coastline of the MCA. Subsea cabling may be 'invisible' once completed, but there may be local/regional impacts from the construction of energy infrastructure such as cable landing sites and substations. Cable landfalls involve disturbance at the coastal edge during construction, but in the longer term have limited impact on

seascape character. Substations have a much greater presence but tend to be located further inland.

Regarding tourism and the local economy, some areas appear to have become more deprived, particularly those impacted by severe erosion (DLUHC, 2019), while some settlements have benefitted from improvements – for example a new leisure centre at Hornsea (Hornsea Hub).

With the issues surrounding erosion and ongoing loss of settlements/tourist infrastructure, there may be impacts on visitor numbers and the local economy which may have different impacts at different locations in the MCA.

3.5.2 Coastal change arising from erosion and depositional processes

Coastal erosion is a dominant and significant element of change across the MCA. Damage to farmland, infrastructure, roads and settlements was recorded during the site visits and satellite imagery demonstrates the retreating coastline.

The rate of erosion has not changed significantly since 2012. More recent estimates suggest that the coastline is eroding at an approximate rate of 1.8 metres per year, a small increase of 0.2 metres per year from 2012 (Hobbs et al., 2019). Intense single events with large scale erosion occur along much of the MCA where sea defences are not in place. Much of the coastline of the MCA is retreating, and this may have significant impacts on sediment transportation resulting in higher water turbidity and changes to the coastline and onshore landscape.

Coastal squeeze and erosion may be impacting natural habitats and wildlife. The Lagoons Site of Special Scientific Interest (SSSI) at Spurn Point supports breeding little terns (*Sternula albifrons*), which are at risk of losing their nesting habitat. Natural England have recorded the SSSI in 'unfavourable declining' condition, although the Spurn Bird Observatory reported a record number of fledging little terns at Spurn Point in 2023 (Spurn Bird Observatory, 2023). Active habitat management may have contributed to this success, highlighting that future action may need to be undertaken in order to preserve nationally important nesting areas for species along the MCA.

3.5.3 Inshore and offshore change

An MCZ has been implemented within the MCA since 2012. The Holderness Inshore MCZ runs along the coastline from Skipsea to Spurn, extending out to 3 nautical miles (Defra, 2016b). The zone contains a mosaic of habitats which support a diverse range of organisms including European eel (*Anguilla anguilla*), edible crab (*Cancer pagurus*) and encrusting fauna. The designation of the site may have a positive impact on future populations of marine species and their habitat.

Sand eel fishing was once a commercially important industry in the North Sea, prior to its eventual closure in 2024. The East Holderness MCA remains an important spawning and nursery ground for the species, however. The UK Government has recently closed the sand eel fishery in the UK's portion of the North Sea. This closure aims to boost seabird numbers and whilst there may be short term economic impacts

for the fishing industry, there is the potential for long term recovery of sand eels and species that rely on them within the MCA.

Offshore wind farms (Westermost Rough Offshore and Humber Gateway) are a distinctive feature in the skyline and are visible along much of the MCA. These were constructed in 2012 and are clearly visible from the coast.

Renewable energy and carbon capture, utilisation and storage (CCUS) may have a significant impact on seascape character in the future, if above-water infrastructure is required.

Offshore wind operations such as the Hornsea Projects and Dogger Bank are in planning, consented or already under construction in the adjacent MCA. The offshore elements of these structures may impact the perceptual and aesthetic character. Onshore infrastructure may have further impacts along the MCA coast, including the construction of cable landfalls – construction presence is likely to last several years, though longer-term effects of landfalls are more limited.

3.6 MCA 6 Humber Waters

3.6.1 Land use change along the coastal edge

A new National Nature Reserve (NNR), the Lincolnshire Coronation Coast, has been designated east of Cleethorpes. This new NNR merged and extended the existing sites of Donna Nook and Saltfleetby to Theddlethorpe Dunes NNRs. The area is now around 33km² and, contains sand dunes, salt marshes, mudflats and freshwater marshes of international importance. This may have a positive impact on the future management of habitats and populations of species that depend on the habitats (Natural England, 2023).

There are several major habitat creation projects within the Humber, including a 2.5km² habitat creation project near Skeffling for mudflats, saltmarsh and wet grassland. The embankment for managed realignment was completed in spring 2023, and the positive management of the site should have implications for species associated with the MCA as well as changes to the perceptual and aesthetic qualities of the area (Environment Agency, 2018).

New urban and industrial expansions outside of the hubs at Grimsby, Hull, Killinghome and other settlements has increased the extent of man-made character change since the 2012 report. Examples include additional infrastructure at Killinghome ports and Immingham Docks.

