Marine
Management
Organisation

Socio-economic Baseline for the east marine plan areas

(MMO1381)

...ambitious for our seas and coasts

MMO1381: Socio-economic Baseline for the east marine plan areas, March 2024

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Contents

1. Executive Summary

The marine planning system in England is strategically important in contributing to the sustainable development of its marine area, whilst delivering on the core objectives set out in the UK's Marine Policy Statement (MPS) for promoting sustainable economic development, contributing to societal benefits and ensuring a sustainable marine environment. Eunomia Research & Consulting was commissioned by the Marine Management Organisation (MMO) to provide a socio-economic baseline review of the marine sectors and coastal communities of the east marine plan area, in order to inform the next iteration of the East Marine Plan. In addition, the study describes the social and economic drivers for the east marine plan areas over the next 20 years, analyses people's perceptions of the marine environment and how they benefit from it, and briefly outlines how changes to the socio-economic baseline could be attributed to the East Marine Plan itself.

The geographic scope of the east marine plan areas, shown in Figure 1 below, is between Felixstowe, in Suffolk, and Flamborough Head, in Yorkshire. The MMO1001a[1] approach was adopted to define how far inland the geographic scope of the socio-economic baseline reaches – this was defined as 10km inland from the low water mark. Using this method, a total of 1,331 Lower layer Super Output Areas (LSOAs) were included in the geographic reach of the east marine plan areas.[2] The area was then divided into five coastal stretches to allow for an analysis of how the socio-economic and demographic characteristics of the area vary along the coast.

Figure 1: Geographical area of the east marine plan areas

he 15 marine economic sectors included in this study are[3]:

- Marine aggregates
- Aquaculture
- Commercial fishing
- Defence and national security
- Dredging and disposal
- Ports
- Energy – Renewables
- Energy – Carbon Capture, Utilisation and Storage (CCUS)
- Energy – Nuclear
- Energy – Oil and Gas
- Marine recreation
- Shipping
- Subsea telecommunications cabling
- Coastal tourism
- Wastewater treatment

The research team used three principal methods of research to collect and analyse quantitative and qualitative data: a literature review, stakeholder interviews, and stakeholder surveys. The three principal economic metrics used to characterise each

[1] MMO (2011) 'MMO1001a: Maximising the socio-economic benefits of marine planning for English coastal communities.' Available at: Link.

[2] Representing 3.83% of all LSOAs in England.

[3] Based on those highlighted in the Marine Policy Statement and those included in the 2014 East Inshore and East Offshore Marine Plans.

marine sector were Gross Value Added (GVA), employment and number of businesses, with data on other indicators collected too to describe each sector. In the literature review, data was collected from sources such as the Office for National Statistics (ONS), Business Register and Employment Survey (BRES), ONS Enterprise Accounts, Government reports, industry reports and databases and Local Authority reports.

The 15 marine sectors in the east marine plan areas were estimated to generate a combined GVA of £27.8bn and employ over 126,000 people. In GVA terms, the renewable energy sector is the largest (£19.5bn) followed by the oil and gas sector (£4.6 bn), whilst the aquaculture (£2.6m), commercial fishing excluding fish processing (£24m) and marine recreation (£57m) are the smallest. In terms of employment, the renewables sector is again the largest, employing an estimated 59,000 people, whilst the next largest are coastal tourism (~23,700), ports (~13,500), and oil and gas (~11,600). [4] The number of businesses in each sector was difficult to estimate and was only possible for seven of the sectors.

Table 1 below shows the estimates for GVA, employment and number of businesses for all 15 sectors:

Table 1: Key economic indicators for all marine sectors in the east marine plan areas

	GVA (£ million)	Direct employment (FTE)	Number of businesses
Aggregates	127	148	7
Aquaculture	2.6	207	31
Commercial fishing–-fishing	24	286	
Commercial fishing – fish processing	474	5,722	63
Defence and National Security			
Dredging and disposal			
Ports	413	13,496	
Energy – Renewables	19,520	59,000	116
Energy – Nuclear	720	7,605	
Energy – CCUS			
Energy – Oil and Gas	4,608	11,617	131
Marine recreation	57	1,345	350
Shipping	131	1,394	
Subsea telecommunications cabling			
Coastal tourism	854	23,685	
Wastewater treatment	358	1,000	3

[4] GVA and employment were not able to be estimated for the following sectors: Defence and National Security, Dredging and Disposal, Energy – CCUS, and Subsea telecommunications cabling.

Using data at the LSOA level, the east marine plan areas has a population of 2.23m, an estimated GVA of just under £52bn and a GVA per person of £23,256. The S2 stretch from Lowestoft to Felixstowe has the highest estimated GVA per person (£25,860) whilst the S1 stretch from Wells-next-the-Sea to Great Yarmouth has the lowest (£16,836).[5] Compared to England overall, the east marine plan areas is characterised by an older population with a higher proportion of White people (+12.2% points), a higher proportion of people with no qualifications (+4.6% points), a higher proportion of economically inactive (+3.6% points) and retired (+5.1% points), and a lower proportion of people identifying as being in 'very good health' (-5.6% points). The east marine plan areas also have a higher proportion of households deprived in 1 or more dimensions (either education, employment, health or housing) than England. The relatively low GVA per person of the east marine plan areas (from ONS data) is consistent with a 2023 report by Pragmatix Advisory which found that household income in coastal areas is almost £3,000 lower than in non-coastal areas.[6] Stretch S1 has the highest percentage of 65+ year olds (28.8%) by quite some margin, whereas stretch N1 from Bridlington to north of the River Humber has the lowest (21.1%).

The east marine plan areas also contain a wealth of heritage assets[7]. Natural assets in the area include unique wetland ecosystems in the Wash, and salt-marsh, sandy beaches and cliffs in the Norfolk coastline. Historic sites (assets) along the coastline include castles such as Skipsea Castle and Baconsthorpe Castle, and abbeys such as Thornton Abbey and Creake Abbey. The Humber, meanwhile, has a rich maritime heritage deeply intertwined with industry and trade which generates significant social and economic benefits.

Drawing from surveys and reports on people's access to and perceptions of the natural environment, as well as the benefits they derive from it, the study found that getting fresh air and physical health and exercise were the main reasons for people taking a visit to a green and natural space. In one survey run by Natural England and Defra, around 30% of adults said they spent time by rivers and 25% of adults said they spent time by beaches during the last month.[8] Coastal areas are attractive environments for recreation, being associated with relaxation, and spending time with family and friends. Seascapes generate a range of feelings associated with the sense of place among coastal residents, including being restored and connected to nature. However, real and perceived barriers to visiting coastal locations include feelings of anxiety (such as children getting lost or drowning), dirty and poorly maintained beaches, and inadequate transport provision and facilities (such as toilets and changing rooms) on the coast.

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[5] It is important to note that GVA per person is not a measure of regional productivity as it includes the economically inactive population.

[6] Pragmatix Advisory (2023) 'Communities on the edge: Assessing the need for Levelling Up in England's coastal authorities.' Available at: Link

[7] Elements of the historic environment such as buildings, monuments, landscapes and seascapes that have been identified as holding a degree of significance.

[8] In the April 2022-March 2023 period.

Estimating what changes to the socio-economic baseline of the area can be attributed to the East Marine Plan was not possible in this study. To do so requires isolating the socio-economic impacts that arise from marine planning from the socio-economic impacts that arise from other ‘external’ factors such as macroeconomic changes, demographic changes, and market forces. There is also a lack of a suitable control scenario that can quantitatively estimate changes to the baseline attributable to marine planning. Indeed, MMO’s Approach to Monitoring states that for some outcomes it will be challenging, if not impossible, to assess whether the change can be attributed solely toward marine plans. However, the socio-economic baseline information collected in the current study is of relevance and can be used to inform the progress of some of the indicators in MMO’s approach to monitoring, such as indicator 11 (Marine industry growth related to the sustainability and diversification of the sector) and indicator 13 (Office for National Statistics sectorial employment statistics derived from marine activity SIC codes), among others.

2. Introduction and Scope

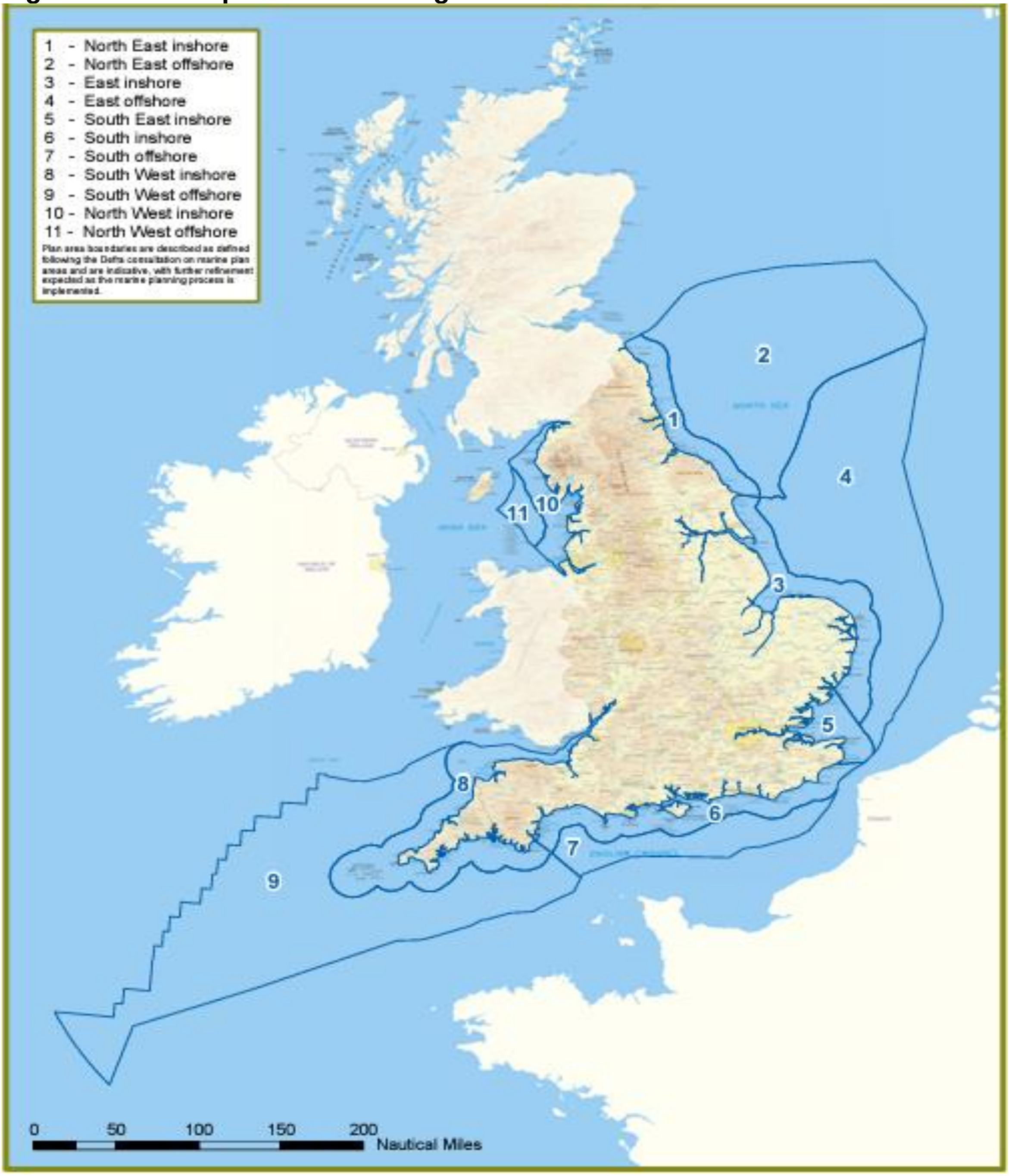
2.1 Context

Marine Plans formulate and present a vision, objectives, and policies for marine plan areas, and are a strategically important component of the marine planning system in England. Marine planning was introduced to provide structure to a management system that was previously ad hoc, inconsistent and incoherent.[9] Marine Plans are designed to balance environmental and economic impacts by considering cumulative impacts and promoting sustainable practices. They also manage conflicts and complementarities between different marine sectors to achieve enhanced integration and functioning of activities within the east marine plan areas.

There are 11 marine plan areas in England: North East (Inshore and Offshore), East (Inshore and Offshore), South East Inshore, South (Inshore and Offshore), South West (Inshore and Offshore) and North West (Inshore and offshore), each of which has their own Marine Plan. These areas are shown in Figure 2.

[9] Defra (2010) 'The Marine Planning System: Impact Assessment'. Available at: Link

Figure 2: Marine plan areas in England



The East Inshore and Offshore Marine Plans were combined into a single plan document and published in 2014.[10] As part of the evidence base required to inform the second iteration of this marine plan, the Marine Management Organisation requires a socio-economic baseline of the area. This baseline provides an understanding of the economic value and contribution of the principal marine sectors in the east marine plan areas, as well as their social impact and influence. Marine planning must take into account future developments, and therefore an additional requirement of this socio-economic baseline is to describe the social and economic

[10] Defra (2014) 'East Inshore and East Offshore Marine Plans'. Available at: Link.

drivers over the next 20 years in the east marine plan areas, on a sector-by-sector basis. The baseline also provides an overview of the coastal communities relevant to the east marine plan areas, including key social and economic indicators used to characterise the communities.

2.2 Objectives

There are four primary objectives of this socio-economic baseline of the east marine plan areas. They are to:

1. Provide a socio-economic baseline review for i) marine sectors and ii) coastal communities of the east marine plan areas
2. Identify any critical gaps and uncertainties in the available socio-economic baseline and recommendations to fill the gaps.
3. Describe the social and economic drivers for the east marine plan areas over the next 20-year period and provide recommendations of where Marine Plans could add value to the east marine plan areas.
4. Recommended ways in which marine planning can measure changes to the socio-economic baseline that can be attributed to Marine Plans.

2.3 Project Scope: The Geographical Area Covered

The geographic scope of the east marine plan areas is between Felixstowe, in Suffolk, and Flamborough Head, in Yorkshire. The inshore limit extends from Mean High Water Springs mark until the seaward limit of the territorial sea (approximately 12 nautical miles), whilst the offshore limit extends from the seaward limit of the territorial sea out to the boundary of the Exclusive Economic Zone. In order to define which specific coastal communities to be associated with the east marine plan areas (how far inland the geographic scope of the socio-economic baseline reaches) we adopted the approach of MMO1001a[11], using Lower layer Super Output Areas (LSOAs) as the base geographical unit, extending 10km inland from the low water mark[12]. This inland extent is shown below in Figure 3.

On its southern boundary, the east inshore marine plan area meets the port of Felixstowe. However, the east inshore marine plan area boundary ends at Landguard Point, so that the bay and River Orwell, are outside of the east marine plan areas. This is an important point, as the port of Felixstowe is located on this river mouth, whilst the River Orwell continues to the town and port of Ipswich. Using the mapping methodology described above, LSOAs in the towns of Felixstowe and Ipswich are included in the analysis. The East Inshore and East Offshore Marine Plans of 2014[13] notes that reporting areas do not have a defined geographical boundary and that rather the area differs depending on the issues being considered. Therefore, for key

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[11] MMO (2011) 'MMO1001a: Maximising the socio-economic benefits of marine planning for English coastal communities.' Available at: Link.

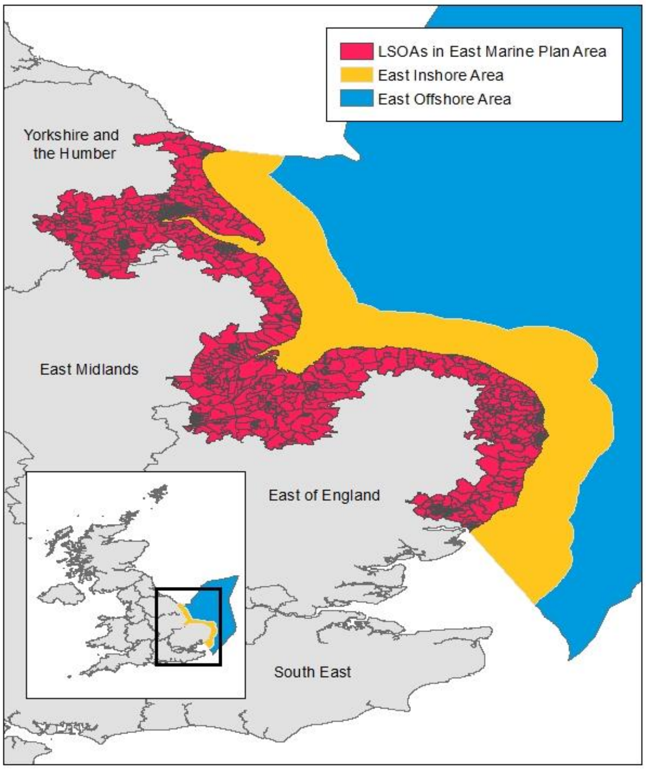
[12] The full criteria used to draw the boundary are outlined on page 8 of the MMO1001a study.

[13] Defra (2014) 'East Inshore and East Offshore Marine Plans'. Available at: Link

socio-economic indicators used to characterise coastal communities relevant to the east marine plan areas, Felixstowe and Ipswich have also been incorporated. The towns have also been incorporated for sectors like recreation and tourism, where, for example, boats moored in Ipswich harbour use waters within the east marine plan areas for recreational purposes. However, in the case of the Ports sector, which involves terrestrial based activities, they have not been included, as the port of Felixstowe (where relevant activities to the sector are carried out) lies in the bay on the mouth of the River Orwell, a stretch of coastline not included in the east marine plan areas.

In total, 1,331 LSOAs were included in the coastal geographical reach of the east marine plan areas.

Figure 3: Geographical area of the east marine plan areas



2.4 Project Scope: The Sectors Covered

The 15 marine economic sectors included in this study are based on those highlighted in the Marine Policy Statement[14] and those included in the 2014 East Inshore and East Offshore Marine Plans[15]. These are as follows:

- Marine aggregates
- Aquaculture
- Energy – Nuclear
- Energy – Oil and Gas

[14] HM Government (2011) 'UK Marine Policy Statement'. Available at: Link

[15] HM Government (2014) 'East Inshore and East Offshore Marine Plans'. Available at: Link

- Commercial fishing
- Defence and national security
- Dredging and disposal
- Ports
- Energy – Renewables
- Energy – Carbon Capture, Utilisation and Storage (CCUS)
- Marine recreation
- Shipping
- Subsea telecommunications cabling
- Coastal tourism
- Wastewater treatment

In addition to these, section 5, which describes the east marine plan areas in socio-economic terms and describes the social benefits and impacts of these economic sectors, includes a section on the heritage (assets) sector.

3. Methodological Approach

Evidence collection and analysis (quantitative and qualitative data, policy information and literature) for this assessment took place over three stages. First, a traditional (narrative) literature review of existing data and literature took place, with the aim of establishing the economic baseline of the east marine plan areas. An initial scope of the social dimensions of this assessment was also carried out. Quantitative and qualitative data was gathered, mostly through grey literature, and analysed in MS Excel for key themes, such as economic indicators and current/future opportunities/challenges, using a thematic analysis. The next stage involved interviewing key stakeholders in priority sectors.[16] This exercise sought to fill any significant evidence gaps, and gather additional data particularly on the social aspects of the assessment. The third and final stage involved sending surveys out to the remaining sectors as a final validation and evidence gathering exercise.

3.1 Key Indicators

The first stage of data collection primarily sought to identify three economic metrics for the 15 sectors included in this report. These are Gross Value Added (GVA), employment and the number of businesses. The definitions of each of these metrics are given below.

<u>Gross Value Added (GVA)</u>

GVA is an economic metric used to describe the economic output of a sector or geographical area. GVA is equal to the value of goods and services that have been produced, less the cost of all inputs and raw materials that are directly attributable to that production.[17] GVA can be calculated using three different approaches – the income approach, the production approach, and the expenditure approach. The income approach measures the total income generated by the production of goods and services within the economy. The production approach measures the total value added via the production of goods and services within the economy. The expenditure approach measures the total expenditures on all finished goods and services

[16] Priority sectors were identified during the initial scoping of the project and were rescoped throughout, in line with consultation by the MMO – see section 3.3 for more detail.

[17] UK Government (2014) 'Productivity measured by Gross Value Added'. Available at: Link

produced within the economy[18]. The Office for National Statistics (ONS) uses both the income and production approaches to calculate the GVA, and the income approach for regional and sub-regional estimates.

Employment – Direct vs Indirect

In this assessment, direct employment generally refers to labour used for the production of a good or service to fulfil the demand for that good or service. Indirect employment refers to labour used to produce the goods and services ultimately required by labourers in direct employment (i.e. upstream supply chain jobs). For example, in the production of wind turbines, direct employees are those that manufacture the wind turbines, whereas indirect employees are, for example, employees at the steel mill that supplies steel to the wind turbine factory, and employees at a factory that make the screws used in wind turbines. For some sectors where a variation of these definitions was used, this is outlined in their respective sections.

Employment – Full-Time Equivalents (FTEs)

Where possible, direct and indirect employment are identified in terms of Full-Time Equivalents (FTEs). This is defined by the Government Statistical Service[19] as:

> *"a unit to measure employed persons in a way that makes them comparable although they may work a different number of hours per week. The unit is obtained by comparing an employee's average number of hours worked to the average number of hours of a full-time worker. A full-time person is therefore counted as one FTE, while a part-time worker gets a score in proportion to the hours he or she works. For example, a part-time worker employed for 20 hours a week where full-time work consists of 40 hours, is counted as 0.5 FTE."*

Whilst this is a useful metric for comparability, it is worth noting that for some sectors it is not a reliable measure of future outlook. For example, the energy sectors have higher FTE employment during the construction phase of a project, however, the number of FTEs will likely decrease following completion. Sectors such as tourism, on the other hand, will see more consistency in FTE employment over time.

Number of businesses

The types of businesses that fall within each sector will vary from sector to sector, with some such as coastal tourism having a wider scope and others such as nuclear energy having a smaller scope. However, the best publicly available figures for number of businesses have been used for each sector, to give an approximate indication of number of businesses for each, with businesses indirectly involved in the sector generally excluded (e.g. equipment manufacturers for the shipping sector).

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[18] ONA (2023) 'Gross domestic product (GDP), UK regions and countries QMI'. Available at: Link

[19] Government Statistical Service (2018) 'Harmonised Definitions for Business Data Variables'. Available at: Link

3.2 Review of Existing Data and Literature

The research team collected all of the data included within this assessment on a sector-by-sector basis. Each sector was scoped using professional judgement, drawing on guidance from previous MMO marine plans and knowledge of the presence of activities within the east marine plan areas. All data was collated into a single database for analysis, and included data from:

- Office for National Statistics (ONS);
- Business Register and Employment Survey (BRES);
- ONS Enterprise Accounts;
- Government reports;
- Local Authority reports; and
- Industry reports.

The raw data was then reviewed and selected based on applicability to the relevant economic metrics.

In most cases, employment and number of businesses were identified using BRES data accessed through the Nomis database. Relevant Standard Industrial Classification (SIC) codes were selected and apportioned for each sector, according to the guidance set out in MMO 1075.[20] The LSOA codes identified through the GIS mapping exercise were used as the geographical boundary for each data query. In some cases, definitions between sectors varied, and so this method was not always possible. For example, the wastewater treatment sector only included water utility companies within the scope of businesses, rather than small-scale commercial wastewater treatment companies. In this case, alternative data sources, such as industry reports, were used to identify the number of businesses.

GVA data was mostly calculated by apportioning UK-wide GVA figures by employment in the east marine plan areas. In some cases, other relevant economic metrics were used to apportion GVA (e.g., for shipping, port freight tonnage and number of passengers were used). UK-wide GVA figures were identified through industry and government reports.

The method and data sources used for each key economic indicator are shown in the sector analyses. Once all of the key economic indicators were identified, a confidence rating was assigned to each data point. The confidence rating system used within this assessment is taken from MMO1050[21], and a detailed description is given in table 2. Ratings range from 1 to 3, with 1 being the lowest confidence level and 3 being the highest. In cases where insufficient data was available to assess the confidence level, the source was given a rating of 0.

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[20] MMO (2014) 'Exploring the Potential of Using Office for National Statistics (ONS) Data for Marine Planning '. Available at: Link

[21] MMO (2013) 'Economic baseline assessment of the South Coast'.

Table 2: Overall confidence assessment ratings

Rating	Confidence	Definition	Potential Considerations
0	Unable to quantify	Insufficient detail is available to assess our confidence in the data.	• The data will not be used as the basis for decision making.
1	Low	Low confidence in the data. The decision maker must be aware that there are limitations to the use. Further investigation will be required.	• The techniques and methods used may not be the accepted, best practice method. • Incomplete or no metadata • Lack of clarity as to whether the data is measured, modelled, predicted or estimated. • Lack of clarity as to when the data was recorded, and over what period. • More up to date versions may be available that result in a low confidence in this set. • Data may not be accurate to the geographical boundaries of the east marine plan areas. • Dataset may not encompass all activities within the sector. • Data source is over five years old.
2	Moderate	Good quality data but may lack internal quality assurance, full documentation of methods, and have inaccuracies.	• Research methodology published but we are unable to determine if this followed "best practice" or was considered "standard" by professionals in that field. • Data is modelled, predicted or estimated with details of such procedures provided. • Data is measured but precision is low or unclear. • Some date information is provided but may be incomplete. • Some quality control information published at the point of data collection and/or during data processing. • Data is reasonably accurate to the geographical boundaries of the east marine plan areas. • Data encompasses the majority of activities within the sector. • Data source is within the last two years
3	High	High quality data, internally quality assessed, high confidence in methodology.	• Detailed research methodology published and using known "best practice" or is considered "standard" by professionals in that field. • Data is measured; precision is high and explicitly stated. • Full date and update information is provided. • Detailed quality control procedures published at the point of data collection and/or during data processing. • Data is accurate to the geographical boundaries of the east marine plan areas. • Data encompasses all activities within the sector. • Data source is within the last year.