Alongside industrial expansion, semi-natural habitat is being protected and created according to the Humber Special Protection Area (SPA) mitigation strategies. The South Humber Gateway Mitigation Strategy east of Grimsby aims to balance the needs of overwintering birds and industrial development (North East Lincolnshire Council, 2019).

Within the Humber there is a drive toward novel CCUS initiatives which may have a direct impact on land use around the MCA and changes in the industrial character of the area.

New onshore wind farms are visible across the skyline in the eastern sections of the MCA (including Out Newton and Bishopthorpe). These are becoming a distinctive feature of the seascape.

3.6.2 Coastal change arising from erosion and depositional processes

The Humber is designated as an international Ramsar site, SAC and SPA. Coastal squeeze and erosion of these habitats may have an impact on species and habitats within the MCA, and may require management interventions which could affect the seascape in the future.

3.6.3 Inshore and offshore change

Updated 5 year mean figures from the British Trust for Ornithology for overwintering birds in the Humber has increased to around 141,614 from 130,000 in 2012, but numbers fluctuate each year (Woodward et al. 2018). The overall trend appears to be positive, but populations of overwintering birds could still be at risk from climate change and habitat changes across the MCA.

The energy company Ørsted has committed to launch the Wilder Humber programme with the Yorkshire Wildlife Trust and Lincolnshire Wildlife Trust, which is a five-year programme aimed at restoring marine habitats. This includes seagrass (*Zostera spp.* primarily) and native oysters (*Ostrea edulis*) (Lincolnshire Wildlife Trust, 2023). There appears to be an appetite for habitat and species conservation from conservation and private sector bodies across the MCA which may have positive impacts on seascape character.

3.7 MCA 7 East Midlands Coastal Waters

3.7.1 Land use change along the coastal edge

There is increasing focus upon nature recovery and conservation with the new Lincolnshire Coronation Coast NNR combining Donna Nook NNR and Saltfleetby to Theddlethorpe Dunes NNR. Other designations throughout this seascape include the Greater Wash SPA which was designated in 2018.

Recreational and educational uses of this seascape are ever increasing in importance and popularity. Cley Marshes opened a new visitor centre in 2015 with an educational centre and green design features and the area attracts more than 110,000 visitors annually (Norfolk Wildlife Trust, 2024).

On the Lincolnshire coast the North Sea Observatory was opened in 2018 which offers visitors the opportunity to learn about the North Sea and use its viewing platforms for bird watching.

There are different changes relating to the historic association of tourism with this seascape (House of Lords, 2019). In Lincolnshire tourism appears to be dwindling, and some seaside towns appear to have declined. Reports show visitor numbers to towns such as Skegness remain less than pre-pandemic levels (North East Lincolnshire Council, 2023). The same effect is not seen in north Norfolk, which has high levels of second home ownership.

3.7.2 Coastal change arising from erosion and depositional processes

Accretion and deposition are apparent along sections of the North Norfolk coastline. At Cley Beach, the shelter next to the car park is slowly being submerged by shingle, with sediment on the water side of the building much higher than the landside. Further up the coast at Wells-next-the-Sea, signs of accretion on the beach can be seen as groynes are becoming increasingly submerged.

Conversely, signs of erosion are also evident throughout much of this area, due to differing geology, coastal topography and coastal processes. Sections of the Peddars Way and Norfolk Coast Path have been diverted at Holme Dunes NNR where dunes are eroding.

Beach nourishment is an important practice along the stretch from Saltfleet to Gibraltar Point, with 400,000 cubic metres of sand deposited each year along a 20km stretch of vulnerable coastline (Environment Agency, 2021a).

3.7.3 Inshore and offshore change

At the time of the 2012 SCA, this seascape was noted for the presence of wind farms and associated visibility of turbines. Since the assessment there has been an increase in the number of wind farms in operation, with views of the Lynn, Inner Dowsing, Lincs, Race Bank, Dudgeon, and Sheringham Shoal wind farms and their extensions. Cable landfall works took place near to Weybourne, Anderby Creek and North Cotes but, following restoration, very little is now visible.

The seascape has historically been associated with fishing. There is now evidence of new aquacultural practices such as seaweed farming, as well as more traditional oyster and mussel farming. Other than floats and vessel movements, little is visible above water of these aquaculture types.

3.8 MCA 8 The Wash

3.8.1 Land use change along the coastal edge

Wildlife protection continues to be a driving force within this seascape with the Greater Wash SPA introduced in 2018 to protect breeding and non-breeding bird assemblages including the largest population of breeding little tern and the second largest aggregation of non-breeding red throated diver in the UK (JNCC, 2018a).