The literature review also sought to identify the social aspects of this assessment, and findings were collated into a single document. Data sources for the social assessment aspects include:

- Industry reports;
- Local Authority reports; and
- Online articles.

3.3 Interviews with Key Stakeholders and Industry Representatives

The second stage of the data collection involved interviewing key stakeholders from each of the priority sectors. Priority sectors were identified during the initial scoping of the project and were rescoped throughout, in line with consultation by the MMO. Sectors were prioritised for interview based on their current and future predicted economic significance in the area (in terms of GVA and/or employment), their relative importance for the area and contribution to the national economy, as well as where data gaps existed from the literature review. The priority sectors identified were energy (renewables and CCUS), ports, coastal tourism, marine aggregates and marine recreation.

A list of key stakeholders was then established, who were each invited to an individual interview. In total, ten stakeholder interviews took place with the organisations identified in Table 3 (NSTA and DESNZ were interviewed in one joint interview). Though these interviews provided valuable industry insight and information for the socio-economic baseline, it is recognised as neither a large sample size nor a comprehensive coverage of all priority sectors.

Table 3: Organisations interviewed and their associated sector classification

Organisation	Sector
Cemex UK	Marine aggregates
British Marine Aggregates Producers Association	Marine aggregates
British Marine	Marine recreation
EIFCA	Commercial fishing
Hutchison Ports UK	Ports (related to Shipping too)
Department for Transport	Ports (related to Shipping too)
National Coastal Tourism Academy	Coastal tourism
North Sea Transition Authority (NSTA)	Energy – CCUS
Department for Energy Security and Net Zero (DESNZ)	Energy – CCUS
Energy sector company (anonymized)	Energy – CCUS and Renewables
Vattenfall	Energy – Renewables

The interviews collected qualitative data on the economic and social presence of each sector in the east marine plan areas, as well as additional quantitative data otherwise not publicly available. A template of interview questions was created, which was then tailored according to each sector. Each interview followed the general structure of:

1. Establishing the role of the stakeholder within their respective sector;

2. Identifying any relevant economic data from the organisation and/or sector;
3. Identifying challenges and opportunities the sector has faced in the last 10 years;
4. Identifying the opportunities and challenges the sector might face in the next 20 years;
5. Identifying any social implications associated with the sector in the context of the east marine plan areas.

At the start of each interview, the interviewer explained to the interviewee the purposes of the study and how information gathered in the interview would be used. Participation was voluntary and consent was sought from all organisations to be named in this report. Specific comments, however, have not been attributed to each organisation. Instead, references included state the sector within which the organisation operates. Answers were recorded within each sector template and stored in a central location.

3.4 Survey of Key Stakeholders and Industry Representatives

The final stage of data collection was to survey key stakeholders in the remaining sectors:

- Aquaculture
- Commercial fishing
- Defence and national security
- Dredging and disposal
- Heritage (Assets)
- Nuclear
- Oil and gas
- Shipping
- Subsea telecommunications cabling
- Wastewater treatment

A general template of questions was created, which was then tailored according to each sector. The key stakeholders in sectors that had not been interviewed were sent the survey, and responses were recorded in a single document. Respondents were followed up over email with details of how their input would be used and an opportunity to verify the findings in the report before publication.

The organisations that responded and contributed to the study through the survey questions were Norfolk Seaweed (for aquaculture), Ministry of Defence (for defence and national security), Yorkshire Water (for wastewater treatment), and Natural England, Environment Agency and Historic England (all for the heritage assets sector).

4. Economic Analysis of Marine Sectors

The economic analysis of each marine sector is structured as follows:

1. Introduction to Sector

2. Current Activity, including estimation of GVA, employment and number of businesses in the east marine plan areas
3. Future Activity

In addition to this general structure, each marine sector gives a description of each sector, any relevant sector specific terminology and definitions, the main activities that take place in the east marine plan areas, the main geographical hotspots of activity, the key challenges and opportunities each has faced, and the social impacts of each sector. For each of the estimations of GVA, employment and number of businesses in the east marine plan areas, the sources and methods are outlined under each.

4.1 Marine Aggregates

Introduction to Sector

In 2022, 14.3 million tonnes of aggregates were extracted from the marine landscape in the UK. This is approximately 3% of all aggregates (419 million tonnes) that were extracted in the country, with the remainder (vast majority) being land based.[22]

Marine aggregates are comprised mostly of sand and gravel, but also consist of crushed rock in some places. They are primarily used in construction but are also used for beach replenishment and coastal protection. In the construction market, marine aggregates are predominantly used in ready-mixed concrete and concrete products. In the east marine plan areas, extraction has gradually shifted away from gravel and toward greater extraction of sand, as areas like the South Coast are relied on more for gravel.[23]

Whilst marine aggregates form a relatively small fraction of the entire aggregates industry, they are nonetheless a vital component for sand and gravel. In 2022, marine aggregates met 27% (14 million tonnes) of total construction needs for sand and gravel in Great Britain. In London and the South East of England, 28% of all the primary aggregates consumed in construction activity in 2019 were supplied from marine sources.[24]

Current Activity

There are three principal areas of activity for marine aggregates extraction that fall within the east marine plan areas. Based on British Marine Aggregate Producers Association (BMAPA) regional mapping areas, these are the East Coast region, the Humber region, and part of the Thames Estuary region (half of the marine licenced areas within this region lies within the east marine plan areas). In 2022, 3.6 million

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[22] Mineral Products Association (2023) 'Profile of the UK Mineral Products Industry: 2023 Edition' Available at: Link

[23] Correspondence with a marine aggregates organisation

[24] Mineral Products Association (2023) 'Profile of the UK Mineral Products Industry: 2023 Edition'. Available at: Link

tonnes were extracted from the East Coast area, 4.4 million tonnes from the Humber area, and 1.7 million tonnes were extracted from the Thames Estuary region. Making the assumption that half of the marine aggregate extracted from the Thames Estuary region (i.e. 0.85 million tonnes) was within the east marine plan areas, this means that a total of 8.8 million tonnes were extracted from the east marine plan areas.[25] Collectively, this comprises 44% of the total marine aggregate extraction nationally (21m tonnes). The majority of the material extracted is not delivered to the coast of the east marine plan areas, due to a relative lack of construction demand compared to other coastal regions. For example, 71% of material extracted from the Humber region was delivered to mainland Europe, whilst in the East Coast Area, 87% was delivered to the Thames estuary, which lies south of the east marine plan areas.[26]

The tonnage of material that has been extracted from the east marine plan areas has fluctuated annually over the last ten years. In 2012, 5 million tonnes was extracted, whilst in 2019, 11 million tonnes was extracted, demonstrating that 2022 was an unexceptional year for extraction in the east marine plan areas (8.8 million tonnes extracted).[27]

Employment

According to the Mineral Products Association, across the entire UK in 2020, there were 337 full-time staff in the sector, of which approximately 80% worked at sea.[28] Apportioning this to the east marine plan areas based on the amount of material extracted in the east marine plan areas relative to the entire UK (44%), equates to 148 staff working in the east marine plan areas in the marine aggregates sector.

Number of businesses

There are seven marine aggregate businesses that operate in the east marine plan areas. These are CEMEX UK Ltd, Volker Dredging, Tarmac Marine Ltd, Hanson Aggregates Marine Ltd, Van Oord UK Ltd, Westminster Gravels Ltd and DEME Building Materials Ltd.[29]

GVA

GVA data of the marine aggregates sector do not appear to be regularly produced or updated. The GVA for the entire sector has been calculated by using the national GVA

[25] British Marine Aggregate Producers Association (2023) 'The area involved – 25th annual report'. Available at: Link

[26] British Marine Aggregate Producers Association (2023) 'The area involved – 25th annual report'. Available at: Link

[27] British Marine Aggregate Producers Association (2012-2023) 'The area involved..' reports.

[28] Mineral Products Association (2021) 'BMAPA Sustainable Development 2020/2021: Data and Developments'. Available at: Link

[29] British Marine Aggregate Producers Association (2023) 'The area involved – 25th annual report'. Available at: Link

figure from 2014, reported in a paper attempting to characterise the marine economy of the United Kingdom[30], and using apportionment factors based on the amount extracted in 2014 in the east marine plan areas relative to the whole of the UK.[31] According to this methodology, the GVA for marine aggregates in the east marine plan areas in 2014 was £127 million. Table 4 below summarises these economic indicators.

Table 4: Key economic indicators – Aggregates

Economic Indicator	Quantity	Source	Confidence rating
GVA (£m)	127	Apportioning based on figures in Stebbings et al (2020)	2
Direct employment (FTEs)	142	Apportioning based on figures in BMAPA industry report	2
Number of Businesses	7	From BMAPA industry report	3
Proportion of activity in England within east marine plan areas	40%	From BMAPA industry report	3

<u>Sector drivers</u>

The key driver for demand for marine aggregates is the state of the construction sector, which fluctuates year to year. In 2022, construction output in the UK hit a record £180bn in the UK, a 5.6% increase on 2021.[32] Marine aggregates are a vital component of the construction sector as a supplier of sand and gravel, particularly in the South East and London. Nationally, the EU Exit has not helped the foreign export market; Mineral Product Association members report being affected by a number of EU Exit related issues including changing terms of trade for products that are exported.[33] Despite this, foreign exports from material extracted from east marine plan areas have changed relatively little before and after EU Exit ; in 2019, 76% of material extracted in the Humber region was exported to mainland Europe[34], whilst in 2022, this figure was 71%.[35]

Whilst beach replenishment and coastal defence forms a relatively small fraction of the total demand for marine aggregates, the last 10 years has seen a growing need

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[30] Stebbings, E., Papathanasopoulou, E., Hooper, T., Austen, M., and Yan, X. (2020) 'The marine economy of the United Kingdom' *Marine Policy (116).* Available at: Link

[31] The latest data available is from 2014.

[32] Mineral Products Association (2023) 'Regional overview of construction and mineral products markets in Great Britain'. Available at: Link

[33] Mineral Products Association (n.d.) 'Issues'. Available at: Link

[34] BMAPA (2020) 'The area involved – 22nd annual report'. Available at: Link

[35] BMAPA (2023) 'The area involved – 25th annual report'. Available at: Link

for coastal defence in response to climate change.[36] An example is the beach replenishment work at Bacton gas storage facility, in Norfolk, which required 2 million tonnes of sand as part of its beach replenishment and coastal defence programme.[37] Other coastal projects that have recently used marine aggregates include coastal defence at Sea Palling (Norfolk) and Lincshore Beach (Lincolnshire), and port development in Grimsby and Green Port Hull.[38]

Marine aggregates can only be extracted from licensed areas. Currently, there are 10 production licences in the Humber region, 11 in the East Coast aggregates region, and 4 in the Thames Estuary region which lie within the east marine plan areas, meaning that there are 25 current production licence areas in the east marine plan areas. These are located within both inshore and offshore waters. Whilst there is remaining aggregate available to be extracted in each of the licence areas, the licences are valid for 15 years. Given they were last issued in 2012/13, licences will need to be reissued in the next two to four years.[39] Issues over spatial competition for extraction have not been an issue in recent history but given that new licences are likely to be issued soon, this may become an issue in the near future (see Future Activity Section).

Marine aggregates are also critical to the construction sector, as noted above. Therefore, their extraction has an indirect impact on construction material prices and may have some influence on house prices if there were particular shortages within the sector. Nonetheless, the majority of marine aggregates extracted in the east marine plan areas are shipped to coastal regions outside the coastal region relevant to the east marine plan areas (notably London, Belgium and the Netherlands). Therefore, their extraction has an indirect social impact in terms of the house prices for individuals in the east marine plan areas, although their wider social impact in this regard is more relevant to areas outside the east marine plan areas, where construction needs are greater.

Furthermore, the role that marine aggregates play in coastal defence and beach replenishment can be seen as one of growing social importance. This can have a role in supporting coastal tourism, now and in the future. As an example of the role that marine aggregates can have in this capacity, Bournemouth beach (in the South Inshore Marine east marine plan areas) undertook a major beach nourishment programme to help preserve its tourism industry in 2016[40], conducted by marine aggregates extractor Van Oord UK Ltd.

Future Activity

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[36] Correspondence with a marine aggregates organisation

[37] Correspondence with a marine aggregates organisation

[38] The Crown Estate (2022) 'Marine Aggregates'. Available at: Link

[39] Correspondence with a marine aggregates organisation

[40] BCP Council (2016) 'Bournemouth Beach Replenishment, Spring 2016'. Available at: Link

Correspondence with sector representatives indicated that spatial competition for licensing areas could become an issue when licensing contracts are to be negotiated and signed in the next few years. Spatial competition with wind farms and their transmission cables (which have a one-mile radius buffer zone from dredging operations) have been identified as the major area of competition in this regard. As more sites are proposed for wind farms, and their cables, the area available for aggregate extraction will decrease.[41] A particular issue for the sector is the impact of Special Protection Areas (SPAs) for birds, notably the Greater Wash SPA which in part protects the second largest non-breeding populations of red-throated diver and little gull within the UK. The sector has expressed concerns that if wind farms displace bird species populations, and cause the SPA's conservation status to be degraded, this will have negative consequential effects for marine aggregates planning.[42] Potential mitigatory enforcements as part of the SPA, such as not permitting marine aggregate activities in winter, would be very challenging for an industry which relies on exporting material all year round.[43]

There are three areas (two inshore and one offshore) that are currently licenced for aggregate exploration and option areas within the east marine plan areas. These are Inner Dowsing (inshore), operated by Hanson Aggregates Marine Ltd, Lowestoft extension (inshore), operated by CEMEX UK Ltd, and East Orford Ness (offshore) operated by Volker Dredging Ltd. These areas allow for the potential exploration of aggregates and the option to extract them if found. These licences, however, will end in September 2024.[44]

It is estimated that:

- In the Humber region there are 19 years left of primary marine aggregate production permitted, allowing 6.88 million tonnes to be extracted annually.
- In the East Coast region there are 11 years left, allowing 7.13 million tonnes to be extracted annually, and
- In the Thames region, which is partially incorporated within the east marine plan areas, there are an estimated 28 years remaining, allowing 3.8 million tonnes to be extracted annually.[45]

Future demand within the construction sector for marine aggregates is anticipated to grow. This is in part because land-based aggregates are under pressure: the land-based replacement rate (the amount of aggregated that can be replaced for every tonne that is extracted) for sand and gravel is 63% nationally which means this is a declining reserve base.[46]

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[41] Correspondence with a marine aggregates organisation

[42] Correspondence with a marine aggregates organisation

[43] Correspondence with a marine aggregates organisation

[44] MMO (2022) 'MMO1274: Area Spatial Assessment Report'. Available at: Link

[45] The Crown Estate (2022) 'Marine Aggregates'. Available at: Link

[46] Mineral Products Association (2022) 'AMPS 2022: 10th Annual Mineral Planning Survey Report' Available at: Link

Demand for all aggregates is also expected to grow significantly. Demand projections for Great Britain suggest that, by 2035, some 323 million tonnes of aggregates will need to be supplied each year, a 25% increase from the current use of 250 million tonnes per year.[47] Furthermore, increasing volumes of crushed rock are being used in construction, particularly in London, which requires greater quantities of sand for mixing.[48] If this trend continues, this will support the demand for marine extraction in the east marine plan areas, which mostly extracts sand. It has been estimated by the Crown Estate that overall, the potential demand for marine aggregates may increase to 29 million tonnes per year by 2030.[49] If the sector does grow significantly, it will be important that there are sufficiently sized facilities and infrastructure for landing aggregates which allows for onward transportation.[50]

As touched on already, beach replenishment and coastal protection is a market that has grown in recent years, and this is expected to continue to do so with the impacts of climate change. Nonetheless, this market was said to be influenced heavily by public sector spend, which tends to fluctuate in the response to crises i.e. an intense period of storms and coastal erosion/degradation could see a sharp increase in this market area, before tailing off again.[51]

Nationally Significant Infrastructure Projects that lie on the coast will likely demand marine aggregates for coastal defence and infrastructure. Sizewell C nuclear power station, on the Suffolk coast and lying within the east marine plan areas (see Section 4.8 Energy- Nuclear), is expected to demand a significant amount of marine aggregate material that is likely to be extracted from the east marine plan areas as construction progresses.[52]

4.2 Aquaculture

Introduction to Sector

Aquaculture is the breeding, rearing, and harvesting of fish, shellfish, algae, and other organisms in all types of water environments.[53] Aquaculture in the UK applies to three main strands of species: finfish (salmon, trout, carp, etc.), shellfish (mussels, oysters, lobsters, etc.) and marine algae (seaweed).

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[47] Mineral Products Association (2022) 'Aggregates demand and supply in Great Britain: Scenarios for 2035'. Available at: Link

[48] Correspondence with an aquaculture organisation

[49] The Crown Estate (2021) 'Capability & Portfolio 2021'. Available at: Link

[50] MMO 'MMO1274: Plan Spatial assessment Final Assessment 2022'. Available at: Link

[51] Correspondence with an aquaculture organisation

[52] Correspondence with an aquaculture organisation

[53] NOAA (n.d.) 'What is aquaculture?'. Available at: Link

Aquaculture is increasingly being recognised for its contribution to global food security and nutrition. Global consumption of aquatic foods increased at an average rate of 3% per year from 1961 to 2019, a rate almost twice that of annual world population growth.[54] Aquaculture is also increasingly being used to help conserve rare species where breeding grounds have been destroyed or other environmental factors have affected reproductive patterns.

Current Activity

In 2021, the UK farmed 217,000 tonnes of fish and shellfish. Aquaculture is extremely important in the UK and provides a total income of around £972m.[55] The top five farmed species by value are Atlantic salmon (£1billion), rainbow trout (£51 million), mussels (£12milion), oysters (£10milion) and carp (£6 million). Whilst there is aquaculture across the UK, it is dominated by salmon farming in Scotland. Scottish finfish aquaculture is rated third in the world behind Norway and Chile in terms of tonnage of production and is the United Kingdom's most valuable food export.

Wild harvest of seaweed is currently still the predominant production method in the UK. There is currently one Norfolk company with a licence for marine aquaculture.[56] The current main challenges to seaweed aquaculture are the licence application process, accessing funding and the high set-up and operational costs.[57] Licence applications for all marine space use, including aquaculture development, must be evidence based and applicants must prove that their development is not going to significantly affect other users of the sea, including their conservation value, environmental value, and other impacts e.g. on navigation. The main focus of the evidence that must be provided in support of an application is the potential impacts to the environment, human health and other marine users from the project[58]. As with the energy sector, there is competition for space. Multiuse at offshore wind farms, co-use and co-existence are being explored as options to utilise the space better.

Marine finfish farms are currently absent in England and Wales, although land-based marine farms are operational. The advancement of offshore technology from Norway and Scotland, coupled with potential investment from appropriate industrial partners, holds promise for the future feasibility of offshore fish farming in England and Wales.

GVA

[54] FAO (2022) 'The State of the World Fisheries and Aquaculture'. Available at: Link

[55] Seafish (n.d.) 'Aquaculture data and insight'. Available at: Link

[56] Correspondence with an aquaculture organisation

[57] SEA (2023) 'Best Practice Report and Current State Analysis of the Norfolk and UK Seaweed Sector in 2023'. Available at: Link

[58] Huntington, T., & R. Cappell (2020). 'English Aquaculture Strategy'. Available at: Link

GVA of the UK marine aquaculture sector has increased from £167m to £386m between 2008 and 2019, with fluctuations seen GVA between this period.[59]

GVA of the entire aquaculture sector in the UK in 2019 was £481m. GVA at the regional level was not available therefore revenue figures and number of sites were used instead to apportion GVA to the east marine plan areas. According to data from Seafish, total revenue generated by the UK aquaculture sector in 2019 was estimated as £972m.[60] According to data from Dun & Bradstreet, a total of 424 aquaculture sites in the UK generate £959m in revenue, with £5.2m of this revenue generated by the 31 sites located within the east marine plan areas.[61] This equates to the east marine plan areas generating 0.54% of the total UK revenue. Multiplying 0.54% by total GVA of £481m results in a GVA of £2.6m for the east marine plan areas. It is worth mentioning that when looking at England the east contributes to 20% of English revenue from the aquaculture sector.

Employment

Employment in the aquaculture sector in the east marine plan areas was estimated by apportioning total employment in the UK aquaculture sector by the proportion of UK aquaculture sites that are located within the east marine plan areas. As previously stated, there are a total of 424 aquaculture sites in the UK, 31 (7%) of which are located within the east marine plan areas. Multiplying 7% by the number of FTE jobs in the UK (2,833) results in employment for the east marine plan areas of 207.

Number of businesses

As previously stated, there are 31 aquaculture businesses in the east marine plan areas, 7% of the total number of aquaculture businesses in the UK. However, these businesses only account for 0.54% of the revenue. This is likely due to Scotland having large established salmon farms, which produce a high-value product. English aquaculture is mainly compromised of small-to-medium sized enterprises which serve niche markets[62].

Seaweed farming has become increasingly popular over the past 10 years. As of October 2023, there are 27 seaweed aquaculture licences granted to operate within the UK.[63]

Table 5 below summarises these economic indicators.

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[59] SEA (2023) 'Best Practice Report and Current State Analysis of the Norfolk and UK Seaweed Sector in 2023'. Available at: Link

[60] Seafish (n.d.) 'Aquaculture data and insight'. Available at: Link

[61] Dun & Bradstreet (n.d.) 'Aquaculture Companies in United Kingdom'. Available at: Link

[62] Huntington, T., & R. Cappell (2020) 'English Aquaculture Strategy'. Available at: Link

[63] SEA (2023) 'Best Practice Report and Current State Analysis of the Norfolk and UK Seaweed Sector in 2023'. Available at: Link

Table 5: Economic Indicators – Aquaculture

Economic Indicator	Quantity	Source	Confidence rating
GVA (£m)	2.6	NEF Consulting and New Economics Forum[64]	2
Direct employment (FTEs)	207	Seafish	2
Numbers of Businesses	31	Dun&Bradstreet[65]	2
Proportion of businesses within east marine plan areas	7%	Dun&Bradstreet	1
Proportion of revenue in east marine plan areas	0.54%	Dun&Bradstreet	1

Future Activity

According to Seafish, aquaculture is the fastest growing food supply sector in the world.[66] Part of this increase will come from seaweed farming, which is set to increase rapidly and be happening at scale by 2040 according to correspondence with a stakeholder. This sector has the potential to deliver longer term benefits such as better sea health, an improvement in human diet and animal feed, and an increasing use of UK-derived bio-stimulants to reduce Nitrogen, Phosphorus, and Potassium (NPK)fertiliser use and the associated pollution run-off from farmland. In addition, crab and lobster businesses will have the opportunity to diversify through seaweed farming.[67]

Seaweed has commercial applications across multiple sectors from food and cosmetics to biofuels and bioplastics. Beyond its ecological merits, the economic prospects of seaweed are driving investment in farming initiatives across the UK. It is predicted that in 2024 the global seaweed market will reach $9 billion[68]. With adequate investment and research support, seaweed farming could expand significantly to help fulfil UK market demand. Projections estimate the UK industry could be worth £850 million annually by 2030, supporting 17,000 jobs[69].

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[64] NEF Consulting (2022) 'An Economic Analysis of Aquaculture in South West England'. Available at: Link

[65] Dun & Bradstreet (n.d.) 'Aquaculture Companies in United Kingdom'. Available at: Link

[66] Seafish (n.d.) 'Aquaculture data and insight'. Available at: Link

[67] Correspondence with an aquaculture organisation

[68] Câr-y-Môr (n.d.) 'Seaweed Farming in the UK: A Growing Industry and Its Local Economic Impact'. Available at: Link

[69] Câr-y-Môr (n.d.) 'Seaweed Farming in the UK: A Growing Industry and Its Local Economic Impact'. Available at: Link

The World Bank anticipates a rise in worldwide aquaculture production by between 1 and 2% from 2020–2029. However, to align with the 2030 target set by the Scottish industry (Fish to 2030), the UK will need to achieve an average growth rate surpassing 4%.[70] The English Aquaculture Strategy sets out a list of objectives which includes the growth and diversification of aquaculture in England over the next 20 years, for English farmed production to contribute at least 15% of overall seafood consumption in England by 2040, and provide up to 5000 jobs by 2040, thus contributing to rural and coastal communities[71].

However, climate change is likely to be a primary driver for change in the UK aquaculture industry over the next 50 years.[72] Factors such as increases in sea surface temperatures and extreme weather could have detrimental effects on the aquaculture industry.

A potential positive impact on the economic output would be co-existence with wind farms. Co-locating offshore wind farms with low-trophic aquaculture (shellfish and seaweed), has been suggested as an efficient way to produce nutritious seafood, clean energy and restorative ecosystem services[73].

4.3 Commercial Fishing

Introduction to Sector

This sector involves two distinct but interconnected industries: commercial fishing and fish processing. The principal regions for commercial fishing in the east marine plan areas are in (or near to) the Humber – centred around the Ports of Grimsby, Hull and Bridlington, the Wash in Lincolnshire, the North Norfolk coast, and Suffolk. These are described below.

The Humber (and its surrounds), located in East Yorkshire and North Lincolnshire, is the most important region in the east marine plan areas in terms of both landed weight (the amount of fish landed, in tonnes) and the economic value of the catch. Grimsby, Bridlington and Hull are key ports in this region, and the fish landed here support 50 fish processing facilities. Species landed are crab and lobster, as well as pelagic species including herring and mackerel, and scallops.[74] Grimsby is the largest fishing port in the east marine plan areas.