Accommodation and education of visitors has become apparent in this seascape with the opening of a revamped visitors centre at Gibraltar Point in 2016. The centre

has panoramic views of the dunes and sea and is itself a prominent feature of the seascape when facing inland.

Wind turbines can be found along the coastal edge which were not mentioned in the 2012 SCA. At Gibraltar Point there are turbines visible when looking inland. There are also visible turbines at Red House Wind Farm near to Holbeach, and a strip of turbines near Ongar Hill. Two turbines on an industrial park north of King's Lynn are visible from the mouth of the Great Ouse. In most cases the visibility of these features is drastically reduced due to distance and layers of vegetation, however onshore turbines were mentioned at three of the four survey locations.

The further increase of offshore wind developments in MCA 7 has impacted the shoreline of the Wash. The underground cables for the Lincs and Race Bank wind farms land at the mouth of the River Nene. Although their installation involved disruption to the coastal edge, very little is now visible. Further developments may impact and disrupt natural habitats in the future.

3.8.2 Coastal change arising from erosion and depositional processes

During field surveys erosion and deposition processes in the MCA were observed less frequently than other MCAs. In part this is due to the nature of the seascape, with views of the open water often much further away than any viewing platform.

At the east boundary of the MCA at Hunstanton, rockfall can be seen at the foot of the cliffs.

Accretion of saltmarsh habitat occurs in this area, one of the few areas in the UK where the extent of this habitat is increasing (JNCC, 2018b).

3.8.3 Inshore and offshore change

Views of the Lynn, Lincs, Inner Dowsing and Race Bank offshore wind farms are clear from many locations across The Wash MCA, particularly when the weather supports expansive views. In comparison to the 2012 assessment, the density of turbines in the view of this seascape has increased, and the wild character of the Wash.

In the 2012 SCA, it was suggested that The Wash was most notable for edible crab (*Cancer pagurus*) and lobster (*Homarus gammarus*) potting however, anecdotal information from stakeholders cited the most common fishing practices as those targeting cockles (*Cardiidae spp.*), shrimps (*Caridae spp.*) and common whelks (*Buccinum undatum*). The Eastern Inshore Fisheries and Conservation Authority (IFCA) introduced a byelaw in 2023 to further reduce potting in the Cromer Shoal MCZ (Eastern IFCA, 2023). The east marine plan areas account for approximately 40% of English shellfish production via aquaculture, with operations present in the Wash (Eastern IFCA, 2020).

3.9 MCA 9 Norfolk Coastal Waters

3.9.1 Land use change along the coastal edge

Continued loss of residential and holiday properties was evident at Hemsby and Happisburgh. In the current Shoreline Management Plan for these areas, managed realignment is the recommended course of action. This is likely to have socio-economic effects on local communities in the future due to continued erosion.

There are plans for Bacton Gas Terminal to be developed for carbon capture and hydrogen storage. This is likely to directly influence the land use around the existing site, further adding to the industrial character of the area and increasing competing pressures on land use.

Cable landfall sites associated with offshore wind farms have been constructed in the area, resulting in short term disturbance but limited long-term impact on character. Further landfalls may have a significant, if localised and short-term, impact on coastal character.

Industrial use of port space at Great Yarmouth Outer Harbour reflects changing character as a result of new economic opportunities from the processing and handling of the component parts for offshore wind turbines.

Continued change and redevelopment along the river fronts at Great Yarmouth and Lowestoft, evidenced by significant new river crossings opening in 2024.

3.9.2 Coastal change arising from erosion and depositional processes

Coastal erosion has led to land use change across the coastal interface. Damage to infrastructure including public rights of way, roads as well as agricultural land is frequent along the MCA.

The Winterton and Horsey Dunes SAC showed signs of erosion as well as accretion from historic satellite imagery. Such processes may have an impact on important species in the area such as the harbour seal.

Signs of erosion and mass movement of cliffs was evident from field surveys between Happisburgh and Cromer. Elevated cliffs within the MCA showed evidence of degradation, often extending out towards the sea due to mass movement.

Ongoing loss of infrastructure in tourist hotspots because of erosion may reduce visitor numbers, and areas with sea defences may benefit from continued visitors whilst others do not.

The Bacton sandscaping scheme (completed in 2019) has placed 1.8 million cubic metres of sand on the beaches near Bacton with an aim to naturally protect the gas terminal by substantially increasing beach height and width. It is expected that the beach profile and levels will shift and change over time (North Norfolk District Council, 2021).