In the Wash (and its surrounds), cockle, mussel and shrimp fisheries are key. Together, they support three fish processing factories. The cockle industry, in

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[70] Government Office for Science (2017) 'Future of the Sea: Trends in Aquaculture'. Available at: Link

[71] Seafood 2040 and Poseidon Aquatic Resource Management (2020) 'English Aquaculture Strategy'. Available at: Link

[72] Government Office for Science (2017) 'Future of the Sea: Trends in Aquaculture'. Available at: Link

[73] Marie Maar et al (2023) 'Multi-use of offshore wind farms with low-trophic aquaculture can help achieve global sustainability goals'. Available at: Link

[74] North Eastern Inshore Fisheries and Conservation Authority (n.d.) 'Commercial'. Available at: Link

particular, can be termed a cottage industry[75] with individuals using shoreline hand rakes to harvest them, although larger businesses using boats also exist. Shrimp is of particular national importance: up to 95% of the entire national shrimp catch is caught in the Wash.[76]

Norfolk, and North Norfolk in particular, is a hub for small scale crab and lobster fishers. These fishers support generational, culturally important fisheries, contributing to the sense of place and local economy directly (supporting fishing related employment) and indirectly (via tourism, hospitality, and recreational fishing).

In Suffolk, there are small scale fisheries landing mostly finfish, namely, herring, sole, thornback rays, bass, plaice whiting, smooth hound, cod and sprat.

Current Activity

In 2023, 13,757 tonnes of fish were landed in ports in the east marine plan areas.[77] The majority of this fish was shellfish, comprising 67% of all fish by weight, whilst demersal constituted 4% by weight and pelagic 28%. The monetary value of the fish landed in the east marine plan areas ports in 2023 was £37m, with the majority by value being shellfish (79%), followed by demersal (11%) and pelagic (11%).

As a proportion of the whole of England, 17% by both weight and by value of fish were landed in the east marine plan areas ports. Whilst much of the fisheries sector in the east marine plan areas is known for its shellfish, 56% of all pelagic fish landings (namely herring and mackerel) in England are landed in east marine plan areas ports.[78]
The fishing ports of Grimsby and Bridlington, both located in East Yorkshire, are the most important ports in the east marine plan areas. In 2022, Grimsby landed 7,132 tonnes of fish, and Bridlington landed 2,248 tonnes, comprising 52% and 16% respectively of the total amount of fish landed in the east marine plan areas. Fish landing statistics, however, are not entirely representative of the actual amount and value of fish landed, particularly in areas with many small-scale fishers operating small vessels. This is because fishers are only required to include landings data on sales notes[79] when more than 35kg of a particular species is landed. Moreover, there is no requirement to produce sales notes when the fish is sold directly to the public. These issues are particularly relevant for the regions of Norfolk, Suffolk, and the Wash, where small scale fishers, often operating self-launched boats, proliferate. Many of these

[75] A small-scale manufacturing business owned and operated by an individual or a family.

[76] Eastern Inshore Fisheries and Conservation Authority (2024) 'Strategic Assessment 2024'.

[77] Marine Management Organisation (2023) '2023 UK and foreign vessels landings by UK port and UK vessel landings abroad: provisional data' *MMO.* Available at: Link

[78] Marine Management Organisation (2023) 2023 UK and foreign vessels landings by UK port and UK vessel landings abroad: provisional data' *MMO.* Available at: Link

[79] It is a statutory requirement for registered buyers of 'first sale' fish to record details of their purchase in a document referred to as a 'sales note'.

fishers also sell directly to the public, with some fishers owning restaurants themselves or having longstanding partnerships with them.[80]
There are 62 fish processing sites in total in the east marine plan areas. The vast majority (50) are in East Yorkshire and Northern Lincolnshire, which contains the prominent fishing ports of Grimsby, Hull and Bridlington. The City of Hull itself, for example, contains nine fish processing facilities. East Anglia contains 12 sites.[81]

GVA

Commercial fishing

GVA of the commercial fishing sector in the east marine plan areas in 2022 was £23.6 million.[82] This represents 23% of GVA for the sector in the whole of England. Turnover was £44.2 million, and its operating profit was £8.3 million.

The vast majority of the wealth generated was from the region of East Yorkshire, which is home to the three most important fishing ports in the east marine plan areas: Grimsby, Bridlington and Hull.

Both GVA and turnover from commercial fishing have increased substantially in recent history in the east marine plan areas. GVA and turnover have both more than doubled between 2014 and 2022 (GVA from £10.1 million to £23.6 million, turnover from £22 million to £44.2 million).

Fish processing

GVA of fish processing in the east marine plan areas is only available up to 2020.[83] In 2020, GVA was £474 million, which represents 56% of GVA for the sector in the whole of England. Turnover in 2020 was £1.28 billion (54% of the sector in the whole of England).

The economic size of the fish processing industry in the east marine plan areas has grown even faster than the commercial fishing industry in the past decade. Since 2014, GVA in the east marine plan areas has increased from £169 million to its current value of £474 million, an increase of 180%.

Employment

Commercial fishing

[80] Correspondence with a commercial fishing organisation

[81] Sea Fish (2023) ‘Processing Enquiry Tool’. Available at: Link

[82] Sea Fish (2023) ‘Fleet Enquiry tool’. Available at: Link

[83] Sea Fish (2023) ‘Fleet Enquiry tool’. Available at: Link

In 2022, there were 680 fishers in the east marine plan areas (of which 666 were FTEs), compared to 832 in 2021, evidencing a notable decline.[84] In East Anglia (administrative port; Lowestoft), there has been a particularly notable decline in the numbers of part time fishers between 2021 and 2022, with 63 fewer part time fishers in 2022. It is also important to note that the number of fishers on larger (>10m) vessels may be underestimated due to the rotational nature of crewing.

Fish processing

The number of people employed in fish processing in the east marine plan areas is far higher than those employed in commercial fishing. In 2020, there were 5,722 FTEs in fish processing in the east marine plan areas. 97% of these employees were located around the Humber and Bridlington areas. The number of employees in fish processing in the east marine plan areas comprises 58% of the total number of employees in the sector in England.[85]

Number of businesses

Commercial fishing

The number of businesses associated with the commercial fishing sector is hard to quantify due to the small scale and independent nature of the operations of many fishers in the east marine plan areas. Nonetheless, Seafish (a public body supporting the seafood sector) collects data on the number of active fishing boats using UK Fishing Registry data and presents this information to allow for easy identification of the number of vessels by geography. In 2022, there were 224 active fishing boats in the east marine plan areas (down by 15% compared to 2010), which represents 12% of all active fishing boats in England.[86] According to the MMO, the largest proportion of currently active boats in the east marine plan areas (48%) were built between 1991 and 2001, whilst just 14% have been built since 2011.

Fish processing

In 2020, there were a total of 62 fish processing businesses along or near to the east marine plan areas coastline, which makes up 31% of the total number of fish processing businesses in England. The vast majority of fish processing sites in the east marine plan areas are in or around Grimsby, Hull, or Bridlington (50), in the area of East Yorkshire and Northern Lincolnshire. Grimsby has been described as the UK's 'premier' seafood processing centre.[87] Nonetheless, the numbers of fish processing sites in this region has declined in recent years, reducing from 76 in 2014, to 50 in 2022. This is despite the GVA and operating profit increasing substantially in that time (GVA increased by 180% between 2014 and 2020 in East Yorkshire and Northern

[84] MMO (2023) 'UK sea fisheries annual statistics report 2022'. Available at: Link

[85] Sea Fish (2023) 'Processing Enquiry Tool'. Available at: Link

[86] Sea Fish (2023) 'Fleet Enquiry tool'. Available at: Link

[87] Turner, D. (2022) 'Why Grimsby was left behind' *UnHerd.* Available at: Link

Lincolnshire, and operating profit by 637%).[88] The reasons for the decrease in the number of sites is not clear and further independent research would be required. The number of sites also decreased by three since 2024 in East Anglia within the east marine plan areas. The social repercussions of such changes are discussed later in this section. In 2012, the prominent Youngs Cromer Crab Factory relocated to Grimsby, citing financial viability. It would be interesting to further examine the causes behind such a move, given the overall positive sectoral financial trend in East Anglia, East Yorkshire and Northern Lincolnshire in the past decade.

In line with general economic trends, the number of fish processing businesses consists of 30% of the entire of England,

Table 6 below summarises these economic indicators.

Table 6: Key economic indicators – Commercial fishing

Sector	Economic Indicator	Quantity	Source	Confidence rating
Commercial Fishing	GVA (£m)	24	Seafish (2022)	3
	Direct employment (FTEs)	666	MMO (2022)	3
	Proportion of activity in England within east marine plan areas	17%	MMO (2022)	3
Fish processing	GVA (£m)	474	Seafish (2020)	3
	Direct employment (FTEs)	5,722	Seafish (2020)	3
	Number of businesses	62	Seafish (2020)	3
	Proportion of activity in England within east marine plan areas	31%	Seafish (2020)	3

[88] Sea Fish (2023) 'Processing Enquiry Tool'. Available at: Link

Whilst East Yorkshire and North Lincolnshire, which includes the ports of Grimsby, Bridlington and Hull, is the most important region economically to the east marine plan areas, fishing is an important heritage industry along much of the rest of the coastline. East Anglia, for example, had 134 registered fishing boats in 2022 (60% of the entire fleet registered in east marine plan area ports). Many of these are small self-launched crafts. For example, the North Norfolk crab and lobster fishery has around 48 boats, most of which are under 10 meters in length and self-launched, operating no more than three miles from the coast.[89] Approximately one third of the fishermen who work them are part-time.

The importance of these smaller heritage industries should not be overlooked. Cromer beach in North Norfolk, for example, is renowned by locals and visitors for its 'Cromer Crab'. Freshly caught crab is an important part of the local tourism industry. Fishing has therefore been identified as central to a sense of place in places like Cromer. Representations of fishing are often found in public spaces and festivals, which reinforce fishing identity. Belonging to a distinct place is important for human well-being, and a source for common identity, even if most people aren't engaged in fishing.[90] Hand worked cockle fishers in the Wash, using rakes on the shoreline to collect small quantities of cockles, are another example of a localised industry with deep cultural significance that far outweighs their monetary value.

The North Norfolk crab and lobster fishery is also a declining industry and is a case in point of how along some areas of the east marine plan areas, fishing is a declining industry, despite the sector overall growing in economic importance, due to the growth of the sector in and around the Humber.

The decline of fishing in such regions has had serious social and economic repercussions for the local communities. These repercussions are evidenced in examples like the street protests when the Young's Crab Factory in Cromer relocated to Grimsby.[91] In North Norfolk, fishermen have had to adapt by moving to single-handed boats as a cost saving strategy, with reported negative implications for their safety and mental wellbeing. Some of the pressures causing this decline are increased policy and regulation (e.g. despite crab and lobster being non quota stocks, there has been increased pressure on crab and shellfish stocks following restrictions placed on the whitefish industry), rising operational costs, and a lack of young fishermen wanting to enter the industry.[92] Furthermore, fishers and their families report a lack of capacity/power to input into decisions that impact them with an associated distrust in

[89] White (2015) 'Getting intro Fishing: Recruitment and Social Resilience in North Norfolk's 'Cromer Crab' Fishery, UK.' *Journal of the European Society for Rural Sociology 55(3): 291-308.* Available at: Link

[90] White (2015b) 'Social Resilience, place and identity in the small-scale North Norfolk "Cromer Crab" fishery, UK'. Available at: Link

[91] White (2015b) 'Social Resilience, place and identity in the small-scale North Norfolk "Cromer Crab" fishery, UK'. Available at: Link

[92] White (2015) 'Getting intro Fishing: Recruitment and Social Resilience in North Norfolk's 'Cromer Crab' Fishery, UK'. *Journal.* Available at: Link

government policy and fisheries science which they say doesn't capture fluctuations in stocks.[93]

A relatively recent opportunity that has affected the sector is the growth of the Whelkmarket. Whelks, a seasnail commonly caught in areas like the Wash, were considered to be a marginal fishery with very low activity prior to 2014. Since 2014, whelk fisheries have constituted one of the most valuable fisheries in the east marine plan areas and consistently make the top 20 species by value landed in the UK.[94,95] This is primarily due to the expansion of the Asian foreign export market.[96] However, with the increase in demand, fishing effort has also increased, but landings of whelks have remained relatively stable, leading to a concern about the fishery's long term sustainability. In the east marine plan areas, this led to the Eastern Inshore Fisheries and Conservation Authority (EIFCA) implementing a Whelk Permit Byelaw in 2016, requiring fishers to obtain a whelk permit and fish with certain conditions, as well as including both a commercial and recreational pot limitation.[97]

As discussed, commercial fishing and fish processing in particular are of economic importance to towns along the Humber like Grimsby and Hull, as well as Bridlington slightly further north. Despite this, towns like Grimsby still suffer from high levels of socio-economic deprivation.

Future Activity

The principal concerns for fishers in England now and in the future are rising operational costs, staff shortages, regulatory changes and changes in quota, as well as changes to export markets.

In this context, Brexit has been reported as having had a significant effect on the UK fishing industry to date, but the medium to long term effects are yet uncertain. The All Party Parliamentary Group on Fisheries produced a report 12 months after the UK left the European Union which attempted to describe the impacts of Brexit on fishing livelihoods as told by members of the UK fishing industry. [98] Fishermen widely described falls in income as a result of increasing regulatory costs, loss of export markets, a decline in the value of catches and in some cases reduced volume of catches owing to the licensing of large EU fishing vessels. This adds to other issues

[93] White (2015b) 'Social Resilience, place and identity in the small-scale North Norfolk "Cromer Crab" fishery, UK'. Available at: Link

[94] EIFCA (2019) 'Whelk Technical Summary Report – Review of whelk permit conditions'. Available at: Link

[95] EIFCA (2024) 'Strategic Assessment 2024'

[96] Correspondence with a commercial fishing organisation

[97] EIFCA (2019) 'Whelk Technical Summary Report – Review of whelk permit conditions'.

[98] APPG (2021) 'Brexit: Voices of the UK Fishing Industry' *All Party Parliamentary Group on Fisheries.* Available at: Link

including increased operational costs due to rising fuel prices and labour shortages.[99] A lack of EU workers to fill gaps, in a market struggling generally to attract new employees, was reported as an additional challenge by some. The impacts of Brexit were said to disproportionately have affected small-scale exporters in the immediate aftermath.[100] According to the EIFCA however, the only major significant long-term harm to date for fisheries from Felixstowe to south of Grimsby has been a loss for the mussels export market. The issue has mostly been one of a failure to deliver on promises, as opposed to significant losses.

Nonetheless, Brexit may yet provide opportunities for the industry as a whole, principally in its ability to set its own quota and operate as an independent coastal state. In 2023, the UK government set out a new set of reforms to formally depart from the Common Fisheries Policy, building on investment and uplift in fisheries opportunities of over £200 million. Vessels smaller than 10-metres, for example, now have greater access to inshore waters and will no longer be subject to EU rules on minimum landing sizes.[101] The UK government has recently introduced economic packages to support the UK fishing industry. In 2022, the UK government injected £5 million into a seafood storage company in Grimsby as part of a £20 million economic package for the UK fishing industry.

In terms of demand for seafood within the UK, according to Seafish[102], the next five years could see tough conditions for the UK fisheries sector. Seafood could suffer as consumers focus on value for money to counter a fall in disposable income. This may give way to an accelerated trend in declining seafood consumption experienced in the 10 years before COVID-19. Increasing environmental concerns about the sustainability of fishing may also negatively affect consumption rates.

Additional pressures include spatial squeeze from wind farms, meaning that fishing grounds are reduced, as well as the impacts of climate change. Spatial squeeze is also influenced by MPA designation, with increases in associated restrictions within MPAs. The EIFCA report that a number of new restrictions, as to be seen in local byelaws, are being worked on currently.[103] An Adaptive Risk Management approach is being taken, for example, to the Cromer Shoal Chalk Beds MCZ, a historically important region for the North Norfolk crab and lobster fishery.[104] There are also new national proposals for introducing minimum sizes for landings in the crab and lobster fisheries.[105]]

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99 Seafish (2023) 'Economics of the UK Fishing Fleet'. Available at: Link

100 APPG (2021) 'Brexit: Voices of the UK Fishing Industry' Available at: Link

101 Defra (2023) 'UK Government seizes post-Brexit freedoms for fishing industry'. Available at: Link

102 Seafish (2023) 'Fish as food: A review of developments in UK seafood consumption, implications, and practical responses'. Available at: Link

103 Correspondence with EIFCA representative.

104 EIFCA (2024) 'Strategic Assessment 2024'.

105 Correspondence with a commercial fishing organisation.

Since 2007, the cockle and mussel fisheries in the Wash have suffered from ‘atypical mortality’ and various attempts have been made to identify the causes.[106] However, increases in incidences of shoreline pollution may be one, whilst in the future, warmer sea temperatures may exacerbate issues.[107] According to EIFCA, climate change may also be influencing an observed change in timelines for seasons for fishing.[108]

4.4 Defence and National Security

Across UK waters, the British Armed Forces (comprised of the Royal Navy, British Army, and Royal Air Force) contributes indirectly to the local economy and boosts economic activities through its role in protecting UK citizens both on the coast and nationwide. This is done by delivering and protecting the nuclear deterrent; securing UK waters containing Defence’s underwater critical national infrastructure; deploying a blend of ships and advanced autonomous sub-sea capabilities; providing a platform for naval special operations; maritime surveillance, reconnaissance, and interception of potential threats, and supporting national resilience activity – including Maritime Counter Terrorism.

In the east marine plan areas, the MOD currently has:

- RAF base Donna Nook, south of the Humber
- RAF Holbeach, an air weapons range on the Wash coastline, Lincolnshire
- RAF Woodbridge, north of Felixstowe, Suffolk
- A Remote Radar Head at Neatishead, Norfolk

The east marine plan areas are specifically significant for practice of air-to-air combat manoeuvres, bombing, and submarine exercises off Flamborough Head.[109] MMO’s seascape character assessment for the east marine plan areas[110] further identified specific areas of the sea where military activity occurs. Dogger Deep Water Channel, East Anglian Shipping Waters, Holderness Coastal Waters, The Lincolnshire Wash and Wainfleet were all stated to be areas where military exercises are carried out. Further details of specific activities in the east marine plan areas were not forthcoming from stakeholders engaged from the MOD, due to national security reasons, with this information held at higher levels of classification.

In the future, UK defence level outputs may evolve. There are no plans at present for any new bases in the next 20 years on the East Coast, although this may change subject to any future military requirement. With the type of activity and intensity

[106] Correspondence with a commercial fishing organisation.

[107] EIFCA (2024) ‘Strategic Assessment 2024’.

[108] Correspondence with a defence and national security organisation.

[109] Defra (2014) ‘East Inshore and East Offshore Marine Plans’. Available at: Link

[110] MMO (2012) ‘Seascape character area assessment: East Inshore and East Offshore marine east marine plan areas’. Available at: Link

implemented by the military in relation to geographic areas constantly adapting in response to military necessity and global influence.[111]

It is not possible to quantify the direct economic importance of the defence sector in the east marine plan areas due to the lack of information on key statistics including spending output, employee numbers, classified information on the diverse range of activities. However, the military's economic influence, as already described, is largely indirect, with effects on regional stability and the protection of coastal and marine infrastructure very difficult to quantify.

4.5 Dredging and Disposal

Introduction to Sector

Dredging is closely linked with the ports sector and consists of gathering up or moving sediments and disposing of them at a different location. There are two main types of dredging:

- Capital dredging: Capital dredging involves the dredging of the seabed in areas where the seabed has not previously been dredged or dredging to deeper depths in areas which are routinely dredged. This is usually done for improved access to ports to allow larger vessels longer optimal tidal windows, and to provide passing places in narrow channels. Capital dredging may also be undertaken as parts of wider marine development activities in order to prepare the seabed for development.
- Maintenance dredging: This is done to maintain existing access to the port and discharges the responsibility to ensure that all vessels using the port may do so safely. It is undertaken on a routine basis to maintain the level of water at the depth indicated on navigational charts.[112]

Other types of dredging activity include clearance dredging, which is the removal of silt from outfalls, culverts or inlets.

Many dredging techniques result in the collection of dredged materials which require subsequent disposal. Most dredged material is disposed of at sea with no further use. Over 99% of sediment dumped at sea is locally generated and results from the dredging of harbours and their approaches to ensure they are navigable. Dredged material can also be used beneficially for purposes such as beach nourishment, habitat creation, and land reclamation. Disposal of dredged material at sea can only occur within designated disposal sites subject to the type of dredged material, including sediment which is being disposed of in a beneficial manner.[113]

Current Activity

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[111] Correspondence with a defence and national security organisation.

[112] UK Marine Monitoring and Assessment Strategy (2010) 'Charting Progress 2 Feeder Report: Productive Seas' *Defra.* Available at: Link

[113] OSPAR (n.d.) 'Dredging and dumping'. Available at: Link

In the Humber Estuary, the Associated British Ports' Humber Estuary Services has responsibility for the maintenance dredging of the Humber Estuary and prepares the Humber Baseline Document as part of the Dredging Protocol. A representative of the Department for Transport Ports and Shipping sector informed the project team that they were not aware of any planned activities to widen or deepen channels (capital dredging) in the Humber Estuary to allow for greater capacity.

Associated British Ports Lowestoft are currently undertaking port works as part of the Lowestoft Port masterplan, which includes elements of capital dredging.[114] Associated British Ports Lowestoft are responsible for the maintenance dredging of the Port of Lowestoft, while Great Yarmouth Port Authority (Peel Ports) are responsible for the maintenance dredging of Great Yarmouth.

Dredging activities in the Orwell Estuary, an estuary located just outside the east marine plan areas boundary which allows access to the port of Felixstowe and Ipswich, are not considered here (see also sections 4.6 Ports and 4.12 Shipping).

Assessing key economic indicators for this sector is challenging. National statistics do not assess the sector in detail and there is a lack of available information from industry or academic sources. Furthermore, there are several other sectors under which dredging activities can be captured, such as ports, shipping and aggregates, and so there is a risk of double counting by their inclusion. Therefore, in line with MMO1119[115], we have omitted calculation of GVA, employment, and number of businesses for this sector. Whilst MMO1050[116] did attempt to calculate GVA based on employment in the licensing of water discharges at the national level and apportioning to the east marine plan areas based on the percentage share of port activity in the east marine plan areas, a very low confidence was reported in this estimate. The project team therefore does not consider this approach to be sufficiently robust to replicate it for the east marine plan areas, following instead the approach of MMO1119 and not providing an estimation.

There are currently 60 open disposal sites in the east marine plan areas[117], although many have attached conditions which restrict their use to specific activities, projects, or marine licences.

It should be noted that disposal of dredged material at sea can have environmental and socio-economic repercussions. Disposal of dredged material at sea can harm marine ecosystems through sedimentation, smothering of benthic habitats, and

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[114] Associated British Ports (2021) 'The Port of Lowestoft: Our future'.

[115] ATKINS (2016) 'MM01119: Economic baseline assessment for the North East, North West, South East and South West marine plans' *Marine Management Organisation.* Available at: Link

[116] Eunomia (2013) 'Economic baseline assessment of the South Coast' *Marine Management Organisation.* Available at: Link

[117] Cefas (2022) 'UK Disposal Site Layer'. Available at: Link

potentially the release of contaminants.[118] This may negatively impact habitats for marine life which can potentially have negative impact on fisheries by disrupting fish habitats. The degree of this impact, in particular for the east marine plan areas, has not been assessed. Disposal sites may also impact recreational activities such as swimming and boating, affecting tourism and local economies. Analysis shows that there are a significant number of sites in the east marine plan areas located in riverine areas or in coastal stretches of water.[119]

Future Activity

Looking ahead, it is assumed that the level of maintenance dredging in operation will be sustained in order to ensure continued operation of the major ports in the east marine plan areas, whereas the level of capital dredging is dependent on the extent of potential port expansion projects which are currently undisclosed.

Climate change induced changes in currents, waves, winds, water levels and tidal range may influence sediment supplies, with potential implications for dredging in future. Extreme weather events may also result in a greater need for reactive dredging to desilt channels.[120]

4.6 Ports

Introduction to Sector

Ports are critical to UK trade, with 95% of international trade arriving or leaving by sea. There are 40 major ports in the UK, seven of which are located in the east marine plan areas (Boston, Goole, Great Yarmouth, Grimsby and Immingham, Hull, River Trent, and Rivers Hull and Humber). Of these, Grimsby and Immingham are the most important, with 50 million tonnes of freight being imported in 2022.[121] Meanwhile, Felixstowe, whose port lies adjacent to the east marine plan areas' southern boundary but lying just outside of it (and therefore not included in the analysis), is the largest container port in the UK.[122] Ipswich port (processing approximately 2 million tonnes of freight annually) lies approximately 10km up the Orwell river inland, and is therefore outside of the analysis as well. However, it is acknowledged that ships using these ports will use the same main shipping channel that traverses the east marine plan area.

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[118] OSPAR (n.d.) 'Dumping and Placement of Dredged Material'. Available at: Link

[119] Cefas (2022) 'UK Disposal Site Layer'. Available at: Link

[120] Central Dredging Association (2012) 'Climate Change Adaptation As It Affects The Dredging Community'. Available at: Link

[121] Department for Transport (2022) 'All freight tonnage by port and year'. Available at: Link

[122] Consultation with Hutchinson Ports, which operates out of Harwich and Felixstowe ports confirmed with the project team, that when dealing with the Ports sector, the port lies outside the Plan boundary, with the port facilities lying at the mouth of the Orwell Estuary. The Plan boundary hugs the coastline and does not continue round into the estuary, terminating at Landguard Point.

In addition, Harwich International Port in Essex (processing 5 million tonnes of freight annually) and situated about 1km across the estuary from Felixstowe at the convergence of the Stour and Orwell rivers, is clearly outside the east marine plan area, and therefore also not included in the analysis. However it should be acknowledged that ships calling there use the same main shipping channel which traverses the east marine plan area. Ports in the east marine plan areas rely heavily on trade with Europe, servicing vessels using short sea routes.[123]

Current Activity

Using categorisations from the Department for Transport, there are seven major ports in the east marine plan areas, and five minor ports which continue to handle freight as of 2022. The Department for Transport defines a major port as those with cargo volumes of at least 1 million tonnes annually.[124] In total in 2022, 76.5 million tonnes of freight were transported to ports in the east marine plan areas, of which the vast majority came into just a few ports in the Humber: 66% came into Grimsby and Immingham, 12% came into Hull, and 14% came into Rivers Hull and Humber port.[125]

In total, freight processed by ports in the east marine plan areas represents 23% of the total freight processed by ports in the whole of England. Grimsby and Immingham combined form Britain's busiest port – as of 2013 this combined port handled more than 30 million tonnes of energy related products, almost 650,000 cars and 500,000 Ro-Ro[126] and Lo-Lo[127] units per year, and total freight tonnage in 2022 was 50 million tonnes.[128] In Hull, key freight handled includes paper, steel and bulk cargo. The Immingham Oil Terminal, Immingham Gas Jetty and South Killinghome Jetty, on the south bank of the Humber, are also key, providing services to the two oil refineries at Immingham, handling crude oil and other petroleum products coming from offshore.[129]

Total freight tonnage volumes have, however, decreased in the past decade. In 2013, a total of 88 million tonnes were processed by ports in the east marine plan areas, meaning that in 2022, total freight tonnage processed in the east marine plan areas has decreased by 13%. Across the country, dry bulk and general cargo has been decreasing in recent years. [130] An example of this is a decrease in forest products due to a reduced demand for newsprint. The amount of liquid bulk imported into the UK has also seen a downward trend since 2000 nationally, but then rebounded in 2022

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[123] Defra (2014) 'East Inshore and East Offshore Marine Plans'. Available at: Link

[124] Department for Transport (2023) 'Port freight statistics: notes and definitions'. Available at: Link

[125] Department for Transport (2022) 'All freight tonnage by port and year'. Available at: Link

[126] Roll on/roll off cargo ships designed to carry wheeled cargo.

[127] Lift on/lift off cargo ships with on-board cranes to load and unload cargo

[128] Humber Nature Partnership (2013) 'Humber Management Scheme'. Available at: Link

[129] Humber Nature Partnership (2013) 'Humber Management Scheme'. Available at: Link

[130] Correspondence with a shipping and ports organisation.

with an 11% increase from 2021.[131] Oil imports have also declined (due to a shift to natural gas in energy production), as have coal imports and iron imports.[132]

Grimsby, Immingham and Hull on the Humber are a critical part of the supply chain for sustainable electricity production in particular, with the Humber known as 'the UK's energy estuary'. Biomass is an important good that is imported via this route, a sector which has seen dramatic increase in consumption over the last decade.[133] Grimsby is currently home to the world's largest offshore wind operations and maintenance centre (see 4.7 Energy- Renewables).[134]

The east marine plan areas' ports are not known as significant passenger terminuses compared to some other ports on the South or West coast. Whilst there are some passenger ferries that dock at Hull, and at Grimsby and Immingham, passenger numbers are relatively low compared to some other ports in England. For example, in 2019 (pre-pandemic) 830,000 passengers came through Hull and 95,000 through Grimsby and Immingham, compared to 11 million at Dover and 1.8 million at Holyhead.

In the 2021 budget, the UK government announced new freeports in Humberside would be created in the east marine plan areas. Freeports are a special kind of port where normal tax and customs rules do not apply, with the aim of specifically encouraging businesses in Freeport tax sites through, for example, relief on Stamp Duty and enhanced capital allowances.[135] [136] However, according to the Department for Transport, these do not make a significant difference to ports as maritime businesses. This is because most of the facilities are inland facilities which can exist independently from the port itself. This means that a lot of the freeport infrastructure is not closely linked to the maritime ports. However, it was noted that this might change in the future.[137]
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[131] Department for Transport 'Port freight annual statistics 2022: overview of port freight statistics and useful information'. Available at: Link

[132] Correspondence with a shipping and ports organisation.

[133] Biomass Connect (2023) 'Data Summary – Solid Biomass consumption trends in the UK energy sector 2016-2021'. Available at: Link

[134] Laister, D. 'How Grimsby has become the gatehouse to a growing green energy power station' *Business Live.* Available at: Link

[135] HMRC (2023) 'HMRC UK Freeports Induction Pack' *Her Majesty's Revenue and Customs.* Available at: Link

[136] MMO (2023) 'MMO1274: east marine plan areas Spatial Assessment Report'. Available at: Link

[137] Correspondence with a shipping and ports organisation.

The COVID-19 pandemic had a significant impact on the ports sector, both nationally and in the east marine plan areas. In 2020, for example, imported tonnage was 10% lower in Grimsby and Immingham than in the previous year.[139]

GVA

GVA has been calculated by using International Territorial Level 1 (ITL1) figures for GVA of the ports industry, compiled by the Centre for Economics and Business Research[140], and then apportioning based on the amount of freight handled in ports that lie within the east marine plan areas. Notably, the most recent GVA data available is from 2019.

It is important to note that the sectors of ports and shipping overlap significantly. However, when determining economic output by sector, port activities are differentiated from shipping activities as follows:

- Ports activities include: warehousing and storage; port activities and management, stevedores (person employed to load and unload ships), cargo and passenger handling; border agency, HMRC and public sector employees operating in ports.
- Shipping activities include: passenger transport, freight transport and other shipping activity.[141]

Whilst freight activity is a shipping activity rather than a port activity, freight activity has been used to calculate apportion factors for port activity in the east marine plan areas. This is because freight activity is deemed a sufficiently reliable indicator of port activities for the purposes of this study, given that freight is stored in ports before being moved further afield. The GVA for the ports sector in England in 2019 is £8.7bn. Apportioning this to the east marine plan areas in 2019 shows that GVA is £413 million, meaning that the GVA of the Ports sector in the east marine plan areas is 5% of the Ports sector in England. Using the same methodology, the turnover in 2019 for the ports sector in the east marine plan areas was £1.24 billion (£30.2 bn in England as a whole).

It is also important to note that the wider economic importance of the ports sector and its integrity to much of the rest of the UK economy, from manufacturing to retail, is not to be understated, and is not captured in the above figures.

Employment

The Centre for Economics and Business Research also collates information on the number of employees working in the ports industry at the ITL1 level. Using this information and apportionment factors based on the proportion of freight handled by port, there are approximately 13,496 FTEs in the east marine plan areas working in the ports industry.

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[139] Department for Transport (2022) 'All freight tonnage by port and year'. Available at: Link

[140] CEBR (2022) 'The economic contribution of the UK ports industry'. Available at: Link

[141] CEBR (2022) 'The economic contribution of the UK ports industry'. Available at: Link

According to a report for the Coastal Communities Alliance, each one port job typically supports a further six jobs external to the ports sector.[142]

Number of businesses

It was not possible to estimate the number of businesses due to insufficient discrete geographic unit areas available to use Nomis UK Business Count data, for the required level of analysis of the ports sector.

Table 7 below summarises these economic indicators.

Table 7: Key economic indicators - Ports

Economic Indicator	Quantity	Source	Confidence rating
GVA (£m)	413	Cebr (2022) apportioned to east marine plan areas based on freight tonnages	2
Direct employment (FTEs)	13,496	Cebr (2022) apportioned to east marine plan areas based on freight tonnages	2
Proportion of activity in England within east marine plan areas	23%	Department for Transport (2022) Freight Statistics	2

Future Activity

The Centre for Economic Business Research expects that the ports industry will experience moderate growth for its forecast to 2025, based on port freight traffic trends.[143] Some estimates are that port freight tonnage could increase by nearly 40% over the next twenty years.[144]Nonetheless, it is notable that there is a weakening relationship between volume growth and what the industry considers value creation, which has been a conscious strategy of port operators.[145] Whilst GVA and turnover has almost doubled over the past decade nationally, in the east marine plan areas,

[142] Pragmatix Advisory (2023) 'Communities on the edge: Assessing the need for Levelling Up in England's coastal authorities.' Available at: Link

[143] CEBR (2022) 'The economic contribution of the UK ports industry'. Available at: Link

[144] Pragmatix Advisory (2023) 'Communities on the edge: Assessing the need for Levelling Up in England's coastal authorities.' Available at: Link

[145] CEBR (2022) 'The economic contribution of the UK ports industry'. Available at: Link

this report's analysis shows that it has fallen, and so such trends must be approached with caution when considering their relevance to the east marine plan areas.

Links with other sectors

UK ports provide hubs for offshore renewables in terms of assembly, mobilisation, operation, and maintenance, but there are also possibilities for a greater role in construction, manufacturing, engineering and training activities. There is currently a call for UK content rules[146] that will encourage a greater quantity of work to be undertaken by the UK-based supply chain.[147]

Whilst the Humber is already critical to the offshore wind sector in the east marine plan areas and further afield, the expansion of this sector is likely to require further investment into ports infrastructure in the Humber to deliver the capacity requirements of this expansion in demand.[148] As further projects are agreed and rolled out by energy developers, the ports sector will require a fast and flexible planning system to enable them to prepare for this growth in demand in the renewables sector. However, the economic value generated from the development of offshore wind for ports will likely be subject to fluctuations: there is significantly more value in the construction of offshore wind farms than there is for their maintenance[149], so economic activity will be strongest for ports when there is active construction ongoing.

According to the stakeholders engaged as part of this project, there are no immediate plans to expand ports in the east marine plan areas with significant capital dredging to enable the berthing of larger ships, however Associated British Ports (ABP) Lowestoft are currently undertaking port development which does include some capital dredge elements as part of the Lowestoft Port masterplan (see 4.5 Dredging and Disposal).

With the predicted rise in marine aggregate extraction by 2030, ports may need to increase their capacity to offload and transit this material (see section 4.1).

The electrification of ports is another challenge on the horizon. Port electricity demand is forecast to quadruple in the next 30 years as the maritime sector decarbonises and ports become clean energy hubs.[150] There is concern that the national grid may struggle to provide enough energy to meet this critical energy demand. Plans are currently being developed for onshore wind turbines at the ports of Hull, Grimsby, and Immingham to help meet this demand, building on measures already introduced including the largest commercial rooftop solar array in the UK at the Port of Hull. The Port of Immingham recently trialled a Terberg hydrogen fuelled tractor in its container

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[146] Standards that dictate the minimum percentage of a product's components that originate from the UK

[147] British Ports Association (2021) 'UK Ports: Seizing the Opportunities'. Available at: Link

[148] Correspondence with a shipping and ports organisation

[149] Correspondence with a shipping and ports organisation

[150] British Ports Association (2021) 'UK Ports: Seizing the Opportunities'. Available at: Link

terminal.[151] In 2023, the ABP launched a new sustainability strategy to begin decarbonisation of the sector. ABP is planning on investing £2bn to become a more sustainable business and achieve net zero by 2040.[152]

Automation is defined as the use of technology and machinery to perform processes with minimal or reduced human intervention. Automation of shipping (see section 4.12 Shipping) is a stronger growth area than the automation of ports, which has already seen significant advances in past decades. Nonetheless, automation of ports can go further in the UK, and replicate the advances of some ports internationally. However, the scope for this in smaller ports, where traffic is smaller, is significantly less and will be most relevant to the major Humberside ports.[153] Varying degrees of remote or autonomous control have been trialled or deployed at ports, including automated docking systems, autonomous cranes, and remote-controlled mobile plants, as well as self-driving vehicles, HGV platooning and drones.[154]

4.7 Energy- Renewables

Introduction to Sector

The renewable energy sector in the UK has experienced significant growth and development in recent years, driven by government policies, technological advancements, and increasing environmental awareness.[155] The key drivers are the push towards net zero and to limit global warming to 1.5 °C above pre-industrial levels, as well as the need for energy security, and reducing the reliance on the Russian gas supply. According to the Net Zero Strategy: Build Back Greener, the UK should be powered entirely by clean electricity by 2035[156][157].

The renewable energy sector has been split as follows:

1. **Wind Energy**: This type of renewable energy refers to electrical energy obtained from harnessing the wind with windmills or wind turbines. Wind power is a leading source of renewable energy in the UK. The country has abundant wind resources, both onshore and offshore. Offshore wind farms, in particular, have seen substantial investment and expansion, making the

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151 Associated British Ports (2023) 'Public consultation on proposed onshore wind at Humber ports'. Available at: Link

152 Solent Forum (2023) 'Horizon Scanning Report 2023'. Available at: Link

153 Correspondence with a shipping and ports organisation.

154 Catapult (2021) 'UK Ports of the Future: A vision and roadmap'. Available at: Link

155 ONS (2021) 'Wind energy in the UK'. Available at: Link

156 Subject to security supply.

157 HM Government (2021) 'Net Zero Strategy: Build Back Greener'. Available at: Link

UK a global leader in offshore wind capacity[158]. The government has set ambitious targets to further increase offshore wind capacity in the coming years.

2. **Solar PV Energy**: Solar photovoltaic (PV) energy refers to the direct conversion of light into electric power using semiconducting materials. Solar power has also gained momentum in the UK, albeit to a lesser extent compared to wind energy. The declining costs of solar PV technology have made it more economically viable, leading to increased installation of solar panels on residential, commercial, and industrial rooftops, as well as in utility-scale solar farms including theoretically offshore floating solar, although there is no offshore solar in the UK at present
3. **Hydropower**: Hydropower plants harness the energy of flowing water to generate electricity, typically through the use of dams or river turbines. Although hydropower contributes a smaller proportion of the UK's renewable energy compared to wind and solar, it still plays a role in the country's energy mix.
4. **Tidal Energy**: Tidal power generation involves capturing the energy from the natural rise and fall of ocean tides. The UK is exploring the potential of tidal energy as a renewable resource. Several tidal energy projects are in development around the UK coastline, aiming to harness the predictable and abundant energy of tidal currents.

Current Activity

In order to estimate the number of renewable energy sites in the east marine plan areas, and the capacity of these sites, data from DESNZ's Renewable Energy Planning Database[159] and GIS mapping was used. The number of operational sites from this database was used as a starting point, and then GIS was used to identify those that fall within the east marine plan areas.

There are a total of 154 renewable energy sites in the east marine plan areas, 14 of which are offshore wind farm sites, 69 onshore wind farm sites and 71 solar PV sites. There are no hydropower sites (small or large) nor tidal/wave energy sites in the east marine plan areas.
The generating capacity from all 154 sites in the east marine plan areas is 10.8 GWe. This is around 50% of the total capacity across England (21.8 GWe), which includes all onshore and offshore wind, small and large hydro, solar photovoltaic and shoreline wave. Of this generating capacity in the east marine plan areas, 87% is from offshore wind farms, 8% from onshore wind farms and 5% from solar photovoltaic.

Renewable technology	Mwe	Number of Sites
Offshore Wind	9,457	14
Onshore Wind	874	69
Solar PV	512	71
Total	**10,844**	**154**

158 ONS (2021) 'Wind energy in the UK'. Available at: Link

159 DESNZ (2024) 'Renewable Energy Planning Database'. Available at: Link

There are also three wind farms in construction in the area with a further nine having secured consent, two with a submitted consent application, and six in pre-application. This totals 34 wind farms at all stages of application with a potential generating capacity of 32.39GW, making up 77% of England's total current capacity.[160]

As shown by these figures, the east marine plan areas has a concentration of offshore wind capacity, which in turn has an impact on generating activity for other sectors onshore. For example, to support work on the offshore wind farms, £80 million was invested to upgrade the port at Grimsby.[161] Due to the growth of the wind energy sector, there has also been a push for an increase in blade fabrication in the UK near the ports.

GVA

A 2017 study by Catapult states that GVA per GW of renewable energy capacity installed is currently £1.8 billion.[162] As stated, there is currently 10.8 GWe of installed capacity in the east marine plan areas. Multiplying these two figures results in an estimated GVA for the renewable energy sector in the east marine plan areas of £19.5 billion.

Employment

In 2019, there were 120,300 jobs in the renewables sector in the UK[163], 51% of which are accounted for by the four types of renewable energy stated above (37% in wind energy, 9% in solar PV, 5% in hydropower, 0.6% in marine/tidal energy). The remaining 49% are employed by other renewable technologies (solid biomass, municipal and industrial waste, liquid biofuels, solar heating/ cooling, biogas and geothermal energy).

Employment figures are not available at the regional level. Therefore, employment in the east marine plan areas has been estimated by apportioning the proportion of total UK renewable energy capacity generated by sites in the east marine plan areas (50%) to total UK employment for the sector (120,300). This results in an estimated employment of 59,900 in the east marine plan areas.

Number of businesses

[160] MMO Strategic Renewables Unit (2024)

[161] Correspondence with a renewables organisation

[162] Catapult (2017) 'The Economic Value of Offshore Wind'. Available at: Link

[163] Statista (n.d.) 'Employment in the renewable energy sector in the United Kingdom (UK) in 2019, by technology'. Available at: Link.

According to data from DESNZ (2024), the 166 renewable energy sites in the east marine plan areas are operated by 116 different companies.[164]

Table 8 below summarises these economic indicators.

Table 8: Key Economic Indicators - Renewables

Economic Indicator	Quantity	Source	Confidence rating
GVA (£m)	19,520	CATAPULT apportioned by capacity	2
Direct employment (FTEs)	59,900	Statistics apportioned by capacity	2
Numbers of Businesses	116	DESNZ	1

Future Activity

With the UK aiming to reach net zero by 2050 and transition away from fossil fuels, there will be an increase in renewable energy in the coming years.[165] Friends of the Earth state that in the future, most of our power, including that used to heat our homes and power our cars, will come from wind and solar power, and a smaller percentage from tidal, hydro and geothermal. RWE confirmed the Electricity Network Commissioners position that there will be a need for a significant revamp of the national grid to ensure all windfarms or other renewable energy sources can come online and that there are enough entry points.[166]

Underwater noise pollution particularly during the construction of offshore wind can have significant impacts on marine mammals, including the harbour porpoise, grey seal and harbour seal which can be found on the east coast, and can alter feeding behaviour as well as their communication. [167] So a concern for this issue might lead to further regulation and government policy on noise mitigation, and therefore have an impact on the supply chains for the sector. Co-ordination between offshore wind developers and other sectors working in the area is required to ensure that noisy activities remain below daily and seasonal thresholds.

[164] DESNZ (2024) 'Renewable Energy Planning Database'. Available at: Link

[165] Climate Change Committee (2020) '6th Carbon Budget'. Available at: Link.

[166] Electricity Network Commissioner (2023) 'Accelerating electricity transmission network deployment'. Available at: Link

[167] Earth.org (2024) 'How Does Noise Pollution Harm Marine Species?'. Available at: Link

There is also expected to be an increase in the safeguarding of wildlife and natural resources which might have an impact on new renewable energy projects, with the likelihood that they will have to show a net gain in biodiversity from their project.[168]

According to a representative of RWE, the renewable energy sector is investing heavily in local coastal areas including ports. There is a current drive to produce wind turbine blades locally and invest in upskilling and training young people in these communities for future employment in the sector. The renewable energy sector provides a range of low-skilled and high-skilled jobs and can appeal to a wide range of people. The renewables sector, such as the wind energy sector, is investing in educating young people in schools about the importance of the sector in meeting clean energy needs, implementing training programmes and education packages to assist schoolteachers. This should help drive wider economic growth in the area.

The impact on the seascape is another consideration for coastal communities. Whilst some residents of coastal communities originally resisted offshore wind because of the perceived negative effect it would have on aesthetics/views, these attitudes could mellow over time so that wind farms become an accepted part of the view.[169] However, there has been strong local resentment in Suffolk and Norfolk towards onshore substations for offshore windfarms especially adverse cumulative effects causing irreversible damage to the natural landscape. A representative of RWE noted, however, that there is a greater ‘disconnect’ between coastal communities and some offshore wind farms, than there is for terrestrial (onshore) wind farms. This is because if wind farms are very far out at sea, there is not an opportunity for visitors to visit them, as is the case for terrestrial wind farm sites. With regards to fishing, interactions between offshore windfarms and fishing activities can have consequential adverse impacts on coastal businesses and communities. Offshore windfarms can disrupt or displace fishing activity, potentially leading to increased costs or loss of earnings for the local industry.

There is currently a proposal to build a £3 billion tidal barrage across the Wash. The tidal barrage could provide power to 600,000 homes and protect from coastal flooding. However, the proposal is contentious with a lot of environmental concerns raised around substantial negative impact on the surrounding wildlife. The Norfolk Wildlife Trust stated that the Wash would be permanently damaged, and the habitat would be irreplaceable.

4.8 Energy- Nuclear

Introduction to Sector

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[168] Correspondence with a renewables organisation.

[169] Collingwood Environmental Planning (2019) ‘Baseline Social Information for Marine Planning: Seascape value, quality and link with sense of place.’ *Marine Management Organisation*

Nuclear energy represents an important part of the UK's energy mix as it shifts away from the use of fossil fuels in order to reach its net zero target by 2050.[170] The UK generates around 15% of its electricity from nuclear energy.[171] This contribution has fallen since the mid-1990s, however, when it provided around 25% of the UK's electricity supply.[172]

The invasion of Ukraine by Russia in February 2022 and subsequent restrictions on gas supply to Europe has intensified the focus of the UK Government on supporting development of alternatives to Russian fuel supply and strengthening UK energy security. In 2022, the government's Energy Security Strategy included a commitment to increase nuclear generation capacity to 24 GW by 2050[173]. In January 2023, DESNZ announced a £75 million Nuclear Fuel Fund to provide greater options for UK nuclear operators to use UK-produced fuel. In January 2024, the UK government published a Civil Nuclear Roadmap to 2050, outlining how the sector might develop to meet the 24 GW by 2050 generation target [174].

Current Activity

As of May 2023, there was a total of five operating civil nuclear power stations in the UK (across 4 sites)[175], all of which are operated by EDF Energy. One of these, the Sizewell B Power Station, is located in the east marine plan areas. Throughout its lifetime, Sizewell B has generated a total of 242TWh, representing 12% of all generation from nuclear power stations[176]. In 2022 the total capacity from nuclear was 5,883 megawatts electric (MWe) in the UK, and Sizewell B has a net capacity of 1,198MWe[177], which means that Sizewell B has 20% of the capacity in the UK. When looking at generation, the UK generated 47,700GWh in 2022 from nuclear energy and Sizewell B generated 10,357GWh in 2022, which is 22% of the total generation from the UK. 22% has been used to apportion the other figures in this sector.

GVA

In 2021, the UK's civil nuclear sector generated £6.1 billion in GDP for the UK economy.[178] To estimate GVA in the civil nuclear sector in the east marine plan areas, the total UK GVA figure has been apportioned to the east marine plan areas using the

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170 NIA (2023) Delivering Value. Available at: Link

171 World Nuclear Association (2024). Available at: Link

172 Thomas Weston (2023) 'The role of Nuclear Energy in the UK's energy supply'. Available at: Link

173 DESNZ (2022) 'British Energy Security Strategy'. Available at: Link

174 DESNZ (2024) 'Civil nuclear: roadmap to 2050'. Available at: Link

175 DESNZ (2023) 'Digest of UK Energy Statistics (DUKES)'. Available at: Link

176 EDF (2023) 'Nuclear power stations in the UK'. Available at: Link

177 Power Reactor Information System (2024) 'Sizewell B'. Available at: Link

178 NIA (2023) 'Delivering Value'. Available at: Link

amount of electricity generated by the Sizewell B plant as a percentage of total nuclear power generation, which is 22%. Multiplying £6.1 billion by 22% results in a total GVA in the east marine plan areas of £1,320 million.

The Nuclear Industry Association (NIA) states that civil nuclear workers are highly productive and contribute an average of £95,300 in GVA per employee. When multiplying this figure by the number of assumed employees (14,007), a very similar GVA figure is given of ~£1,335 million. The £1,320 million figure has been provided in the table below, both methodologies are estimates based on apportionment and so the actual GVA for the east marine plan areas may differ.

Employment

The Sizewell B nuclear power plant directly employs a total of 770 people, 520 of whom are direct employees of EDF and a further 250 of whom are contracted staff.[179]

However, direct employment in the nuclear sector does not just encompass those employed by the individual power plants, but also includes those employed in the civil nuclear sector more widely. In 2022, total UK employment in the civil nuclear sector amounted to 64,509.[180] To estimate the number of employees in the civil nuclear sector in the east marine plan areas, this employment figure has been apportioned to the east marine plan areas using the same method as for GVA, apportioning it according to the amount of electricity generated by the Sizewell B plant as a percentage of total nuclear power generation (which is 22%). Multiplying 64,509 by 22% results in a total number of employees in the east marine plan areas of 14,007. It is worth noting that in 2023 the total employment in the civil nuclear sector was 77,413, however given the generation data was from 2022, the 2022 employment figure was used.

Number of businesses

Whilst EDF are the main operator in the management of nuclear power stations in the UK, there are a number of other companies involved in the civil nuclear sector. According to the Jobs Map produced by the NIA[181] the constituency of Suffolk has 11 companies providing employment to 1,364 people, and one company in Beverly and Holderness with one employee. This does only include data from companies who are members of the NIA and so may not be a complete list of the businesses. Based on this information a figure of 12 has been provided with the caveat that this is unlikely to be an exhaustive list.

Table 9 below summarises these economic indicators.

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[179] EDF Energy (n.d.) 'Nuclear power stations in the UK'. Available at: Link.

[180] NIA (2023) 'Jobs Map'. Available at: Link.

[181] NIA (2023) 'Jobs Map'. Available at: Link.