3.9.3 Inshore and offshore change

A new MCZ was designated in 2016. The Cromer Shoal Chalk Beds MCZ is an inshore site 200m off the North Norfolk Coast. It begins just west of Weybourne and ends at Happisburgh, extending around 10km out to sea. The zone is designated due to the diverse range of flora and fauna it supports including crabs, lobsters, European eel and Parpal Dumplin (*Hymedesmia sp.*) a sea sponge first discovered in 2011) (Defra, 2016a).

The Sheringham Shoal wind farm was recorded in views into the adjacent MCA from Cromer during the field surveys, that the 2012 assessment previously had not highlighted (construction was ongoing and turbines were present at that time).

Proposed renewable energy infrastructure may have a substantial impact on offshore seascape character of the MCA, with offshore wind sites such as the Dudgeon Extension and Norfolk Boreas either under concept/early planning or fully commissioned.

3.10 MCA 10 Suffolk Coastal Waters

3.10.1 Land use change along the coastal edge

Regional changes in character are likely to result from the construction of energy infrastructure along the coast. Examples include the Scottish Power Renewables Maintenance & Operations Base at Hamilton Dock in Lowestoft, and proposed LionLink cable landfall sites at either Walberswick or Southwold, though the latter are less likely to have long-term impacts following construction works.

The construction associated with the proposed new Sizewell C reactor is likely to have a significant local effect on the coastal landscape through expansion of the existing site, additional coastal defences and landing facilities.

Since the 2012 assessment Felixstowe port, just outside the MCA to the south, has been extended by nearly 200m, further increasing the existing container port infrastructure in the region.

3.10.2 Coastal change arising from erosion and depositional processes

Breaches in coastal lagoons sites (e.g. Benacre SAC and Orford Ness SAC) can happen regularly. A breach in the Orford Ness site caused by a tidal surge in 2013 altered the site significantly (Spencer et al, 2015). The saline lagoon systems are ephemeral and prone to natural change. Despite both sites stabilising recently, future pressures from increased storm surges and erosion put the habitat and wildlife in these SACs at greater risk.

The RSPB Minsmere site located along the coastal interface is at risk of erosion. Little Terns nested frequently on the site until the shingle beach at Minsmere became unsuitable due to erosion. Little Terns have since returned to the area but now only nest further inland on artificial habitats (Campbell, 2023).

Erosion is having an impact on recreational access to areas of the MCA. Access along the top of, and at the base of, the cliffs at Dunwich Heath and Beach is restricted due to cliff recession (Bennett, 2024). Further erosion may impact areas along the coastline that are undefended. Infrastructure associated with coastal holiday and caravan parks, such as Kessingland and Benacre, is at risk of erosion and this is likely to impact the visual and socio-economic landscape.

3.10.3 Inshore and offshore change

The addition of Kittiwake towers (artificial bird nesting structures) offshore of Minsmere and Lowestoft, are visible from the coastline.

Despite no current offshore wind farms being clearly visible from the coastline, others are planned or under construction outside of the MCA (i.e. further offshore in MCA 4). Renewable energy infrastructure is likely to have a substantial impact on seascape character in the future. Offshore elements of consented wind farms such as East Anglia Two may not alter the perceptual character of the MCA directly as they will be just outside of the boundary. The construction presence and ships needed to transport the turbines may have a greater visual effect on MCA character.

Major works to deepen the approach channels into the Port of Felixstowe were completed in 2023. Increasing the number of ultra-large vessels navigating the port is likely to have a notable influence on the visual character of the area.

4. Summary and Conclusions

This section provides a summary of the key types of change across the three themes. It also addresses the implications for the 'vision' for the 2014 East Marine Plans.

4.1 Summary of Changes

4.1.1 Land use change along the coast

Built development along the coast takes a number of forms. The expansion of different forms of development has the potential to change coastal character locally, and in some cases more widely. Expansion of urban areas and caravan parks was noted as a localised change in character in several places. Larger scale developments such as industrial infrastructure, ports and harbours are more widespread as well as the proposed construction of the Sizewell C nuclear power plant. The influence of wind farms both onshore and offshore was noted in several places, as well as the impact of ancillary work such as cable landfalls and operations bases.

By contrast, habitat creation schemes were also identified as influential on character, with several schemes aimed at restoring or enhancing saltmarsh and coastal wetlands for the benefit of nature recovery. Associated with this, new tourist facilities and visitor centres support expansion of nature-led tourism in some coastal areas. Changes were also observed to the character of coastal towns. While socio-economic issues are outside the scope of this study, appearances indicate that this is a result of poorly performing local economies. Some locations appeared to be experiencing decline, potentially as a result of wider effects of the Covid-19 pandemic on visitor numbers during lockdowns (Office for National Statistics, 2021). Decline may also be linked to coastal change, with erosion adversely impacting on visitor facilities such as caravan parks and beach access.