Table 9: Key Economic Indicators - Nuclear

Economic Indicator	Quantity	Source	Confidence rating
GVA (£m)	1,320	NIA apportioned with percentage of generation (22%)	2
Direct employment (FTEs)	14,007	NIA apportioned with percentage of generation (22%)	2
Numbers of Businesses	12	NIA Jobs Map	1

Future Activity

Total nuclear power capacity in the UK is likely to decline in the short to medium term, as the capacity of reactors scheduled for decommissioning exceeds that of approved new reactors, thereby resulting in a net reduction in capacity. Much of the UK's current nuclear capacity is due to be decommissioned over the next decade, and only one new plant, Hinkley Point C, is currently under construction. If no other new nuclear power stations are built, the UK's nuclear capacity in 2050 will be around a third of what it was in 2021.[182] However, a proposed development for two new reactors at the Sizewell site in Suffolk (Sizewell C) has received development consent[183],and is awaiting a final investment decision. If the proposal goes ahead, the Sizewell C development will have significant socio-economic implications for the east marine plan areas. According to the Sizewell C website, the construction will provide 2,600 jobs in the Suffolk area, and it will bring £4.4 billion of investment to the East of England during construction[184]. More broadly, government ambition for 24GW of nuclear fission generating capacity by 2050 will require increased rollout of existing and new nuclear technologies[185] The potential for the facility to be constructed, and its location, remains highly uncertain. However, the Theddlethorpe community (which is within the east marine plan areas) is currently being considered[186].

4.9 Energy- CCUS

Introduction to Sector

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[182] UK Parliament (2021) 'Nuclear power in the UK'. Available at: Link

[183] National Infrastructure Consenting (2022) 'The Sizewell C Project'. Available at: Link

[184] Sizewell C (2024) 'Green light for construction phase as Sizewell C triggers Development Consent Order'. Available at: Link

[185] DESNZ (2024) 'Civil nuclear: roadmap to 2050'. Available at: Link

[186] Theddlethorpe (n.d) Available at: Link

Carbon capture, usage and storage (CCUS) is a technology that can capture carbon dioxide emissions from industrial processes and combustion of fossil fuels for electricity generation, to be used or stored. The process involves:

- capturing carbon dioxide from industrial processes or electricity production
- transporting compressed (liquid) carbon dioxide by trunk pipeline or ship to a storage site
- safely and permanently storing the carbon dioxide in very deep subsurface rock formations; suitable storage sites include but are not limited to depleted oil and gas fields, and saline aquifers
- utilisation of the captured carbon dioxide in some instances. The carbon dioxide can then be transported, including via repurposed gas pipelines, and stored, for example within rock formations in the UKCS, (United Kingdom Continental Shelf) including depleted oil and gas reservoirs. CCUS is often referred to as Carbon Capture and Storage (CCS). It is worth noting that CCUS is a developing energy sector and the technology is fairly new.

At present there are two industrial clusters, “Track 1” clusters (priority clusters at HyNet North West and East Coast Cluster) and “Track 2” (Viking and Acorn) clusters. Viking and the East Coast Cluster are either wholly or have elements at the storage sites, located in the east marine plan areas.

Current Activity

There are currently 21 CCUS first round North Sea Transition Authority (NSTA) carbon storage licences in the UK, 18 of which (67%) are in the east marine plan areas. There are also 6 additional licenses which were already in place before the first licence round. As can be seen from Figure 4 below, most CCUS activity lies within the east marine plan areas, particularly the more mature projects which are working towards carbon storage permits.[187][188] This is in part to do with the east marine plan areas also being an area with high oil and gas activity, as outlined in section 5.10 below. Competition and increasing demand for sea floor area from other sectors such as the renewables sectors presents a challenge. The NSTA is the technical regulator for carbon storage issuing licensing, stewarding licensees and reviewing application for carbon storage permits. The Crown Estate is working to design and deliver the required leasing process for CCUS developers in England, Wales and Northern Ireland, ensuring a holistic view is taken of how new infrastructure sits alongside all other marine users and respects the nation’s vital coastal environments and habitats.

[187] Correspondence with a CCUS organisation

[188] Once a licence has been awarded by the NSTA, the licencee also needs to obtain a seabed lease from The Crown Estate or Crown Estate Scotland.

Figure 4: North Sea Transition Authority Map of the CCUS sites

GVA and Employment

No data is available on current GVA and employment of the CCUS sector as the sector is new and upcoming.

However, driven by the UK Net Zero Strategy[189] and CCUS Strategy[190], the UK government has a set of targets to drive UK CCUS deployment pre-2030 and beyond, including capturing 6 mega tonnes per annum of CO_2 from industry and at least 4 appraised and operational storage sites by 2030. If the number of sites reach these targets, there is a potential for £4-5 billion in GVA from UK CCUS exports by 2050, and to support 50,000 jobs by 2030 across four CCUS clusters.[191]

The announcements of the CCUS licences puts the UK on track to achieve between 20 and 30 megatonnes of captured stored carbon dioxide a year[192].

Number of businesses

There are 14 business in the UK that hold carbon storage licences for the 21 CCUS sites, six of which hold the 18 licences for sites located in the east marine plan areas[193].

Future Activity

Major uncertainties with the future of the CCUS sector include the commercial suitability for storage of areas and how many of the current licences will progress to storage permit.

According to NSTA, potentially 100 stores need appraisal to meet domestic demand but if the UK wishes to take up the business opportunity to import captured carbon from Europe then many more sites will need to be appraised.

Although the east marine plan areas are currently a focal area for CCUS, there is high uncertainty in how the sector will grow in the coming years.[194] There are currently two types of storage sites – former oil and gas fields, and saline aquifers. Oil and gas fields, of which the east marine plan areas has many, could have lower risk and be quicker to appraise due to availability of existing data, and because they are reaching their end of life, this will likely be more common in the east marine plan areas. As an increasing number of storage sites are required, there will also be an increasing need for saline aquifers – these might be located elsewhere and not necessarily in the east marine plan areas.

[189] HM Government (2021) 'Net Zero Strategy: Build Back Greener'. Available at: Link

[190] DESNZ (2023) 'Carbon Capture, Usage and Storage'. Available at: Link

[191] DESNZ (2023) 'Carbon Capture, Usage and Storage'. Available at: Link

[192] NSTA (2023) 'Net zero boost as carbon storage licences accepted'. Available at: Link

[193] NSTA (n.d.) NSTA Interactive Map, filtered to Carbon Storage Licences'. Available at: Link

[194] Correspondence with a CCUS organisation.

Existing infrastructure and supply chains in the UK from the oil and gas sector will be key in supporting the CCUS sector in the future, and lead to significant cost savings[195]. As mentioned, the UK has extensive offshore infrastructure put in place to facilitate oil and gas extraction. This includes pipelines, wells and depleted oil and gas reservoirs, a lot of which will be decommissioned within the next 20 years. Much of this infrastructure is similar to that needed for a CCUS project. These assets would, however, ultimately need to undergo decommissioning in accordance with the Energy Act 2008 and the Petroleum Act 1998.

European nations have similarly ambitious net zero targets to the UK but have limited storage capacities within their marine sectors. This presents a significant export opportunity for the UK, which has one of the largest potential capacities in Europe. This should mean the UK is well placed to capture a large market share of the region. Additionally, the UK is a market leader in the subsea engineering sector. Due to similarities in technical abilities and competencies between the oil and gas sector, and the CCUS sector, there are ample reskilling opportunities. An area of concern, however, is the lack of new geoscience university graduates, who will be required to work in the growing CCUS sector.

There is also a great degree of uncertainty regarding how the CCUS market will evolve over time. The current “Track 1” clusters (priority clusters at HyNet North West and East Coast Cluster) and “Track 2” clusters (Viking and Acorn) are government supported, but over time these will need to move towards being self-sustainable and be more commercially driven.

Co-location with the renewables sector is being explored as a future solution but is a big challenge within the sector. The barrier to co-location with renewables is that CCUS storage sites will likely require seismic monitoring. Seismic monitoring is traditionally conducted by larger vessels, which deploy equipment off the back of the vessel, and these vessels cannot maneuver through offshore wind farms. There will therefore be a need to work closely with spatial planners to enable CCUS and renewable projects to co-locate, such as designing offshore wind farms to facilitate CCUS seismic monitoring where the sites overlap. Another risk to the use of storage sites is ensuring they remain secure and isolated to prevent any adverse environmental impacts. Construction near sites may cause issues and potentially cause leakage. Additionally, there will need to be frequent monitoring to ensure the sites remain secure.

4.10 Energy- Oil and Gas

Overview of Sector

The UK's oil and gas industry is predominantly characterised by offshore production, which constitutes almost all of the country's output. Currently, the UK's oil and gas production spans over 250 fields, encompassing both small fields and technically

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[195] DESNZ (2023) ‘Carbon Capture, Usage and Storage’. Available at: Link

intricate ones, the latter of which can often lead to higher development and production costs.

As of the end of 2022, approximately 47 billion barrels of oil equivalent had been extracted from the UK and its continental shelf (UKCS). In 2022, domestic oil production amounted to approximately 61% of the UK's total oil consumption, down from 72% in 2021. In 2022, the total consumption of oil and gas exceeded production by 21% in the UK, and production also decreased. In 2022 the oil and gas imports into the UK more than doubled in 2022 vs 2021. From 2018 to 2022, capacities of the proven and probable oil and gas reserves in the UK have declined at an annual compound rate of 11% and 9% respectively.[196]

Meanwhile, gross domestic production of natural gas accounted for 54% of the UK's natural gas consumption in 2022, up from 42% in 2021. The UK has a robust and adaptable gas supply network, characterised by diverse sources. The UK maintains one of Europe's largest and most dynamic gas markets, supported by extensive import infrastructure and a wide array of supply sources, including pipelines from Norway, Belgium, and the Netherlands, domestic production, and Liquified Natural Gas terminals facilitating gas imports from global sources.[197]

The industry acknowledges widespread concerns regarding climate change, emphasising the need to strike a balance between meeting domestic energy demands, supporting employment in the energy sector, decarbonisation efforts, and ensuring future extraction remains economically viable.

Current Activity

GVA

There are 266 oil and gas fields in the UK, 103 (39%) of which are located in the east marine plan areas.[198] According to UK Extractive Industries Transparency Initiative (UK EITI), GVA for the extractive industry in 2022 was £19 billion, and fell to £14 billion in 2023. Of this total, oil and gas accounts for the vast majority, with around 85% of the GVA. Therefore, GVA of the UK oil and gas sector was £16 billion in 2022 and £12 billion in 2023.

As can be seen from the figures above, GVA declined by 26% between 2022 and 2023, likely due to the UK’s push towards net zero targets and subsequent reduction in energy output from oil and gas, in favour of zero and low carbon alternatives.

Due to a lack of information on GVA of the oil and gas sector on a regional (and east marine plan areas) basis, the UK-wide figure for GVA (£12 billion in 2023) has been apportioned to the east marine plan areas using the figure for the proportion of oil and

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196 BDO – UK (2023) ‘Oil and Gas Report, Market Overview 2023’. Available at: Link

197 UK EITI. Available at: Link

198 NSTA. Available at: Link

gas fields (sites) that fall within the east marine plan areas (39%). This results in a GVA for the oil and gas sector in the east marine plan areas of £4.6 billion.

Employment

The UK's offshore oil and gas industry has been operating for over six decades. With direct employment exceeding 30,000, the sector plays a significant role in the nation's workforce. Offshore Energies UK's analysis indicates that by 2022, nearly 120,000 jobs were either directly or indirectly supported by the UK's upstream oil and gas sector, with an additional 60,000 jobs benefiting from its activities across the broader economy.[199]

Due to a lack of information on employment on a regional (and east marine plan areas) basis, the UK-wide figure for employment (30,000 direct employees) has been apportioned to the east marine plan areas using the figure for the proportion of oil and gas fields (sites) that fall within the east marine plan areas (39%). This results in employment in the oil and gas sector in the east marine plan areas of 11,617.

Number of businesses

There are two SIC codes that relate to oil and gas which are:
- Extraction of crude petroleum and natural gas
- Support activities for petroleum and natural gas extractions.

In the UK as a whole, there are 145 enterprises in extraction and 193 enterprises in support activities, giving a total of 338 enterprises.[200] In terms of number of businesses operating in the sector in the east marine plan areas, there are 12 companies that operate the 103 sites in the east marine plan areas.

Due to a lack of information on the number of enterprises on a regional (and east marine plan areas) basis, the UK-wide figure for the number of enterprises (338) has been apportioned to the east marine plan areas using the figure for the proportion of oil and gas fields (sites) that fall within the east marine plan areas (39%). This results in the number of enterprises in the oil and gas sector in the east marine plan areas of 131.

Table 10 below summarises these economic indicators.

Table 10: Key Economic Indicators - Oil and Gas

Economic Indicator	Quantity	Source	Confidence rating
GVA (£m)	4,608	UK EITI and apportioned using NSTA mapping data	2

[199] Offshore Energy UK (2022) 'Workforce Insight'. Available at: Link

[200] UK EITI. Available at: Link

Economic Indicator	Quantity	Source	Confidence rating
Direct employment (FTEs)	11,617	UK EITI and apportioned using NSTA mapping data	2
Numbers of Businesses	131	UK EITI and apportioned using NSTA mapping data	2

Future Activity

As the UK transitions towards a low carbon economy, oil and gas will play a different role in meeting energy demand than it has in the past. Oil and gas will still be needed to maintain security of supply, but as fossil fuels are phased out, oil and gas infrastructure, and the skilled workforce that comes with it, will shift towards the emerging CCUS sector and the renewables sector and hydrogen. Furthermore, as discussed in the section on the CCUS sector, depleted oil and gas fields will be used as storage sites for CCUS.

4.11 Marine Recreation

Introduction to Sector

Marine recreation includes all activities undertaken in the inshore and offshore areas, for leisure and recreation purposes. This includes sports such as sailing, powerboating, angling, paddle-sports and manual activities, as well as ancillary activities such as manufacturing, retail and marinas.[201] Due to the strong links with the coastal tourism sector and therefore avoiding double counting economic indicators, supporting activities such as accommodation have been scoped out of this sector.

The marine recreation sector contributed £1.03bn in GVA to the UK economy in the 2021/2022 financial year.[202] However, the sector has not yet recovered to pre-pandemic levels, which stood at £1.2bn in 2019.[203] Nevertheless, new opportunities for the sector have arisen as the general public are reprioritising health, family and holidays, resulting in more people getting on the water. More accessible activities such as stand-up paddleboarding and kayaking have become particularly popular since the pandemic. Despite restrictions, more people are also buying boats, and in 2020/2021, new and used boat wholesale and retail increased by 29.8%, while industries such as

[201] British Marine (2023) 'Key Performance Indicators for the Leisure, Superyacht & Small Commercial Marine Industry, 2021-22'

[202] British Marine (2023) 'Key Performance Indicators for the Leisure, Superyacht & Small Commercial Marine Industry, 2021-22'

[203] CEBR (2022) 'The economic contribution of the UK Leisure Marine industry'. Available at: Link

boating tourism and boat manufacture decreased by 42.4% and 32.7% respectively.[204] The decrease in boat manufacture alongside an increase in boating wholesale and retail may be explained by an increase in used boat sales, or a lag between the production and the sale of new boats.

Current Activity

The east inshore and offshore marine plan areas account for approximately 5% of UK coastal recreation activities, according to sectoral employment statistics. There are 18 marinas in the area, mostly situated in Norfolk and Suffolk.[205] Access is limited for larger boats in the area, due to the flat geography along the Norfolk and Suffolk coasts creating shallow inshore waters. Therefore, there is less demand for marinas in the area than in coastal stretches with deeper inshore waters, such as the Solent, located on the south coast of the UK. Activities such as recreational angling, small sailing boat and powerboat hire, canoes, kayaks and small ferry boat trips, are most popular in the east marine plan areas.

GVA and Employment

The GVA of the marine recreation sector in the east marine plan areas in 2021/2022 was £57m. This was calculated by apportioning the UK-wide GVA figure of £1.03bn by the number of marine recreation employees in the area. The 1,315 FTEs employed in the marine recreation sector in the east marine plan areas in 2021 was 5.6% of the 23,602 FTEs employed in the whole of the UK. The number of employees was identified using Nomis, under the SIC codes '93120: Activities of sport clubs', '93199: Other sports activities', and '93290: Other amusement and recreation activities'. These figures were then apportioned at ratios of 10%, 10% and 50% respectively, following guidance on the use of ONS data.[206] Employment figures were determined for both 2021 and 2022, with the former being used for continuation purposes when calculating GVA and number of businesses, and the latter being used as an up-to-date sector figure.

Number of businesses

The number of businesses was determined following a similar apportionment method. In 2021/2022 financial year, there were 6,286 businesses operating in the marine recreation sector in the UK. When apportioned by the employment ratio of 5.6%, a figure of 350 businesses was identified.

Table 11: Key Economic Indicators – Marine Recreation

Economic Indicator	Quantity	Source	Confidence rating

[204] British Marine (2022) 'Key Performance Indicators for the Leisure, Superyacht & Small Commercial Marine Industry, 2020-21'. Available at: Link

[205] Marinas.com (n.d.) 'Map'. Available at: Link

[206] Marine Management Organisation (2014) 'Exploring the Potential of Using Office for National Statistics (ONS) Data for Marine Planning'. Available at: Link

GVA (£m)	57	Apportioning based on figures from British Marine (2022) and Nomis	2
Direct employment (FTEs)	1,345	Nomis (2022)	2
Numbers of Businesses	350	Apportioning based on figures from British Marine (2022) and Nomis	2
Proportion of UK activity within east marine plan areas	5.6%	Apportioning based on employment figures using Nomis	2

Suffolk Yacht Harbour (SYH), with a capacity of 500 berths, is the largest marina directly serving the east marine plan areas. It is located on the onshore boundary between the east and south plan areas, along the River Orwell, and is accessible at all states of tide as the area around the marina is dredged annually.[207] The marina creates significant economic value in the area, by providing extensive facilities and access to the entire stretch of coast along the east marine plan areas. Since 2014, the SYH has also been working with the Suffolk Wildlife Trust to restore the salt marsh in Levington Lagoon, by depositing silt from the marina's maintenance dredging operations here.[208] This has helped to protect the marine environment and generate GVA through attracting tourists and bird watchers to the area. Activities on offer at the SYH include organised regattas, sailing tuition and accessible sailing for adults and children with disabilities. Whilst this is the largest marina within the east marine plan areas, smaller marinas with similar facilities are situated further north, such as Hull Marina, and the Royal Norfolk and Suffolk Yacht Club.

The marine recreation sector in the plan areas is partly driven by the presence of nationally designated coastal areas, such as the Norfolk Broads, where recreational activities are supported by the wildlife in the area. In 2014, 18% of the 8.1m visitors to the Norfolk Broads went fishing, spending between £91-100m.[209] As 23% of anglers visit coastal areas they otherwise would not have done if they did not fish[210], the natural economy of the area is clearly significant for the sector.

Over the last 4 years, the sector has faced significant challenges with regard to industry shutdown resulting from the Covid-19 pandemic. However, the rising

[207] Suffolk Yacht Harbour (n.d.) 'Home'. Available at: Link

[208] British Marine and Canal & River Trust (2021) 'Measuring the economic, social and wellbeing value associated with inland and coastal boating – Final Report'

[209] Environment Agency (2015) 'The Value of Angling in Essex, Norfolk and Suffolk Area'. Available at: Link

[210] Canal & River Trust (2019) 'Angling for Good: National Angling strategy 2019-2024'. Available at: Link

popularity of activities such as stand up paddleboarding during this period meant that the east marine plan areas were not as badly affected as other parts of the UK, which are more reliant on larger cruising vessels. Other badly affected industries impacting the east marine plan areas include boat manufacturing and hire boats. The manufacturing sector has been further impacted by supply chain disruptions and rising costs as a result of the Russia-Ukraine war.

Future Activity

Traditionally, trends in leisure boating tend towards a gradual increase in the size of vessels.[211] However, the inshore marine plan area is already struggling to accommodate larger vessels due to the topography of the seabed. Further increases may be limited, stalling sector growth. Therefore, the sector may look to utilise dredging practices in the future, particularly around marinas, to ensure moorings can meet the requirements of larger boats.

Changing consumer demands are also leading to an emergence of electric motorboat manufacturing technologies, which, although in the early stages of development, are predicted to grow in popularity as the technology improves. This could lead to a reduction in the size of propulsion engines and vessels, which would be more suited to the environment of the inshore area. Furthermore, legislation is expected to impact the sector, as low emission zones and decarbonisation targets are likely to contribute to the growing popularity of electric propulsion technologies. This could also help drive the recovery of the boat manufacturing industry to pre-pandemic levels.

Concerns around extreme weather events are growing, especially in the east marine plan areas where the Holderness Coast is retreating at a rate of 2 metres/ year, the highest loss rate in Europe.[212] Bridlington Harbour is the only marina located on this stretch of coast. Nevertheless, it is important for recreational activities in the area, and damage to the harbour could have potentially significant knock-on effects to the sector. Although offshore sailing is not directly impacted by coastal weathering, as boats can be launched from further afar, vessels which require beach launches, such as SUPs and kayaks, will likely be affected by beach closures.

4.12 Shipping

Introduction to Sector

The key activities in the shipping sector are sea and coastal freight water transport, sea and coastal passenger water transport and cargo handling. Shipping is a critical sector in the east marine plan areas, with the Humberside ports of Grimsby and Immingham, and Hull, in particular, being crucial to this sector. This sector overlaps significantly with the ports sector (section 4.6 Ports).

[211] Correspondence with a marine recreation organisation.

[212] Aggregate Industries (2024) ‘The True Cost of Coastal Erosion to the UK’. Available at: Link

Shipping vessel categories, as described by the European Maritime Safety Agency[213], include:

- Tankers (including liquefied gas tankers, oil tankers, chemical and other liquid tankers such as water tankers)
- Bulk carriers (including bulk dry, bulk dry/oil, self-discharging bulk dry and other bulk dry carriers)
- General Cargo (including general cargo, palletised cargo and deck cargo ships)
- Container ships (fully cellular container ships and fully cellular with ro-ro facility container ships)
- Ro-Ro cargo ships (including Ro-Ro cargo ships, vehicles carrier, container/ro-ro cargo ships and landing craft)
- Passenger ships (all passenger ships including RoPax and HSC, passenger/container ships and passenger/general cargo ships)
- HSC (High Speed Passenger Craft)
- RoPax (passenger/ro-ro cargo ships and passenger/landing craft with are not HSC)
- Other cargo ships (refrigerated cargo ships and other dry cargo ships such as livestock carriers, barge carriers, heavy load carriers and nuclear fuel carriers)
- Other work vessels (all offshore, research, towing/pushing, dredging and other activities)

Automatic Information Systems (AIS) mapping has been used to provide a spatial analysis of shipping in the east marine plan areas. These are presented in diagrammatic form, according to four separate shipping typologies (cargo, tanker, passenger and other routes). The cargo typology combines several of the vessel categories listed above, whilst the passenger typology combines three of the vessel categories.

Whilst AIS mapping has been used in the past to estimate the economic value of shipping activities (see MMO1158[214]), this method has not been used within this socio-economic baseline due to a lack of up-to-date additional data, available to the project team, which would be required to inform shipping cargo values. Separate follow up work could be dedicated to further exploring the economic value of shipping in the east marine plan areas using this approach. For the purposes of this report, national figures for GVA and employment in the shipping sector have been apportioned to the east marine plan areas based on passenger and freight data for east marine plan area ports.

Current Activity

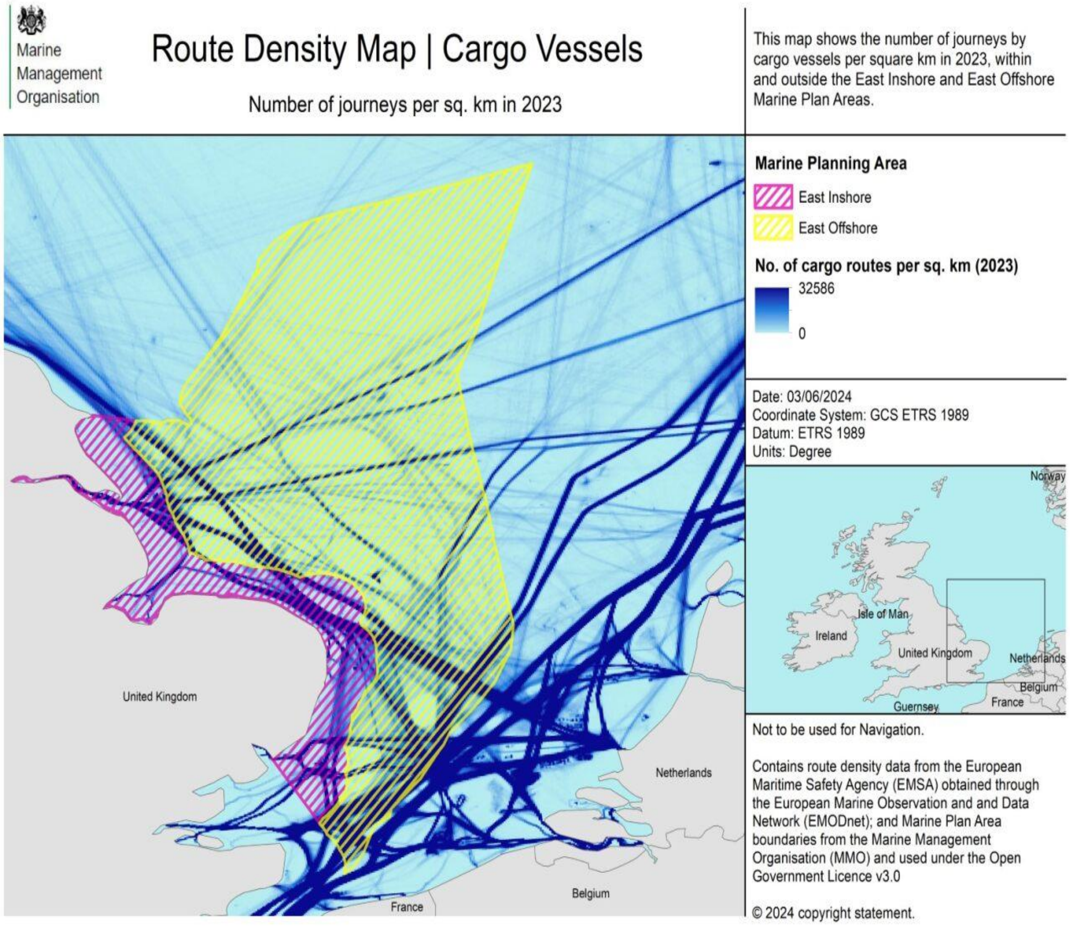
Spatial analysis of activity based on Automatic Information Systems data

[213] European Maritime Safety Agency (2022) 'European Maritime Safety Report 2022'

[214] MMO (2019) 'MMO1158: Mapping Shipping Cargo Value Non-Technical Summary'. Available at: Link

Automatic Information Systems data, drawn from The European Marine Observation and Data Network (EMODnet),[215] has been used to represent annual route densities of shipping in the east marine plan areas. This is displayed in four maps, showing the route densities of the four vessel typologies already described: cargo vessels (Figure 5), tanker vessels (Figure 6), passenger vessels (Figure 7), and 'other' vessels (Figure 8). Scales on the right-hand side of maps show how the density of shipping activity, in terms of number of routes per square kilometre, is expressed by the strength of shading of the routes. The maps show a high proportion of shipping activity in the east marine plan areas, in particular for cargo vessels and 'other' vessels operating within the east inshore marine plan area.

Figure 5: Route density map for cargo vessels in the East Inshore and East Offshore marine plan areas



[215] European Commission (2023) 'The European Marine Observation and Data Network (EMODnet) – Map Viewer'. Available at: Link

Figure 6: Route density map for tanker vessels in the East Inshore and East Offshore marine plan areas

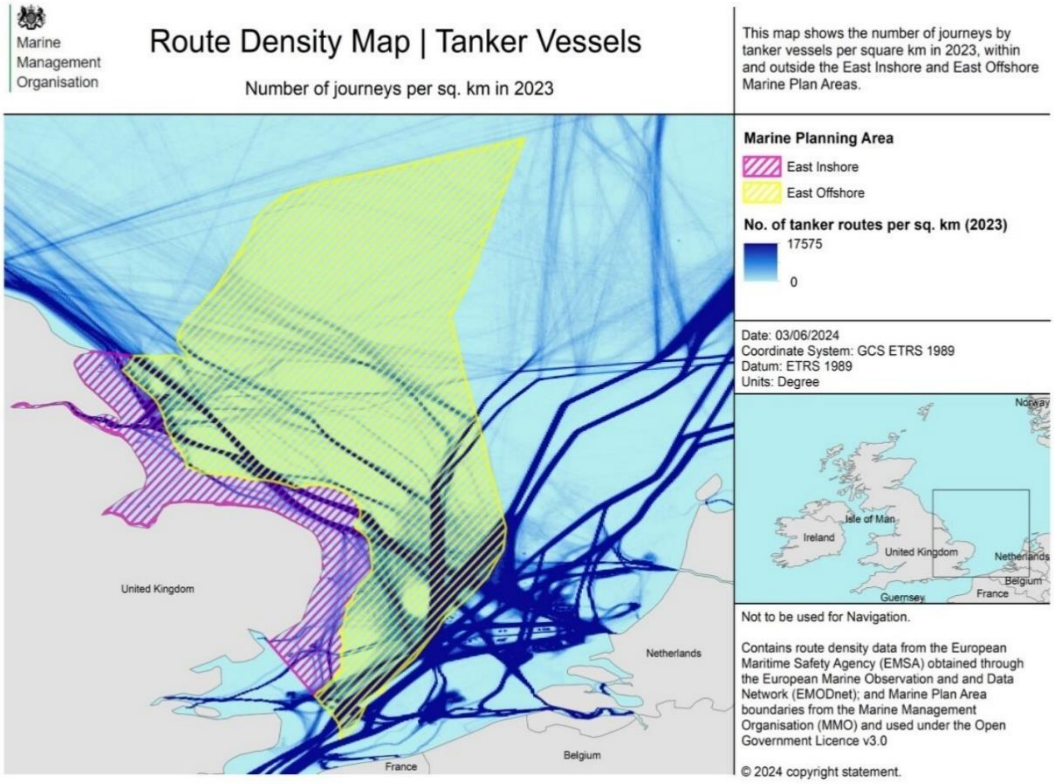


Figure 7: Route density map for passenger vessels in the East Inshore and East Offshore marine plan areas

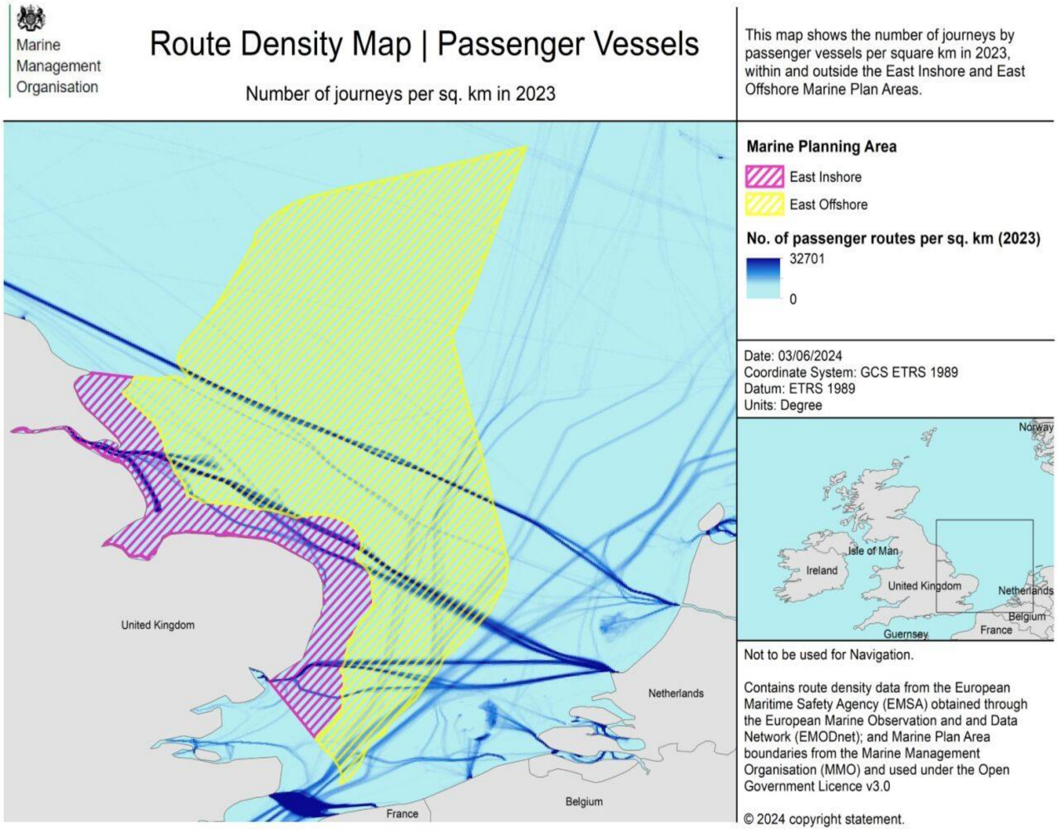
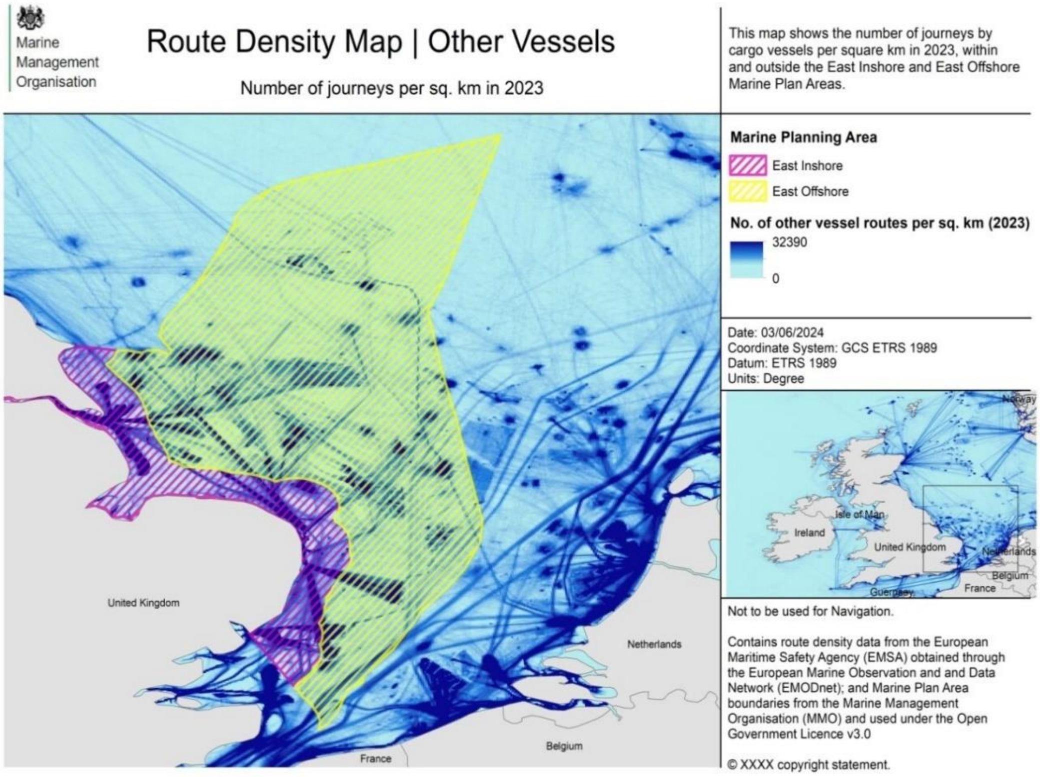


Figure 8: Route density map for other vessels in the East Inshore and East Offshore marine plan areas



Freight and passenger data

In 2022, 78 million tonnes of freight were imported into ports in the east marine plan areas, with the vast majority (93%) coming into the Humber and landing at Humberside ports.[216] In 2013, there were approximately 26,000 commercial vessel movements in the Humber Estuary.[217] Inland riverine shipping is also important. Ports on the River Trent and the Rivers Hull and Humber landed 906,000 and 10.96m tonnes of freight, respectively.[218] The amount of freight shipped into ports in the east marine plan areas has reduced by 13% since 2018, and by 20% since 2013. As for the ports sector, ships docking at Felixstowe, Ipswich, as well as Harwich, are not included in the analysis for figures relevant to freight landed and passenger numbers. However, it is acknowledged that ships using these ports will use the same main shipping channel that traverses the east marine plan area, as will be true for other ships using the east marine plan area docking at ports further afield.

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[216] Department for Transport (2023) 'Port freight statistics 2022: Overview of port freight statistics and useful information'. Available at: Link

[217] Humber Nature Partnership (2013) 'Humber Management Scheme'. Available at: Link

[218] Department for Transport (2023) 'Port freight statistics 2022: Overview of port freight statistics and useful information'. Available at: Link

In 2022, 483,000 passengers used ports located in the east marine plan areas, all of whom used the ports either at Hull (83%) or at Grimsby and Immingham (17%).[219] Passenger transport is far less significant to the east marine plan areas than freight, consisting of just 3.5% of all UK passenger maritime transport. 2018 saw the highest figures for passenger transport, with 950,000 users in the east marine plan areas. However, 2022 figures appear not to have recovered from pre-pandemic levels. In 2019, 925,000 passengers came through east marine plan areas ports (830,000 through Hull and 95,000 through Grimsby and Immingham).

A total of 95% of all UK trade is seaborne. In 2019, shipping in the UK accounted for 40% of turnover of the entire maritime sector, the maritime sector comprising shipping, ports, leisure marine, marine engineering, and scientific and maritime business services.[220] As a sector overall, analysis suggests that the EU Exit has sharply reduced the range of goods traded between the UK and the EU, as the cost of trading causes smaller traders to exit the market both for exports and imports. This has reduced both exports and imports, the latter by slightly more.[221]

Sector performance has been impacted by the performance of the UK economy as a whole, UK foreign trade deals, and geopolitical influences. For example, Houthi rebel attacks in 2024 in the Red Sea have led to some of the world's top shipping companies, including Maersk and Hapag-Lloyd, diverting ships from the Suez Canal and rerouting them around the southern tip of Africa. As a result, in the UK some manufacturers said 12 to 18 days could be added to some expected deliveries, disrupting their production schedules.[222]

GVA

Shipping activities include passenger transport, freight transport and other shipping activity.[223] GVA for the east marine plan areas has been calculated by using ITL1 regions figures for GVA of the UK shipping industry, compiled by the Centre for Economics and Business Research[224], and then apportioning this figure to the east marine plan areas, based on passenger and freight statistics relevant to the ports included in the east marine plan areas.[225] This involves multiplying the GVA of a ITL1

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[219] Department for Transport (2023) 'Sea passenger statistics, all routes: 2022 data tables'. Available at: Link

[220] CEBR (2019) 'Forecasting Eye'. Available at: Link

[221] CEBR (2022) 'How rising shipping costs have hindered the UK's attempts to boost exports outside the EU'. Available at: Link

[222] The Guardian (2024) 'UK manufacturers hit by Red Sea disruption and rising shipping costs'. Available at: Link

[223] CEBR (2022) 'The economic contribution of the UK shipping industry'. Available at: Link

[224] CEBR (2022) 'The economic contribution of the shipping industry'. Available at: Link

[225] Since shipping involves the transit of passengers as well as freight, both must be considered for shipping, whereas for ports, activities relevant to passengers are minimal and the majority of activities

region by the proportion of freight in the ITL1 region that is processed in east marine plan areas ports, and by freights relative economic value, and vice versa for passengers. Notably, the latest GVA data is only available from 2019, and this is the year that has been used when using passenger and freight statistics. Using this methodology, the GVA for the shipping sector in the east marine plan areas in 2019 has been calculated to be £131m.

Employment

To determine the numbers of FTEs in the shipping sector in the east marine plan areas, the same apportioning methodology was used as for GVA. ITL1 figures for employment in the sector statistics were provided by the Centre for Economics and Business Research[226] and shows 48,138 FTEs in the shipping sector in 2019 in England. Thus proportionally there were 1,394 FTEs in the shipping sector in 2019 in the east marine plan areas.

Number of businesses

This has not been able to be estimated due to insufficient discrete geographic unit areas available to use Nomis UK Business Count data, for the required level of analysis of the shipping sector.

Table 12 below summarises these economic indicators for the sector.

Table 12: Economic indicators - Shipping

Economic Indicator	Quantity	Source	Confidence rating
GVA (£m)	131	Cebr (2022) apportioned to east marine plan areas based on freight tonnages and passenger numbers	2
Direct employment (FTEs)	1,394	Cebr (2022) apportioned to east marine plan areas based on freight tonnages and passenger numbers	2
Proportion of activity in England within east marine plan areas (freight)	23%	Department for Transport (2022) Freight Statistics	2

are relevant to the handling of freight and its storage. This is why when apportioning for shipping, both passengers and freight are considered, whereas for ports only freight is considered.

[226] CEBR (2022) 'The economic contribution of the UK shipping industry'. Available at: Link

Proportion of activity in England within east marine plan areas (passengers)	3.5%	Department for Transport (2022) Passenger statistics	2

Future Activity

Whilst it is projected that there will be continued falls in bulk trade[227] in shipping (e.g. oil, coal and grain), there is expected to be a 90% growth in container trade[228] by 2050. Felixstowe, just outside the east marine plan areas boundary, is the UK's largest container port, dealing with 42% of Britain's containerised trade,[229] and therefore can expect to see significantly greater demand in volumes of shipping. Meanwhile, Humberside ports may need to diversify to meet this demand for containerised trade.

Due to climate change, the Arctic shipping season could become three times longer and more reliable, meaning that voyages between East Asia and the UK could be 10-12 days shorter for summer shipping by 2050.[230] With key ports on the Eastern seaboard, the east marine plan areas may benefit from these potential new routes, giving the UK a strategic advantage over more southerly European neighbours. Benefits include reduced shipping costs and increased trade opportunities for ships using east marine plan areas ports. This will generate knock-on benefits for the ports themselves like increased revenue and the stimulation of investment. Port traffic, and therefore income due to increased trade opportunities and lower shipping costs, may stimulate further investments. The east marine plan areas may also become busier as the need for shipping increases to meet the growth in the Arctic economy (including mineral resources, tourism, and logistics).[231] Nonetheless, the opening of Arctic sea routes may also bring challenges for shipping that uses the east marine plan areas, such as limited port facilities and emergency response capabilities during their crossings. There are also issues with regulatory oversight, the heightening of geopolitical tensions and environmental impact toward an already fragile region.[232]

Recently, the UK has been establishing itself as a hub for autonomous vessels (vessels that do not require direct human intervention due to technological advances in areas like remote sensing and AI). It is projected that this industry will reach $136

[227] Bulk trade consists of large quantities of raw materials, typically without packaging. Common products include coal, iron ore, grains, minerals, oil and other petroleum products.

[228] Container cargo refers to goods that are packed and transported in standardized shipping containers, with common products including manufactured goods, electronics, machinery, textiles, and food products.

[229] Institute of Civil Engineering (n.d.) 'Felixstowe Docks'. Available at: Link

[230] Melia, N. (2017) 'What opening Arctic sea routes mean for the UK'. *Government Office for Science.* Available at: Link

[231] Melia, N. 'What opening Arctic Sea routes mean for the UK' *Government Office for Science.* Available at: Link

[232] Atlas International Marine Services (n.d.) 'Navigating the Arctic: Challenges and Opportunities in Arctic Shipping Routes'. Available at: Link

billion in turnover globally by 2030 and is likely to be a significant disrupting technology.[233] According to a representative of Hutchinson Ports, though the development of autonomous shipping technology has progressed the most in ships using ports in the south-west, this does not mean it could not be a growth area in other areas of the country too such as the east coast.[234] One of the key changes that this development may bring about is to reduce the reliance on harbour tug boats and harbour pilots. Whilst in the short-term technological development can lead to the creation of highly skilled jobs for those developing the technologies, it is likely to have the social impact of reducing employment through a reduction in crew numbers. However, the crew of many vessels using UK ports are not from the UK, meaning that this impact is relatively minor in terms of employment in the east marine plan areas.

4.13 Subsea Telecommunications Cabling

Introduction to Sector

Modern subsea cables use fibre optic cables to carry data in the form of international phone calls and internet traffic.

Subsea cables can be divided into two broad categories: telecommunication cables and high-voltage power cables, the latter of which are typically associated with renewable energy projects. High-voltage power cables are relevant to the renewable energy sector, and have not been included here in order to avoid double counting. Similarly, pipelines are required for connections to oil and gas rigs, and these are included in the oil and gas sector. The MOD has subsea cables, but locations of these are unknown due to national security. Nearer to the shore, telecommunications cables are buried under the seabed for protection, but in the deep sea they are laid directly on the ocean floor.[235]

Cables were traditionally owned by telecom carriers who would form a consortium of all parties interested in using the cable. Today, independent companies (of which companies like Google and Amazon are major investors) tend to build private cables and sell off the capacity to users.

Maintenance of subsea cabling is an important aspect of the sector. Accidents like fishing gear interactions and ships dragging anchors account for two-thirds of all cable faults. Less commonly, underwater components can fail due to internal faults. These issues result in the need for maintenance teams to fix them.[236] Maintenance companies operate out of depots that act as hubs for subsea cabling maintenance ships that operate around the globe.

Current Activity

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[233] Centre for economic and business research (2019) 'Forecasting Eye'. Available at: Link

[234] Correspondence with a shipping and ports organisation

[235] TeleGeography (2024) 'Submarine Cable Frequently Asked Questions'. Available at: Link

[236] TeleGeography (2024) 'Submarine Cable Frequently Asked Questions'. Available at: Link

There are currently 28 telecommunications subsea cables in the east marine plan areas. From north to south, one of these cables makes landing at Weybourne, 8 make landing at Winteron-on-sea, ten make landing near Lowestoft, and 9 make landing near Southwold.[237]

Some of the cables are recent and have been built since 2021; for example, Scylla, Zeus, and Iceni, all of which land internationally in the Netherlands.[238] In total, 112 subsea telecommunications cables enter into England[239], meaning that the east marine plan areas are responsible for 25% of subsea telecommunication lines by number, although what this represents in terms of data capacity is unquantified.

The presence of the subsea telecommunications cables in East Anglia, as opposed to further north in the east marine plan areas, demonstrates the fact that East Anglia is well positioned to mainland Europe (Netherlands and Belgium) as a suitable site for cabling to enter the UK mainland.

GVA

GVA for the entirety of the telecoms and communications sector, as opposed to subsea telecommunications alone, for the whole of the UK was £32.7 billion in 2022. Due to the unavailability of regional figures, or suitable apportioning data, it is not possible to provide a robust estimate for the GVA of the telecommunications sector in the east marine plan areas specifically, and the importance of subsea cabling within this. However, two potential methods for doing so are as follows:

- In MMO1119[240] it was suggested that 5% of activity within a SIC code relevant to 'other telecommunication activities'[241] is marine related.
- A 2008 report for the Crown Estate estimated the value of subsea cables as 10% of total value of telecommunication sector, based on data indicating that 10% of telephone calls were international.

Both of these approaches, however, have not been deemed sufficiently robust to estimate the GVA of the sector, and potentially risks undervaluing the critical importance of subsea cabling to the telecommunications today. In the case of the Crown Estate's analysis, this is particularly so in the current context where demand for data far outstrips demand for international telephone calls. It is clear, however, that the sector makes a significant economic contribution to both the east marine plan

[237] European Commission (n.d.) 'European Marine Observation and Data Network (EMODnet)'. Available at: Link

[238] TeleGeography (2023) 'Submarine Cable Map'. Available at: Link

[239] European Commission (n.d.) 'European Marine Observation and Data Network (EMODnet)'. Available at: Link

[240] ATKINS (2016) 'MM01119: Economic baseline assessment for the North East, North West, South East and South West marine plans' *Marine Management Organisation.* Available at: Link

[241] SIC code: 61900.

areas and the UK as a whole and is indeed a critical component of the infrastructure that keeps the country functioning on a daily basis.

Employment

Although there are employment figures for the telecommunications sector as a whole (220,800 in the UK in 2018[242]), there is a lack of both UK and regional data on employment in subsea cabling specifically. There is also no SIC code for subsea cabling specifically. Therefore, it was not possible to estimate apportioning factors or ONS data to estimate the numbers of individuals employed in the subsea telecommunications sector.

Number of businesses

There are six different companies which operate the eight cables in the east marine plan areas, including BT, GIT communications, euNetworks, Zayo, Verizon, and Tampnet.[243]

Future Activity

Globally, between 2018 and 2023, the submarine fibre capacity on major routes grew at a Compound Annual Growth Rate of 13.3%. Global submarine telecoms capacity, meanwhile, was expected to increase by 74.5% between 2023 and the end of 2025.[244]

Satellite technology is also used in telecommunications, however, on a by-bit basis, cables can carry far more data than satellites can transmit at far less cost, and therefore satellites only pose an advantage in hard-to-reach areas for fibre. In the US, for example, satellites account for just 0.4% of all US international capacity.[245] Satellites, therefore, do not pose a significant threat to the growth of the subsea cabling market.

UK demand for data is unprecedented, driven by factors including cloud-based server growth, ubiquity of mobile devices, and the rapid deployment of technologies like 5G.[246] In the UK, consumption per data user on mobile phones increased by 24% between 2021 and 2022 to 8 GB per month. On fixed broadband connections, the average monthly data use increased by 6% to 482 GB.[247]

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242 Statista (2024) 'Total number of employees in the telecommunications sector in the United Kingdom (UK) from 2009 to 2018'. Available at: Link

243 TeleGeography (2023) 'Submarine Cable Map'. Available at: Link

244 Submarine Telecoms Forum (2023) '2023/2024 Industry Report'. Available at: Link

245 TeleGeography (2024) 'Submarine Cable Frequently Asked Questions'. Available at: Link

246 Submarine Telecoms Forum (2023) '2023/2024 Industry Report'. Available at: Link

247 Ofcom (2023) 'Communications Market Report 2023'. Available at: Link

The rapidly expanding need for data is likely to increase the requirement for more subsea telecommunications cables into the UK. Moreover, cables are engineered with a minimum design life of 25 years, although they can be retired earlier if economically obsolete. Some of the cables that make land in the east marine plan areas (Concerto, Circe North, Ulyssses-2, Tampnet) were built just before the end of the millennium[248], indicating that these cables will soon be obsolete (given their 25-year life span) and will need to be replaced. Therefore, whilst the project team is not aware of specific immediate plans for further subsea telecommunication cabling to be built within the east marine plan areas, given rapid growth trajectories, it is likely that this sector will grow in the east marine plan areas in the short to medium term.

4.14 Coastal Tourism

Introduction to Sector

For the purposes of this study, the coastal tourism sector has been defined as comprising of all day and overnight visits in the UK by domestic and international visitors undertaking activities set in or reliant on the coastal environment. These include visiting the beach, hiking, cycling and birdwatching. Due to the strong links with the recreation sector, activities taking place in the inshore and offshore areas are excluded from coastal tourism figures, however, the ancillary activities associated with these, such as accommodation, are included. Coastal tourism in England is mostly driven by a desire to relax, spend quality time with friends or family, and sightsee or explore.[249] In the UK, tourism hotspots are categorised into 'principal seaside towns', 'smaller seaside towns', 'other seaside towns' and 'holiday parks'. *Beatty et al.* define these as:

- Principal seaside towns: places with a population of at least 10,000 where seaside tourism is a significant component of the local economy;
- Smaller seaside towns: places with a population of at least 1,500 but less than 10,000 where seaside tourism is a significant component of the local economy;
- Holidays parks: places where there are individual holiday parks, or, where there is a high concentration of camping and caravan sites; and
- 'Other' seaside towns: places where seaside tourism is an additional component of the local economy, or sub-parts of larger urban areas that, taken as a whole, could not be described as a 'seaside resort'.[250]

The European Commission (EC) reported that the GVA of UK coastal tourism was £7.2bn in 2018.[251] Post-exit from the EU, the EC no longer reports UK data, however, the National Coastal Tourism Academy's (NCTA) most recent data reports that tourism

[248] TeleGeography (2023) 'Submarine Cable Map'. Available at: Link

[249] National Coastal Tourism Academy (2024) 'Coastal Tourism Overview'.