4.1.2 Coastal change

The coastal processes of erosion, transportation and deposition around the UK coasts are relatively well understood. Material is eroded from one coastal location, transported in the water, and deposited elsewhere. The soft materials of many of the coasts in the area considered in this assessment, including glacial till and chalk, are particularly susceptible to erosion. Elsewhere, deposition results in features such as the long shingle spit of Spurn Point, and the saltmarshes and mud flats of The Wash. The processes of erosion and deposition are continuous and often incremental but change over time can be clearly observed. Since the Middle Ages, several Holderness villages have been lost to the sea, while the former seaport of King's Lynn now lies several kilometres inland.

Erosion was seen to be affecting the coast in MCA 5 Holderness Coastal Waters, MCA 9 Norfolk Coastal Waters and MCA 10 Suffolk Coastal Waters particularly. The effects of rapid erosion on farmland, infrastructure, housing and visitor infrastructure were observed. Erosion was also noted to have affected natural features and habitats, with impacts on nature reserves. Although the impacts of erosion on the

coast are clear, the overall rate of erosion has not changed substantially since the 2012 assessment, and therefore the change in character is more limited. Erosion remains a key characteristic of the Holderness and north-east Norfolk coasts.

Coastal squeeze is an issue that was noted in several locations. This occurs where areas of natural coastal habitats are confined by human infrastructure on their landward side, while experiencing erosion from the sea. It can lead to loss of biodiversity at coastal margins, particularly in the face of rising sea levels. If habitats such as saltmarsh are lost, there would be a significant change in coastal character.

The human response to erosion has historically been to prevent coastal loss with hard defences such as sea walls. These were observed along many of the coastal settlements in the area. While some defences remain robust, others have been eroded and undermined. More recent approaches include the use of 'soft' sea defences to resist coastal erosion using natural materials rather than concrete. This includes the Sandscaping scheme at Bacton and the ongoing beach nourishment along the Lincolnshire Coast, seeking to replenish material lost through natural erosion. Although these approaches do not involve construction of hard defences, they can still result in changes in character, for example during construction works or by increasing beach width and height.

Shoreline Management Plans set out a series of management approaches to coastal change. The approaches being applied in the east marine plan areas are (Environment Agency, 2024):

Hold the line: *“maintain or upgrade protection from flooding or erosion by holding the shoreline in broadly the same position”* – this approach is being applied within the east inshore marine plan area along the frontages of settlement and industry, as well as along areas of significant habitat, which require protection from further loss.

No active intervention: *“maintain or encourage a more natural coastline, which may involve discussing adaptation to the risk from flooding or erosion”* – this approach is being applied along sections of coast such as Holderness and in parts of Norfolk, essentially allowing erosion to take its course.

Managed realignment: *“change the position of the shoreline in a controlled way, such as by slowing erosion or creating areas of habitat to help manage flooding”* – this approach is being applied along sections of the north Norfolk coast, where active management will create flooded areas that themselves act as a barrier to further loss.

Shoreline Management Plans set out the likely approach to coastal management up to 2105, though they remain live documents under review. Both the 'no active intervention' and 'managed realignment' approaches could lead to significant changes in the coast and in seascape character in the longer term. The Shoreline Management Plan is therefore likely to set the basis for ongoing change within each area.

4.1.3 Inshore and offshore change

A number of new MPAs have been designated (marine conservation zones (MCZs)) within the east marine plan areas since 2012. Although they do not directly affect seascape character, the presence of the designations and their associated management measures in some cases influences marine activities, such as fishing activity (for instance bottom towed gear is restricted in Dogger Bank SAC²) and species recovery. Fisheries or fishing practices are restricted within some MPAs or more generally, as with the closure of the sand eel fishery. Other changes in fishing activity may be related to spatial shifts in species distribution or to displacement from other activities. Novel activities observed in the area included seaweed farming.

The southern North Sea, within the east offshore marine plan area at MCA 1 Dogger Bank, MCA 2 Dogger Deep Water Channel, MCA 3 East Midlands Offshore Gas Fields and MCA 4 East Anglian Shipping Waters, has been exploited for its natural gas reserves since the 1960s. This resulted in a number of static offshore platforms being present where previously only passing vessels would have been visible. Most of these are some distance offshore, at least 30km, and are not generally seen from the coastline. The undersea pipeline network connects them to onshore facilities such as Easington and Bacton, which are large industrial facilities and do have a coastal presence in the area. Several platforms have been decommissioned in recent years, though as noted in the analysis, the physical structures often remain in place for some time afterwards.