[250] Beatty, C., Fothergill, S., Gore, T. & Wilson, I (2010) 'The Seaside Tourist Industry in England and Wales'. Available at: Link

[251] European Commission (2020) 'Blue Economy Report'. Available at: Link

spending decreased by 37% between 2019 and 2021 as a result of the Covid-19 pandemic.[252]

Current Activity

Within the east marine plan areas, there are four principal seaside towns (Bridlington, Skegness, Great Yarmouth and Lowestoft), 12 smaller seaside towns, five holiday parks and two 'other' seaside towns.[253]

The Lincolnshire coast, and a large part of the East Anglian coast (which are both within the east marine plan areas' boundaries), make up the largest proportion of the Lincolnshire and East Anglian visitor economies. At pre COVID-19 levels, the east marine plan areas contributed around 12% to the UK coastal tourism sector. However, overall, the East and North East coastlines are some of the quieter regions for coastal tourism in the UK. During the first UK lockdown Skegness and Mablethorpe were some of the most disproportionately affected seaside towns, losing as much as 25-50% of their accommodation stock.[254]

GVA and Employment

The GVA of the coastal tourism sector within the east marine plan areas was £854m in 2018. This figure was calculated by apportioning the UK-wide GVA (£7.2bn) by sector employment in the area. The 23,945 FTEs employed in the coastal tourism sector in the east marine plan areas in 2018 comprised 12% of the 201,300 FTEs employed in the whole of the UK. Employment was determined using Nomis, by identifying the number of FTEs in the area under the relevant SIC codes.[255] In 2022, direct employment was 23,685 FTEs. Employment figures were determined for both 2018 and 2022, with the former being used for continuation purposes when calculating GVA, and the latter being used as an up-to-date sector figure.

Number of businesses

The number of businesses could not be determined as UK-wide figures for this indicator are not reported.

Table 13 below summarises these economic indicators.

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[252] National Coastal Tourism Academy (2024) 'Coastal Tourism Overview'.

[253] Beatty, C., Fothergill, S., Gore, T. & Wilson, I (2010) 'The Seaside Tourist Industry in England and Wales'. Available at: Link

[254] Centre for Towns (2020) 'The effect of the COVID-19 pandemic on our towns and cities'. Available at: Link

[255] 55100: Hotels and similar accommodation; 55201: Holiday centres and villages; 55202:Youth hostels; 55209: Other holiday and collective accommodation; 55300: Recreational vehicle parks, trailer parks and camping grounds; 55900: Other accommodation; 79901: Activities of tourist guides; 91020: Museum activities; 91030: Operation of historical sites and buildings and similar visitor attractions; 91040: Botanical and zoological gardens and nature reserve activities; 93210: Activities of amusement parks and theme parks; 93290: Other amusement and recreation activities

Table 13: Key economic indicators - Tourism

Economic Indicator	Quantity	Source	Confidence rating
GVA (£m)	854	Apportioning based on figures in EU Blue Economy Report (2020)	2
Direct employment (FTEs)	23,685	Nomis (2022)	2
Number of businesses	Undetermined		
Proportion of UK activity within east marine plan areas	12%	From GVA figures	2

A large part of the visitor economy in the east marine plan areas is driven by nature, as the east marine plan areas contain 10 blue flag beaches (an international award given to beaches that meet management, environmental and water quality requirements), 3 areas of outstanding natural beauty (AONBs) and 14 National Nature Reserves (NNRs).[256,257,258] The Wash, located in Norfolk, is the largest NNR in the UK. A total of 10% of England's saltmarsh is located within the Wash, which represents a valuable breeding zone for birds, as well as supporting one of the largest common seal populations in England.[259]

The growth in domestic tourism in the UK is largely motivated by changing consumer demands following the pandemic, as well as an increasing concern for the environment. In particular, this growth is driven by under 25s and over 55s who are less likely to be travelling with children and so have the freedom of choice to travel by train rather than by car or plane. Over 55s are the most likely group to choose UK holidays over international. The drive towards sustainable consumerism has also seen a significant increase in the number of electric vehicle (EV) sales in the UK. Whilst this has helped to mitigate the issues of sound and air pollution in coastal communities, problems have arisen where infrastructure has failed to meet the demand for EVs in visitor areas. EV owners are instead having to park their cars in residential areas, which creates conflict with locals.

The East coast stretch is currently facing difficulties managing the conflict between preserving the natural experience and demand for commercial beach holidays.

[256] Blue Flag (n.d.) 'Blue Flag Sites'. Available at: Link

[257] Natural England (n.d.) 'Areas of Outstanding Natural Beauty (England)'. Available at: Link

[258] Natural England (n.d.) 'National Nature Reserves (England)'. Available at: Link

[259] Natural England (n.d.) 'Norfolk's National Nature Reserves'. Available at: Link

Blakeney Point, on the North Norfolk coast, is a particular point of contention between locals, visitors and authorities. The area is home to England's largest colony of grey seals and in 2012 Natural England proposed to create a Marine Conservation Zone (MCZ) across the saltmarshes to protect the area from tourist activities. This was met with widespread criticism from locals, who rely on the marshes for traditional uses such as sailing and samphire picking, but also from heritage conservation groups such as the National Trust.

Local residents in Blakeney are also in conflict with second-home owners, as around 44% of properties here are second homes and holiday lets. In 2023, villagers voted to ban future development of second homes, meaning that any new properties must be the principal residence of their owners.[260] This proposal aims to curb the economic and social impacts of seasonal activity. A seasonal economy is one that experiences high and low periods of activity during certain months of the year. Coastal tourism in the UK experiences peak activity during July and August[261], but rates of seasonality can be higher in areas where there is a greater proportion of second and holiday homes.

Other stretches of the east marine plan areas where seasonality is impacting the local economy are along the Lincolnshire coast where seasonality rates are the highest in the UK in terms of the visitor economy. This is partly due to high flood risk in the winter months, meaning that beaches are often only open over the summer. This creates challenges for businesses in terms of investment in skills and training, as well as the impacts of high unemployment in the winter months on local communities. Sometimes the opposite can be a problem, where low unemployment rates in an area could create a shortage of workers in the summer months. Although winter visits to the coast are growing slightly in the UK, numbers are still low and the rates of seasonality in the east marine plan areas are some of the worst in the UK.

Future Activity

There are large concerns in the area over the future impact of extreme weather events on the visitor economy, especially as coastal erosion rates along the east marine plan areas are some of the highest in Europe. Beach closures present issues in terms of attracting domestic visitors, and so the careful management of coastal defence systems are important for protecting the local economy. In 2020, the UK government established the Flood and Coastal Erosion Risk Management Investment Plan which doubled flood defence investment to £5.2 billion for 2021-2027 and is forecast to reduce national flood risk by up to 11% by 2027. Investments in the east marine plan areas include the Benacre and Kessingland flood defence embankment and the Saltfleet to Gibraltar Point beach replenishment scheme. The latter scheme aims to protect 20,000 homes and businesses, 24,500 static caravans and 35,000 hectares of land from flooding.[262]

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[260] Blakeney Parish Council (2023) 'The Blakeney Neighbourhood Plan'. Available at: Link

[261] National Coastal Tourism Academy (n.d.) 'Coastal Tourism'. Available at: Link

[262] Department for Environment Food & Rural Affairs (2021) 'Flood and coastal erosion risk management: An investment plan for 2021 to 2027'. Available at: Link

Another associated risk of extreme weather events is the increased use of storm overflows by wastewater management companies (see section 4.15), which causes water contamination in popular swimming spots. In 2023, three North Norfolk beaches lost their blue flag status due to water pollution. Surfers Against Sewage have also issued warnings at a further three swimming sites within the east marine plan areas. An online petition has been started following concerns from residents in the King's Lynn & West Norfolk constituency about the deteriorating water quality standards at Heacham Beach, which is located in the Wash. Whilst water companies have pledged an £11bn investment into preventing sewage spills in 2025-2030, Anglian Water, which has the largest presence of any water company operating in the east marine plan areas, was recently fined £2.65m for dumping 7.5m litres of sewage into the North Sea.[263] The conflict between wastewater management and the tourism sector continues to contribute to the difficulties faced by the already struggling sector in the east marine plan areas. It is reported that 23% of sea swimmers in the UK would not take a dip in the ocean in 2023 due to sewage dumping[264], making a return to pre-pandemic visitor levels more difficult.

Coastal tourism in the east marine plan areas is competing with the energy sector for use of the onshore and offshore areas. The potential development of the nuclear power plant Sizewell C in Suffolk has already become a point of contention between key stakeholders in each sector. Despite the proposed £250mn investment to mitigate the impact of the project on communities, environment and infrastructure, an economic impact report prepared by East Suffolk Council predicts that a 5% drop in visitor numbers could lead to a £30mn loss annually for the tourism sector. This could be caused by a number of factors including:

- the use of tourist accommodation by construction workers, which would reduce capacity for visitors to the area;
- the displacement effect of existing tourism industry employees in Suffolk taking jobs at Sizewell C instead; and
- a loss of visitors due to the construction work.[265]

Offshore wind farms also present similar issues to that of Sizewell C, as they can be perceived as an eyesore. However, in recent years, opportunities have arisen for the tourism sector to benefit from these offshore energy projects. Boat trip operators are increasingly offering trips to see offshore wind farms up-close. From Great Yarmouth, visitors have the opportunity to observe seals against the backdrop of Scroby Sands offshore wind farm. Such projects may become a unique selling point for the tourism sector here in the future.

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[263] Environment Agency (2023) 'Anglian Water fined £2.65*m after sewage discharge into North Sea'. Available at: Link

[264] Liberal Democrats (2023) 'One in four sea swimmers in the UK put off by sewage this summer'. Available at: Link

[265] East Suffolk Council (2018) 'Sizewell C Economic Impact Assessment'. Available at: Link

Other opportunities for coastal tourism in the area have emerged following the domestic travel boom of the pandemic. There has been a steady growth in the natural market, including cultural, wildlife and nature tourism. The England Coast Path is a huge untapped opportunity, which when completed will span 2,700 miles of the English coast. Currently the England Coast Path spans less than half the coastline of the east onshore marine plan area, however a stretch of the path between Sutton Bridge and Skegness has been approved for development and three more stretches are either approved in part or have had proposals published.[266] This will likely be a significant opportunity for the coastal tourism sector in the area once completed.

Emerging technologies are likely to become increasingly important for domestic visitor holidays in the future. For example, over the next 20 years, Electric Vehicle (EV) sales are projected to increase significantly, with more domestic tourists opting to travel via climate-friendly means. Although the current infrastructure to support this growth is not in place, in particular along rural parts of the east marine plan areas, investment into charging points is also expected to grow.

Artificial Intelligence (AI) is becoming increasingly important for planning holidays, as well as for tourism boards and private companies to monitor and manage the coastal tourism sector. Consumer research shows that people are looking for a more personalised holiday experience, and AI can be used to generate tailored itineraries for example. *Visit Great Yarmouth* has adopted the use of an AI tool, which analyses the footfall data in the town, identifying information such as number of visitors and where they have come from. The company is hoping to use this data in the development of future marketing campaigns.[267] This type of technology will likely become common place within organisations responsible for managing and monitoring coastal tourism in the area.

4.15 Wastewater Treatment

Introduction to Sector

The wastewater treatment (WWT) sector manages the treatment of wastewater and sewage before it is released back into the environment. It plays a significant role in maintaining the health and safety of communities.[268] There are currently 9 water suppliers across England, each responsible for all customers within an agreed geographical region. Water is collected and treated by the supplier, however, during periods of heavy rain, raw sewage may be released via Combined Sewer Overflows (CSOs) into the sea or rivers up to a permitted amount. There are around 22,000 CSOs across the UK (excluding Scotland), which are mostly situated along the coastline.

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[266] Natural England (2024) 'King Charles III England Coast Path – Stretch Progress: East Hub Team'. Available at: Link

[267] Eastern Daily Press (2024) 'Great Yarmouth tourism board using AI to boost visitors'. Available at: Link

[268] Water UK (n.d.) 'Sewage Treatment Works'. Available at: Link

Scrutiny over the activities of water companies in the UK has heightened, following campaigns by the organisations Surfers Against Sewage and the Rivers Trust. These organisations have sought to bring attention to the scale of sewage spills being conducted by water companies, including by creating an interactive map (using Environment Agency data) with live reporting of sewage spills from CSOs. As a result of these campaigns, public awareness of this issue has been increasing and, in 2023, the £250,000 cap on fines for water companies was removed, meaning that water companies can now be fined an unlimited sum for dumping raw sewage beyond what their permit allows.[269]

Current Activity

The wastewater produced by households in the east marine plan areas is managed by three water companies, as seen in Table 14. This table also shows each company's Environmental Performance Assessment (EPA) ratings and number of treatment facilities in the area, which was identified using GIS mapping.

Table 14: Water companies operating in the east marine plan onshore areas

Water company	EPA rating	Number of facilities in the area
Anglian Water	Requires improvement – 2/4	246
Yorkshire Water	Good – ¾	75
Severn Trent Water	Leading – 4/4	26

Between 2018-2022, 4 water companies in the UK were prosecuted for breaching their overflow permits, including all three of the water companies operating in the east marine plan areas.

<u>GVA and Employment</u>

GVA of the WWT sector in the east marine plan areas was calculated by apportioning GVA for the sector in the whole of the UK by the number of people employed in the sector in the east marine plan areas. In 2020, the GVA of WWT in the east marine plan areas was £358m. The 800 FTEs employed in the WWT sector in the east marine plan areas in 2020 contributed 4% to the total 19,300 FTEs supported in the whole of the UK. This was multiplied by the UK-wide figure of £8.6bn to determine the sector GVA within the east marine plan areas. Direct employment data was extracted from Nomis using the SIC code '3700: Sewerage'. In 2022 this figure was 1,000 FTEs. Employment figures were determined for both 2018 and 2022, with the former being used for continuation purposes when calculating GVA, and the latter being used as an up-to-date sector figure.

Table 15 below summarises these economic indicators.

[269] Department for Environment, Food & Rural Affairs (2023) 'Unlimited penalties introduced for those who pollute environment'. Available at: Link

Table 15: Key Economic Indicators – Wastewater treatment

Economic Indicator	Quantity	Source	Confidence rating
GVA (£m)	358	Apportioning based on ONS data (2020)	2
Direct employment (FTEs)	1,000	Nomis (2022)	2
Numbers of Businesses	3	GIS mapping	3

Future Activity

The impacts of anthropogenic climate change are creating uncertainty in the future of the wastewater treatment sector. The UK is experiencing increased numbers of extreme weather events, including flooding and storm surges, which increases the reliance of WWT companies on CSOs. In particular, sewage systems will have to be adapted to suit wetter conditions in the winter, and drier spells in the summer months. In 2008, the water service regulation authority for England and Wales, Ofwat, published a report titled 'Preparing for the future – Ofwat's climate change policy statement', detailing steps to be taken towards mitigating potential impacts of climate change on the WWT sector.

WWT companies operating in the east marine plan areas are having to adapt to high rates of coastal erosion, which pose a risk to water service infrastructure. These companies will have to invest in relocating assets located close to the shore which may be lost to the sea in the near future.[270] The WWT sector has to address impacts from the tourism sector in the area, as periods of high visitor numbers put pressure on infrastructure. For example, fast food outlets can contribute to elevated levels of fats, oils and greases within the sewer network, causing blockages and damage to the sewers.[271]

As criticism of the WWT sector grows, due to increased usage of CSOs, water companies are channeling more investment into improving the sewage networks and protecting the environment. The Water Industry National Environment Programme (WINEP), developed by the Environment Agency, lays out a series of actions for water companies operating in the UK to take, with the aim of delivering benefits to the natural environment. The current WINEP (2020-2025) accounts for approximately £5.2 billion of asset improvements, investigations, monitoring and catchment interventions.[272] In 2023, water companies in England and Wales also submitted plans to invest a total of £96bn in water and sewage infrastructure between 2025 and 2030.[273] Of this, £11bn

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[270] Correspondence with a WWT company

[271] Correspondence with a WWT company

[272] Environment Agency (2022) 'Water industry national environment programme (WINEP)'. Available at: Link

[273] Water UK (2023) 'Water companies propose largest ever investment'. Available at: Link

will go directly to reducing overflow spills, and it is projected that 140,000 spills each year will be prevented as a result.

Within this proposal, Anglian Water has pledged to start planning for two new reservoirs, create an area of wetland and renew 695km of vulnerable pipes. Yorkshire Water has pledged to refurbish five reservoirs, improve poorly performing pumping stations and replace 746km of mains pipes. Severn Trent has promised an investment of £12.9bn, which will go towards improving biodiversity at 26 sites, replacing 30ha of hard surfaces to allow for sustainable drainage, and installing 1,000 water-quality sensors in rivers.[274]

Although plans to improve sewage infrastructure will have positive social impacts in the long-term, through mitigating impacts of flooding and improving bathing water quality, in the short-term local communities may face increased financial pressure. Household water bills are likely to increase year on year, as set out by Ofwat[275], to compensate for demands to improve WWT infrastructure. This is likely to have significant negative social impacts, particularly in the context of the current cost of living pressures. Water companies are looking to engage with local communities to ensure that vulnerable groups are supported financially, as well as to protect coastal environments.[276] For example, Yorkshire Water have launched the 'Do your Bit' campaign to help educate and engage beach users on coastal maintenance.[277] In the future, WWT companies will have to continue engagement with local communities to ensure that improvements to sewage systems are balanced with economic and environmental pressures in the area.

4.16 Summary

This analysis has demonstrated that the east marine plan areas currently encompass a diverse range of activities which have a significant contribution to the wider economy. The estimated combined GVA of the sectors calculated in the east marine plan areas is £27.8bn, and the sectors cumulatively employ over 126,000 people.

Table 16 below is a summary of GVA, employment and number of businesses for all 15 sectors.

The analysis comprises data sources of varying quality. Where available, data sources were attributed using a confidence rating of high, medium, or low. This should be considered when applying further the findings of this report. For some sectors, data was missing or unable to be calculated. This was the case for Defence and National Security, Dredging and Disposal, CCUS, and Subsea Telecommunications Cabling, whilst the number of businesses was also not available for some additional sectors.

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274 New Civil Engineer (2023) 'Water companies outline £96bn infrastructure plans for next five-year investment period'. Available at: Link

275 Ofwat (n.d.) 'Price reviews'. Available at: Link

276 Correspondence with a WWT company

277 Yorkshire Water (n.d.) 'Do your bit'. Available at: Link

Table 16: Key economic indicators for all marine sectors in the east marine plan areas

	GVA (£ million)	Direct employment (FTE)	Number of businesses
Aggregates	127	148	7
Aquaculture	2.6	207	31
Commercial fishing–-fishing	24	286	
Commercial fishing – fish processing	474	5,722	63
Defence and National Security			
Dredging and disposal			
Ports	413	13,496	
Energy – Renewables	19,520	59,000	116
Energy – Nuclear	720	7,605	
Energy – CCUS			
Energy – Oil and Gas	4,608	11,617	131
Marine recreation	57	1,345	350
Shipping	131	1,394	
Subsea telecommunications cabling			
Coastal tourism	854	23,685	
Wastewater treatment	358	1,000	3

5. Social Baseline Analysis

This section explores the social elements of the east marine plan areas. Section 5.1 describes the area in socio-economic terms, section 5.2 outlines the heritage (assets) sector and its relevance to culture and identity, and section 5.3 explores some of the ways people experience nature and the marine environment, as well as what the social benefits are of the marine environment.

5.1 Socio-economic Baseline of the Area

This section of the report is the first attempt to build the social baseline of the east marine plan areas, describing the area in demographic and socio-economic terms. The section draws from published ONS and Nomis data[278] on sex composition, age composition, ethnicity, education qualifications profiles, economic status, health statistics, life expectancy and deprivation statistics. The section compares the figures for the east marine plan areas with those of England as a whole, the three ITL1 regions of which the east marine plan areas is a part of (East of England, East Midlands, Yorkshire and the Humber) and the five coastal stretches of the east marine plan areas as outlined below.

[278] Nomis (n.d.). Available at: Link

The five coastal stretches of the east marine plan areas

The east marine plan areas were divided into five stretches along the coast from the northern boundary at Bridlington to the southern boundary at Felixstowe, to allow for a more detailed analysis of how the socio-economic and demographic characteristics might vary along the coast. The boundaries of the stretches were determined by dividing up the whole coastal length of the east marine plan areas into five stretches of approximately equal length, however also considering factors such as spatial/geographical area, county and LSOA boundaries, and 'cultural identity'. The stretches are as follows:

- **N1 stretch: Bridlington to north of the River Humber**
- **N2 stretch: South of the River Humber to Skegness**
- **C1 stretch: The Wash (Skegness to Wells-next-the-Sea):** The Wash has been designated as one stretch, as communities along this coastline are generally engaged in similar activities and so have a strong sense of 'identity' as forming part of the Wash.
- **S1 stretch: Wells-next-the-Sea (in north Norfolk) to Great Yarmouth:** This stretch is approximately aligned with Norfolk county (the coastal areas of Norfolk county).
- **S2 stretch: Lowestoft (in north Suffolk) to Felixstowe:** Lowestoft is one of the first towns in the northern boundary of Suffolk. This stretch is approximately aligned with Suffolk county (the coastal areas of Suffolk county).

A map of these stretches is shown in Figure 9 below.

Figure 9: Map showing the five coastal stretches of the east marine plan area

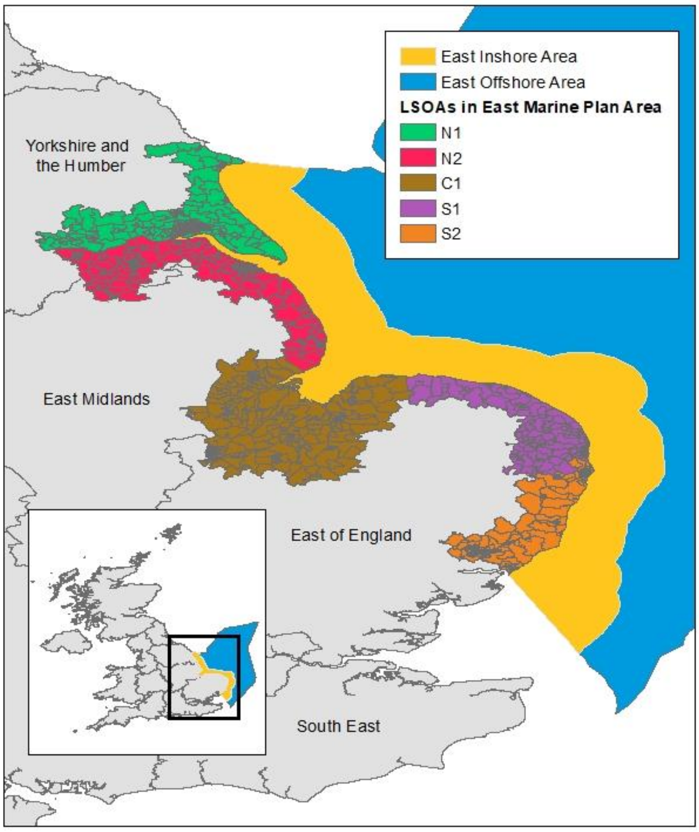

Table 26 in the Appendix shows the full set of data for each of the socio-economic indicators in each of the geographical areas. The next section highlights some of the key statistics.

GVA

Total GVA was calculated for each of the coastal stretches by aggregating the GVA figures of all of the LSOAs in that coastal stretch, together with the aggregated GVA of the five coastal stretches, to estimate the GVA for the east marine plan areas. These results are shown in Table 17 below.

As can be seen from Table 17, GVA for the whole of the east marine plan areas in 2021 has been estimated as £51.9 billion. In terms of GVA, the Wash (C1) is the highest, accounting for £13.6bn (26%) of the total, followed by stretch N1 with £13.3bn (also 26%), stretch S2 with £10.5bn (20%) and stretch N2 with £10.2bn (also 20%). The lowest in terms of GVA by quite some margin is stretch S1 with £4.3bn (8%). It must be noted, however, that the way these stretches have been determined means that stretch S1 from Wells-next-the-Sea to Great Yarmouth, has a much lower population than the others, which is part of the reason for its lower GVA.

GVA/ person

Total GVA per person in the east marine plan areas in 2021 was £23,244.[279] To account for varying populations of the different coastal stretches, GVA per person has been calculated for each coastal stretch. In this metric, the stretch furthest south (S2) has the highest GVA per person at £26,107, 12% higher than average (mean) GVA/person for the east marine plan areas. The S1 stretch from Wells-next-the-Sea to Great Yarmouth, meanwhile, has the lowest at £17,573 (-24% lower than the east marine plan areas average). As GVA is an economic metric used to describe economic output, stretch S2 is the coastal stretch with the highest economic output per person and S1 the lowest.