While oil and gas exploration continues in this area, the focus of offshore energy has shifted to wind farms. In 2012, there were four offshore wind farms in the study area. There are now around fifteen wind farms in operation, with others under construction and several more planned. Earlier schemes are located closer to shore, in the area between Norfolk and Lincolnshire and south-east of Suffolk. Offshore wind turbines have become substantially larger over this period, from 108m in height at Scroby Sands (2004), to those around 260m in height which are currently being installed at Dogger Bank. The wind farms have also been positioned further offshore, and while some are still visible from shore, others such as Dogger Bank cannot be seen by coastal observers. Nevertheless, the scale of these wind farms exerts a widespread influence which has altered seascape character in several areas. One form of mitigation employed by recent offshore wind farm projects is the installation of structures to provide artificial nesting sites for affected birds, which have a more localised influence on character.

Offshore cables associated with wind farms and interconnectors have less influence on character once complete, although construction of cable landfall sites can have substantial effects on the seascape. Similarly, other offshore activities were noted in the analysis, such as seabed carbon storage, but with an uncertain future influence on character. Limited changes to shipping were noted, other than an intensification of large vessels around Felixstowe, associated with upgraded port infrastructure.

2

https://assets.publishing.service.gov.uk/media/62569be5d3bf7f6002963937/Dogger_Bank_SAC_Byelaw.pdf

4.2 Conclusions

This final section of the report reflects on how the observed changes in the seascape can inform an understanding of the performance of marine planning policies, in the context of the vision for the east marine plan areas. It also considers how seascape planning policies can be enhanced within the forthcoming replacement of the East Marine Plans.

4.2.1 Analysis of current policy

Analysing change in the east marine plan areas' seascape reveals that current seascape policies appear to be influencing the seascape character across the area. The increase in offshore wind farms has a significant influence across the area. Offshore wind energy is itself seen as a key part of the East Marine Plans 2014 vision, but it is clear that the potential to affect seascape character must also be considered. The presence of a policy regarding seascape within the East Marine Plans has ensured that this matter is considered in the selection and appraisal of offshore wind projects. Newer, larger wind farm proposals have been planned further offshore than the earlier, smaller wind farms. There is recognition that very large offshore wind farms can have adverse effects on sensitive coastal landscapes, and this has been addressed in developer decisions. For example, the recent reduction in the extent of the proposed North Falls Offshore Wind Farm in MCA 4, to increase distance to the Suffolk and Essex Coast and Heaths National Landscape (North Falls, 2023).

Resources published by MMO since 2012, such as Visual Resource Mapping (VRM) and seascape sensitivity guidance, appear to be contributing to the consideration of seascape in coastal and marine development decisions. MMO has completed VRM for the whole English coastline.³ This demonstrates visual interrelationships between sea and land, helping to understand sensitivities in the marine and coastal environment. In 2020 MMO published additional guidance on [assessing the sensitivity of seascapes to development](#), which can be applied either at a site level or to an area more widely. In Suffolk, a seascape sensitivity assessment undertaken using this MMO guidance document is now available (White Consultants, 2020). Other local seascape character and sensitivity assessments are likely to become available. It is recommended that references to these documents should be added to future seascape policies. Consideration should be given to encouragement of wider adoption of local-scale seascape character and sensitivity assessments, particularly in relation to more sensitive coastlines.

4.2.2 Considerations for future policy

The analysis presented in this report suggests that many types of change tend to be incremental rather than wholesale. That is, they emerge from ongoing processes as well as numerous small-scale changes. These incremental changes in many cases amount to no overall change in seascape character. Instead, they can be seen as a reinforcement or continuation of existing characteristics. This is particularly the case

³ Available in the seascape character assessment reports for the North-east, North-west, South-west and Southeast marine plan areas.

with onshore land use, where changes tend to be small-scale and localised. When considering such change in terms of policy, the localised nature of impacts on seascape character is unlikely to be a determining influence on decision making. However, policy should recognise the potential for many small changes to have cumulative effects on seascape character.

The change analysis presented here highlights areas in which seascape policy could be strengthened in the new East Marine Plan. Firstly, larger scale onshore developments were identified to have influenced seascape character more widely, though there appear to be few, if any, examples of large-scale proposals that are incompatible with the underlying seascape character. The analysis also identified changes that were clearly positive, for example those resulting from habitat creation initiatives. There may be opportunities for seascape policy to positively encourage this type of change. For example, with regards to larger-scale development proposals, the hierarchy set out in current seascape policy in the original East Marine Plans (SOC3) could be augmented in the new East Marine Plan with reference to the types of positive change that could be incorporated into proposals to mitigate or offset their adverse effects.

The impacts of coastal processes, particularly erosion, are frequently cited in this study, but may be more difficult to link to the application of seascape policy. Generally, patterns of erosion have not changed in the period between the two SCAs considered here. For example, MCA 5 Holderness Coastal Waters was as equally defined by erosion in 2024 as it was in 2012. Despite this, coastal processes such as erosion remain intricately linked with seascape. For example, large coastal infrastructure developments are prominent seascape features of many of the MCAs considered here (e.g. Bacton Gas Terminal in MCA 9 Norfolk Coastal Waters). Decisions to protect these features from erosion have demonstrable impacts on seascape and its future evolution. Additionally, the impacts of erosion on communities can be significant, with the loss of homes and tourist facilities. While the impacts of erosion are primarily socio-economic in nature, this change analysis illustrates the tight coupling between coastal processes and seascape. In the future, seascape policy could better reflect these inter-relationships. This could be through specific policies in support of appropriate coastal defences and/or managed realignment, or more generally by strengthening the link between seascape character and shoreline management, so that proposals need to take cognisance of effects on character.

This study has identified that there are opportunities to strengthen and refresh marine plan policies on seascape within the forthcoming replacement East Marine Plan. However, overall, these policies appear to be functioning positively, in that changes observed within the east marine plan areas are in line with the vision set out in the original East Marine Plans.

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Annex 1: General Methodology for Understanding Seascape Change

Any approach to understanding change in seascape character needs to be clearly grounded in established approaches. Natural England's Approach to Seascape Character Assessment (Natural England, 2012) sets out a method for identifying and describing seascape character. The full set of Seascape Character Assessments (SCAs) published by the MMO present a comprehensive description of the seascapes across English waters and serve as a baseline against which change can be monitored. The existing SCA methodology does not extend to analysing changes in the seascape or how to monitor change over time. Applying the same methodology in all SCAs can inherently inform whether a seascape has changed. As such, this methodology highlights aspects of the SCA that are used in analysing seascape change.

The methodology is split into two main sections:

Section A1: methods to understand and describe change, including stakeholder engagement.

Section A2: optional, additional sources of information, or approaches that may help to convey findings to a range of audiences.

For each sub-section, we highlight the corresponding section of this report.

A1. Work to understand and describe seascape change

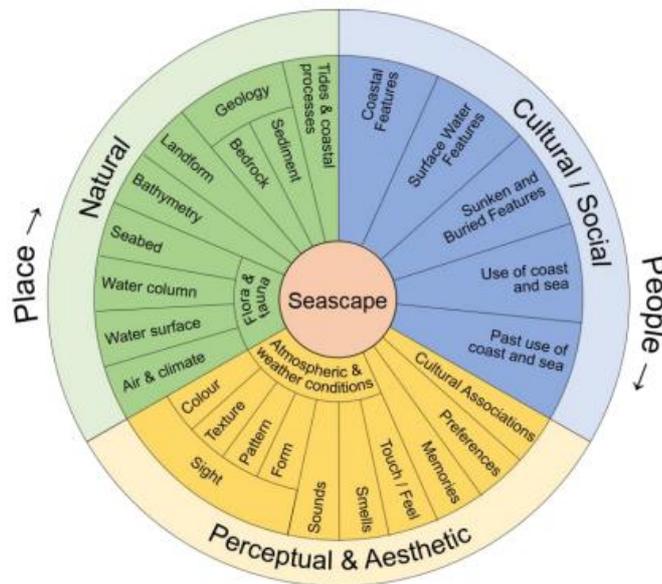
A1.1 Desk-based assessment

The first, desk-based, stage involves gathering relevant information including literature, datasets, historic plans and strategies to inform the work and provide a baseline. Information from the existing SCA will be a key reference source, along with any more detailed local scale SCAs within the study area. The existing SCA documents will form the baseline against which change can be assessed. The baseline data used for the existing SCA should be reviewed, and updated iterations of the same datasets should be acquired.

The data and literature can be categorised according to the three key themes of the 'Seascape Wheel' (Figure 1): natural, cultural/social, and perceptual & aesthetic. The structure provided by the Seascape Wheel provides a helpful framework for character assessment, and by extension for considering change. This is both in terms of organising and presenting information and ensuring that complex relationships between different influences are acknowledged. The Seascape Wheel can be a useful tool to organise information even where an updated SCA is not being carried out.

Refer to Section 2.1 of this report.

Figure A1: The Seascape Wheel (Natural England, 2012).



(Adapted from Natural England (2012), Figure 1, page 9)

A1.2 Collation of information

Information sources to analyse physical changes in the seascape include both spatial and non-spatial data such as satellite imagery, historical maps, and remote sensing technologies. Information on coastline alterations, land-use changes, and human activities impacting the marine environment should also be included. This could include a review of literature on seascape, using both scientific papers and 'grey' literature, environmental reports, and other relevant studies to understand past research findings and methodologies.

Understanding historical patterns can also provide context for current seascape transformations. As such, historical records and archival research may help to identify past human interventions, coastal developments, and environmental changes over the longer term.

Refer to Section 2.1.3 of this report.

A1.3 Mapping and GIS

Where geospatial datasets are available, Geographic Information System (GIS) tools to create maps that visually represent seascape changes should be utilised. A range of important data layers include coastal erosion, habitat loss, and human activities to identify trends and hotspots. Annex 2 to the Seascape Character Assessment guidance presents a potential data list that can be used as a starting point.

Refer to Section 2.1.3 of this report.

A1.4 Field survey

Field surveys provide the opportunity to simultaneously verify the ‘natural’ and ‘cultural/social’ themes identified in the desk-based assessment, as well as record qualitative ‘perceptual and aesthetic’ themes such as sight, sound and smell that otherwise would not be possible from desk-based work. Surveys are an essential part of seascape change analysis.

To carry out surveys of both inshore and offshore areas, a combination of land-based and boat-based surveys are usually required. However, circumstances such as timing and weather may make the latter more difficult to achieve for all projects. Dynamic changes are likely to be concentrated in inshore areas, therefore inshore, land-based surveys should be prioritised over offshore boat-based surveys.

Land-based surveys consist of several field survey points in each survey area. Survey points can be selected through data analysis, literature, and satellite imagery to determine areas that have the potential to illustrate the greatest amount of change. Coverage of survey locations should be sufficient to inform an understanding of each seascape character area or seascape character type. The limitations, if any, of survey point selections should be described.

Where previous survey information is available, it is recommended that further surveys be carried out from the same land-based locations, where information such as grid references and photographs allow. This will provide a direct temporal comparison of those seascapes and readily highlight any change.

Refer to Section 2.1.3 of this report.

A1.5. Stakeholder Engagement

Engagement with stakeholders, who may include local communities, fisheries, environmental agencies, local authorities, and others, can provide the qualitative insights into observations and experiences of seascape changes. Documenting traditional knowledge and local perspectives, and in particular any trends can inform the understanding of change. The process of stakeholder engagement allows for more information on perceptual and aesthetic qualities to be gauged to supplement the findings from the field survey work.

Refer to Section 2.1.4 of this report.

A2. Additional elements to be considered

Although not essential for the study of change in seascape character, and not undertaken as part of the present commission, some or all of these elements could provide relevant data. This could be as part of an ongoing monitoring programme or to inform analysis of specific changes.

A2.1. Public Awareness Campaigns

Outreach programmes could be established to raise awareness about seascape and seascape change, their causes, and potential impacts. Educate the public on sustainable practices and encourage community involvement in preserving marine environments.

A2.2 Policy Recommendations

Based on the findings, collaborate with policymakers to review existing policies and draw up amendments aimed at mitigating the effects of processes observed to be adversely affecting seascape character. Advocate for sustainable coastal management practices and conservation initiatives.

A2.3 Continuous Monitoring and Adaptation

Future-proof the methodology by establishing a framework for continuous monitoring and adaptation. Regularly update methodologies based on new technological advancements, scientific discoveries, and emerging environmental concerns to ensure the relevance and accuracy of the study. This could include any or all of the following:

Environmental Monitoring

Incorporate information from ongoing monitoring programs using buoys, sensors, and other technologies to track water quality, temperature, and biodiversity changes. Long-term data collection can provide valuable insights into dynamic environmental shifts.

Ecological Surveys

Similarly, ecological surveys to assess the health of marine ecosystems can inform an understanding of seascape change. This could include biodiversity assessments, fish population studies, and the monitoring of key indicator species to gauge the overall ecological balance.

Modelling and Forecasts

Predictive models using collected data could conceivably be used to forecast potential future seascape changes. Scenarios involving climate change, sea level rise, and anthropogenic activities could be considered in order to anticipate possible outcomes.