Table 17: Population and economic figures of the east marine plan areas and its coastal stretches

Coastal stretch	Number of LSOAs	GVA (£bn)	Population	GVA/ person (£)	GVA/ LSOA (£m)
N1: Bridlington to north of the River Humber	353	£13.3bn	563,728	£23,644	£37.8
N2: South of the River Humber to Skegness	277	£10.2bn	449,613	£22,599	£36.7
C1: The Wash	310	£13.6bn	573,889	£23,768	£44.0
S1: Wells-next-the-Sea to Great Yarmouth	150	£4.3bn	244,405	£17,573	£28.6
S2: Lowestoft to Felixstowe	241	£10.5bn	401,578	£26,107	£43.5
Total east marine east marine plan areas	**1,331**	**£51.9bn**	**2,233,213**	**£23,244**	**£39.0m**

Demographic composition

The following demographic composition and analysis of the east marine plan areas is based on the latest available ONS Nomis official census and labour market statistics from 2021.[280]

Population

In 2020, the total population of the east marine plan areas was 2.23 million, representing 3.9% of the population of England, and 3.3% of the population of the UK as a whole.

[279] It is important to note that the population included in the “GVA per person” calculation in this case includes the economically inactive population.

[280] Nomis (n.d.). Available at: [Link]

The Wash has the highest population share of the east marine plan areas (25.7%), followed by the N1 stretch from Bridlington to north of the River Humber (25.2%), stretch N2 from south of the River Humber to Skegness (20.1%) and stretch S2 from north Suffolk to Felixstowe (18.0%). Stretch S1 from Wells-next-the-Sea (in north Norfolk) to Great Yarmouth is the smallest with just 10.9% of the population.

Sex composition

The east marine plan areas have a higher percentage of women (50.9%) than England does (49%) but is in line with the ITL1 regions of East (51%), East Midlands (50.8%), and Yorkshire and the Humber (50.9%). Stretch S1 has the highest percentage of women (51.2%) of all the stretches.

This sex composition is shown by Table 18 below:

Table 18: Sex composition of east marine plan areas and England

	% Male	% Female
East marine plan areas	49.1%	50.9%
England	51.0%	49.0%
Difference east marine plan areas vs England	-1.9%	+1.9%

Age composition

The east marine plan areas have an older population than England and the three ITL1 regions do, with 22.7% of the population aged 65 and over (compared to 18.4% in England, and an average of 19.3% in the three ITL1 regions) and just 21.7% of the population aged 19 and under (23% in England and the three ITL1 regions). Stretch S1 has the highest percentage of 65+ year olds (28.8%), whereas stretch N1 has the lowest (21.1%).

This age composition is shown by Table 19 below:

Table 19: Age composition of east marine plan areas and England

	% population aged 0-19	% population aged 20-64	% population aged 65+
East marine plan areas	21.7%	55.6%	22.7%
England	23.0%	58.5%	18.4%
Difference east marine plan areas vs. England	-1.3%	-2.9%	+4.3%

The relatively older population of the east marine plan areas compared to England overall is also consistent with data from the ONS census 2021 data on characteristics of coastal communities which found that the median age was higher in coastal (42 years) than non-coastal (39 years) built-up areas, with more residents over the age of 16 years being retired (coastal 24.7%, non-coastal 20.6%).[281]

Ethnicity

In terms of ethnic group breakdown, the east marine plan areas have a higher proportion of people identifying themselves as white (93.2%) than England does (81%). The east marine plan areas therefore have a lower proportion of other ethnicities; Asian, Asian British or Asian Welsh (3.1% vs 9.6%) and a lower proportion of Black, Black British, Black Welsh, Caribbean or African (1.1% vs 4.2%). Stretch C1 has the lowest white population (89.3%) with a much higher Asian, Asian British or Asian Welsh population (5.8%) compared to the other stretches (which average 2%).

This ethnic group breakdown is shown by Table 20 below:

Table 20: Ethnic group breakdown of east marine plan areas and England

	Asian, Asian British or Asian Welsh	Black, Black British, Black Welsh, Caribbean or African	Mixed or Multiple ethnic groups	White	Other ethnic group
East marine plan areas	3.1%	1.1%	1.7%	93.2%	1.0%
England	9.6%	4.2%	3.0%	81.0%	2.2%
Difference east marine plan areas vs. England	-6.5%	-3.1%	-1.3%	12.2%	-1.2%

Education qualifications profiles

In terms of education qualifications, the east marine plan areas have a higher proportion of people with no qualifications (22.7%) compared to England (18.1%), and a much lower proportion of people with a Level 4 qualification[282] (24.2%) as their highest level of qualification compared to England (33.9%). Interestingly, however, the east marine plan areas have a higher proportion of people in apprenticeships (6.8%) compared to England as a whole (5.3%). Stretches N2 and C1 have the highest percentage of people with no qualifications (24.3% and 24.5% respectively), and S2 the lowest (20.1%).

This education qualification breakdown is shown by Table 21 below:

[281] ONS (2021) 'Coastal communities, characteristics of built-up areas, England and Wales: Census 2021'. Available at: Link.

[282] Level 4 qualifications or above: degree (BA, BSc), higher degree (MA, PhD, PGCE), NVQ level 4 to 5, HNC, HND, RSA Higher Diploma, BTEC Higher level, professional qualifications (for example, teaching, nursing, accountancy)

Table 21: Highest level of qualification of east marine plan areas and England

	No qualifications	Level 3 and below	Level 4	Apprenticeship	Other qualifications
East marine plan areas	22.7%	43.1%	24.2%	6.8%	3.2%
England	18.1%	39.9%	33.9%	5.3%	2.8%
Difference east marine plan areas vs. England	4.6%	3.2%	-9.7%	1.5%	0.4%

The lower proportion of people with Level 4 qualifications in the east marine plan areas compared to England overall is also consistent with ONS census 2021 data on characteristics of coastal communities. Coastal areas had lower proportions of residents with higher education qualifications (28.7%) than non-coastal areas (34.5%).[283]

Economic status

People classified as "economically active" are those people aged 16 and over who are either in employment, or unemployed but looking for work and could start within two weeks. The "economically inactive", meanwhile, are those people aged 16 and over without a job who have not sought work in the last four weeks and/or are not available to start work in the next two weeks.[284] Together they make up the whole of the adult population aged 16 and over. The east marine plan areas have a higher percentage of economically inactive people (42.7%) than England (39.1%). Stretch S1 has the highest percentage of economically inactive people (47.6%) and C1 the lowest (40.0%).

Economically inactive

Of those 42.7% who are economically inactive in the east marine plan areas, 26.6% are retired, 3.6% are students, 4.8% are looking after home or family, 4.7% are long-term sick or disabled and 3.0% are classified as other. The east marine plan areas has a much higher retired population (26.6%) than England (21.5%) and a lower proportion of students (3.6% vs 5.6%). Stretch S1 has the highest retired population (32.3%) whilst stretch N1 has the lowest (25.1%). Stretch N2 has the highest percentage of long-term sick or disabled (5.7%, compared to 4.7% in the east marine plan areas, and 4.1% in England).

Economically active

[283] ONS (2021) 'Coastal communities, characteristics of built-up areas, England and Wales: Census 2021'. Available at: Link.

[284] ONS (2020) 'A guide to labour market statistics'. Available at: Link

Unemployment rates are calculated, in accordance with international guidelines, as the number of unemployed people divided by the economically active population (those in employment plus those who are unemployed).[285] The unemployment rate in the east marine plan areas (5.4%) is lower than the unemployment rate in England (5.7%) and Yorkshire and the Humber (5.8%) but higher than the East (4.9%) and East Midlands (5.0%). Stretch N1 has the highest unemployment rate (6.0%) whereas C1 has the lowest (5.0%).

The economic status of the east marine plan areas and England population is shown by Table 22 below:

Table 22: Economic status of east marine plan areas and England

	Economically active		Economically inactive				
	Employed	Unemployed	Retired	Student	Looking after home or family	Long-term sick or disabled	Other
East marine plan areas	54.2%	3.1%	26.6%	3.6%	4.8%	4.7%	3.0%
England	57.4%	3.5%	21.5%	5.6%	4.8%	4.1%	3.1%
Difference east marine plan areas vs. England	-3.2%	-0.4%	5.1%	-2.0%	0.0%	0.6%	-0.1%

The higher proportion of long-term sick or disabled in the east marine plan areas compared to England overall is also consistent with ONS census 2021 data on characteristics of coastal communities. This found that after controlling for the age of the population, there were higher proportions of people who were "disabled: limited a lot" in coastal (9.2%) compared with non-coastal (7.5%) areas.[286] Data from this census also shows that coastal areas had a lower proportion of residents aged 16 to 64 years that were working (68.7%) than non-coastal built-up areas (71.0%), which also supports the finding in table 20 that fewer people are employed in the east marine plan areas compared to England overall.

Life Expectancy

Life expectancy was not available at the LSOA level and therefore has not been estimated for the east marine plan areas or any of the five coastal stretches. Life expectancy is lowest in Yorkshire and the Humber compared to the East of England and East Midlands, and England as a whole. Life expectancy figures are shown in table 23 below.

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[285] ONS (2020) 'A guide to labour market statistics'. Available at: Link

[286] ONS (2021) 'Coastal communities, characteristics of built-up areas, England and Wales: Census 2021'. Available at: Link.

Table 23: Life expectancy of ITL1 regions and England

	Men	Women
East of England	79.8	80.4
East Midlands	78.6	79.5
Yorkshire and the Humber	77.9	78.7
England	78.9	79.7

Health

In terms of health of the population, the east marine plan areas have a lower proportion (-5.6% points) of people saying they are in ‘very good health’ (42.9%) compared to England as a whole (48.5%). Most of this deficit is accounted for by more people saying they are in ‘good health’ (+2.2% points) or ‘fair health’ (+2.4% points) compared to England. The lower % of people who say they are in ‘very good health’ is likely due to the older age demographic of the east marine plan areas compared to England (see section on Age Composition). Of all the coastal stretches, stretch N2 has the highest proportion of people saying they are in ‘bad health’ or ‘very bad health’ (7%, compared to 6.1% in the east marine plan areas).

The health status of the east marine plan areas and England population is shown by Table 24 below:

Table 24: Health status of the east marine plan areas and England

	Very good health	Good health	Fair health	Bad health	Very bad health
East marine plan areas	42.9%	35.9%	15.1%	4.7%	1.4%
England	48.5%	33.7%	12.7%	4.0%	1.2%
Difference east marine plan areas vs. England	-5.6%	2.2%	2.4%	0.7%	0.2%

The relatively poor health status of those living in the east marine plan areas compared to England overall is also consistent with ONS census 2021 data on characteristics of coastal communities. This found that accounting for the population age, coastal areas had a smaller proportion of people reporting very good health (45.4%) than non-coastal area (47.7%), and more people in bad (4.9%) or very bad health (1.5%) than non-coastal areas (bad health 4.1%, very bad health 1.2%).[287]

[287] ONS (2021) ‘Coastal communities, characteristics of built-up areas, England and Wales: Census 2021’. Available at: Link.

The health indicator data shown above is also consistent with a 2021 report published by the Department of Health and Social Care's Chief Medical Officer which found that coastal communities (the villages, towns and cities of England's coast) "have some of the worst health outcomes in England, with low life expectancy and high rates of many major diseases". [288] The study argues that coastal communities suffer from poor health outcomes due to reasons such as:

- Having a higher number of older, retired citizens, who inevitably have more and increasing health problems;
- Poor quality private rented housing (converted from cheap former guesthouses, designed for a previous form of seaside tourism) leads to concentrations of deprivation and ill health;
- Attracting NHS and social care staff to peripheral coastal areas is harder.

Deprivation

Households by deprivation dimensions

The dimensions of deprivation used to classify households are indicators based on the following four selected household characteristics:

- **Education**: A household is classified as deprived in the education dimension if no one has at least level 2 education and no one aged 16 to 18 years is a full-time student.
- **Employment**: A household is classified as deprived in the employment dimension if any member, not a full-time student, is either unemployed or economically inactive due to long-term sickness or disability.
- **Health**: A household is classified as deprived in the health dimension if any person in the household has general health that is bad or very bad or is identified as disabled. People who have assessed their day-to-day activities as limited by long-term physical or mental health conditions or illnesses are considered disabled. This definition of a disabled person meets the harmonised standard for measuring disability and is in line with the Equality Act (2010).
- **Housing**: A household is classified as deprived in the housing dimension if the household's accommodation is either overcrowded, in a shared dwelling, or has no central heating.

In the east marine plan areas, 44.6% of people are not deprived (in any dimension) and 55.4% are deprived in 1 or more dimension. This compares to 48.4% not deprived vs. 51.6% deprived in England. Therefore, the east marine plan areas have a higher proportion of people deprived (+3.8% points) than England as a whole. The proportion of households by deprivation dimensions in the east marine plan areas and how it compares to England as a whole is shown by Table 25 below:

[288] Department of Health and Social Care (2021) 'The Chief Medical Officer's Annual Report 2021: Health in Coastal Communities'. Available at: Link

Table 25: Households by deprivation dimensions in east marine plan areas and England

	Not deprived	Deprived in 1 dimension	Deprived in 2 dimensions	Deprived in 3 dimensions	Deprived in all 4 dimensions
East marine plan areas	44.6%	35.5%	15.8%	3.9%	0.2%
England	48.4%	33.5%	14.2%	3.7%	0.2%
Difference east marine plan areas vs. England	-3.8%	2.0%	1.6%	0.2%	0.0%

Index of multiple deprivation (IMD)

The Index of Multiple Deprivation (IMD) is an overall relative measure of deprivation constructed by combining seven domains of deprivation according to their respective weights. The seven domains of deprivation are: Income Deprivation, Employment Deprivation, Education, Skills & Training deprivation, Health Deprivation & Disability, Crime, Barriers to Housing & Services, and Living Environment Deprivation. The larger the IMD score, the more deprived the area is, and the lower its rank.

The average IMD score of the east marine plan areas is 25.7, compared to 21.7 for England, meaning on average the east marine plan areas are more deprived than England overall. Stretches N1 (IMD score 27.7) and N2 (29.2) are the most deprived whilst stretch S2 is the least deprived (21.8) but only comparable to the national average.

5.2 Levelling Up Coastal Communities

A 2023 report by Pragmatix Advisory titled "Communities on the edge" found there is a need for levelling-up in England's coastal communities.[289] Though the study encompasses all coastal communities in England, rather than just those that fall within the east marine plan areas, it nonetheless presents some important findings on the challenges that coastal communities face. According to the study:

- Household income in coastal areas is almost £3,000 lower than in non-coastal areas;
- Nearly 20% of coastal jobs are below the living wage, a greater proportion than England overall.
- Productivity is lower
- Health outcomes are poorer, and
- Digital and physical connectivity are lagging behind the rest of the country.

[289] Pragmatix Advisory (2023) 'Communities on the edge: Assessing the need for Levelling Up in England's coastal authorities.' Available at: Link

5.3 Heritage (Assets) Sector

Heritage assets can be defined as elements of the historic environment such as buildings, monuments, landscapes and seascapes that have been identified as holding a degree of significance.[290] The east marine plan areas contain a wealth of such assets, both out at sea, and on its relevant coastline – these are outlined in the following section.

The Humber has a rich maritime heritage deeply intertwined with industry and trade. The Humber River, with its strategic location, facilitated maritime commerce, fostering a vibrant shipping hub, whilst Grimsby and Hull have long been important centres for not only for shipping but for fishing as well. Further south, the Wash, a large tidal estuary on the east coast, has unique wetland ecosystems, crucial for bird migration and coastal ecology; its mudflats and salt marshes support a numerous bird species and provide important habitats for marine life. The Norfolk coastline encompasses diverse landscapes including saltmarsh, sandy beaches and cliffs. Coastal towns like Wells-next-the-Sea, Cromer and Sheringham preserve their maritime heritage through fishing and its wildlife-rich habitats, including internationally renowned reserves like the Norfolk Broads and Snettisham Nature Reserve, making it an important location for birdwatchers and walkers. These sites also contain heritage assets and the historic environment which underpins the biodiversity.

With regards to heritage features located in the east marine plan areas, a recent project named CITiZAN has recorded 6,000 heritage features around the coast, with high concentrations in Norfolk, Suffolk and the Humber.[291] English Heritage manages numerous historic sites along the coastline, including; Skipsea Castle, St Peter's Church, Thornton Abbey, Creake Abbey, Blakeney Guildhall, Baconsthorpe Castle, Caister Roman Fort, Great Yarmouth Row Houses, Leston Abbey, and Orford Castle.[292] In addition, the archaeological site of Anglo Saxon Sutton Hoo lies 6 miles inland from the Suffolk coast, along the River Deben.

Offshore, the east marine plan areas include the largest chalk reef in Europe, the Cromer Shoals Chalk Beds MCZ (Norfolk), as well as Dogger Bank, an extensive area of shallow waters which are important fish spawning grounds and which holds important archaeological potential as the site of 'Doggerland'.[293] There are also hundreds of shipwrecks in the area, with their precise locations detailed in the East Inshore and East Offshore Marine Plans (2014)[294], and other heritage assets and elements of the historic environment, including both designated assets[295] and non-

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[290] Defra (2014) 'East Inshore and East Offshore Marine Plans'. Available at: Link.

[291] CITiZAn (n.d.) 'Explore Our Coastal Map'. Available at: Link

[292] English Heritage (n.d.) 'Heritage Sites Map'. Available at: Link

[293] Doggerland was an area of land in Northern Europe, now submerged beneath the North Sea, that connected Britain to continental Europe.

[294] Defra (2014) 'East Inshore and East Offshore Marine Plans'. Available at: Link.

[295] Historic England (n.d.). Available at: Link.

designated assets.[296] The earliest site of hominin occupation outside of Africa lies on a beach in Happisburgh, Norfolk, whilst 200,000 year-old artefacts have been investigated off the coast of Great Yarmouth.[297]

The UK Marine Policy Statement outlines that alongside cultural value, the historic environment is an asset of social, economic and environmental value.[298] Marine and maritime cultural heritage generates significant social and economic benefits and therefore whilst conservation of marine and maritime cultural heritage is warranted for its own sake, a further reason conservation should be carried out is due to these benefits.[299] The value of marine and maritime cultural heritage is also pervasive far beyond its immediate location. England's heritage sector is estimated to have contributed £45.1 billion in GVA to the UK economy in 2021 and employed over 538,000 workers, including direct, indirect and induced impacts.[300] Whilst apportionment to the east marine plan areas has not been possible in this study, The Royal Society for Arts, Manufactures and Commerce has produced a tool to evaluate the value of heritage assets at local authority level.[301] The tool shows that some areas within the east marine plan areas coastline have particularly high values for heritage value. North Norfolk, for example, ranks 25th out of 316 in the UK, whilst Great Yarmouth ranks 38th.

Together with their partners, Historic England are implementing Heritage Action Zone (HAZ) initiatives which have the aim of bringing new life to old places that are rich in heritage, unlocking their potential and making them more attractive to residents, businesses, tourists and investors. One example of this is the Greater Grimsby Heritage Action Zone (HAZ), which maps out future investment in Grimsby's economy and environment.[302]

Evidence demonstrates that visiting heritage sites can boost life satisfaction and happiness. Connecting with the past and feeling rooted in our communities is important to wellbeing. Heritage assets can act as 'symbols' of significance that bond people to place by providing reminders of meaningful personal experiences and family histories, among other things. Attachments to places can help meet basic emotional and psychological needs, such as for stability, continuity, security and relaxation.[303] Visiting heritage sites positively influences life satisfaction. Assigning monetary values

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296 UK Government (n.d.). 'Historic environment'. Available at: Link.

297 Honor Frost Foundation (2015) 'The Social and Economic Benefits of Marine and Maritime Cultural Heritage'. Available at: Link

298 DEFRA (2011) 'UK Marine Policy Statement'. Available at: Link.

299 Honor Frost Foundation (2015) 'The Social and Economic Benefits of Marine and Maritime Cultural Heritage'. Available at: Link

300 Historic England (2023) 'The Economic Value of the Heritage Sector'. Available at: Link

301 RSA (2020) 'Pride in place: The RSA Heritage Index 2020'. Available at: Link

302 Historic England (n.d.) 'Greater Grimsby Heritage Action Zone'. Available at: Link.

303 Historic England (2023) 'People's attachment to historic places and the benefits'. Available at: Link

to the impacts of sites, based on the amount needed to offset the wellbeing benefits gained from these sites, they determined that the heritage sector overall had wellbeing benefits of £1,646 per person.[304] Moreover, research demonstrates that our shared heritage can inspire curiosity, imagination, critical thinking and new perspectives. This enhances people's innovative capacity; leading to greater productivity and economic growth.[305] For example, it has been found that increases in cultural events and heritage assets correlate with rises in firm density and creative industry density.[306] Seascapes offer fertile locations that have inspired generations of artists and innovators, adding richness and economic value to coastal communities and further afield.

MMO commissioned a report[307] in 2019 to investigate the value of seascapes and linking them to a sense of place for coastal communities in the UK. Sights and views were reported as the most important element of seascapes by respondents. Sensory characteristics, wildlife, beaches and cliffs were also important elements for at least 70% of participants. Whilst shipwrecks and historic elements were deemed less important (less than 30% of participants identifying this as a characteristic special to them), they nonetheless are a vital component of the seascape that also hold significant national historic value beyond their immediate vicinity. Coastal residents identified very strong attachments and emotional bonds with seascapes, including beneficial impacts on wellbeing through feeling restored. A strong sense of place attachment is associated with care and action, and may increase awareness and pro-environmental behaviour in a region.[308] Indeed, a survey of over 8,000 people across England and Wales found that 'concern' was the overriding emotion that they used to describe their attachment with the ocean environment in general. Just 17% believed that the health of the marine environment is either good or very good.[309]

The East Marine Plan area is also home to a legacy of historic and archaeological research and public information, such as the "Deep History Coast" promoted by Visit Norfolk[310], and the Seahenge gallery at Lynn Museum[311]. National and international research activity and funding has also focussed on the East Anglian offshore areas and coastline, with funding secured by academic institutes to research these areas –

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304 Fujiwara, D., Cornwall, T. and Dolan, P. (2014) 'Heritage and Wellbeing'. Available at: Link

305 Historic England (2024) 'Culture, Heritage, Creativity and the Creative Economy. Available at: Link

306 Graves, A., Rowell, A., Vardakoulias, O., Arnold, S. and Evans, G. (2017) 'The role of culture, sport and heritage in place shaping'. Available at: Link

307 MMO (2019) 'Baseline Social Information for Marine Planning: Seascape value, quality and links with sense of place (MMO1132)'. Available at: Link

308 Köpsel, V., Walsh, C. and Leyshon, C. (2017) Landscape narratives in practice: implications for climate change adaptation. The Geographical Journal 183 (2), pp: 175-186. Available at: Link

309 Defra (2019) 'Ocean Literacy in England and Wales: Headline Findings Report'. Available at: Link

310 Visit North Norfolk (n.d.) 'North Norfolk Heritage and Arts'. Available at: Link.

311 Lynn Museum (n.d.) 'Seahenge gallery at Lynn Museum'. Available at: Link.

examples include “Europe’s Lost Frontiers”[312] and long running programmes by the Natural History Museum.[313]

Future outlook

While the creation of ‘new’ historic environment features and landscapes takes considerable time, the discovery of new and previously unknown sites is ongoing. As an example, for shipwrecks, an additional 5 wrecks were given protection by Historic England in 2022.[314] Many of CITiZAN’s sites were newly identified, whilst The Museum of London is piloting a new project called Coasts in Mind which intends to record information from communities on coastal change in the past 100 years and this could lead to the discovery of new sites and features, and improved information on existing features.[315] As such it is entirely possible that additional heritage assets will be designated within the east marine plana areas in the next 20 years.

Climate change, coastal erosion and sea level rise are affecting and will continue to impact coastal communities. There is potential for whole communities to be lost or changed, through the process. Coastal sites are vulnerable to sea level changes, erosion and the effects of storm waves. Coastal and marine erosion is also already taking place at an accelerated pace. Many of England’s coastal and lowland assets will be at risk, as will the character of the landscape itself as flood defences are strengthened and assets potentially relocated. Assets on the coastal fringe will become increasingly at risk from inundation, damage or loss from erosion, with foreshore and cliff-top equally vulnerable, depending on geology.[316] As an example, the rapid degeneration of the cliffs at Happisburgh, on the North Norfolk Coast, risks the loss of archaeological records like the series of 800,000 year old hominin footprints afore mentioned, as well as a historic village and a 14th century church.[317] Dynamic coastal change, due to extreme weather events and sea level rises, will lead to complete loss of heritage assets in some cases, and therefore funding and resources will have to be targeted and prioritised towards protecting areas ahead of loss.

Looking ahead, there are opportunities to better integrate protection and management of nature and heritage on the coast and to share stories of how it has been shaped by people and nature. Natural England have recently published guidance on Nature Recovery and the Historic Environment related to this issue.[318]

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[312] University of Bradford (n.d.) ‘Europe’s Lost Frontiers‘. Available at: Link.

[313] Natural History Museum (n.d.) ‘The making of an island’ Available at: Link.

[314] Correspondence with sector representatives

[315] CITiZAN (2023) ‘Coasts in Mind update: exploring archives’. Available at: Link

[316] Historic England (n.d.) ‘What Are the Effects of Climate Change on the Historic Environment?’. Available at: Link

[317] North Norfolk District Council (n.d.) ‘Coastal Adaptation at Happisburgh’. Available at: Link

[318] Association of Local Government Archaeological Officers (2023) ‘Natural England Guidance and Documents’. Available at: Link.

It has also been recognised that there is a lack of heritage professionals trained and working in the marine historic environment. Studies are currently underway to look at the heritage skill gap and this includes consideration of coastal marine heritage skills[319], which is also linked with Nature Recovery initiatives.

As certain industries decline, such as fishing (as explored in the relevant section), there is the risk of the associated loss of heritage that characterises the communities involved in the practice. Whether in terms of traditions or assets, managing the loss of heritage is a challenge, but also a potential opportunity through holding cultural events/days associated with said activity as acts of remembrance and/or to assist with the sustained carrying out of the activity through income generation and advocacy (for example the Cromer Crab and Lobster Festival, Norfolk).

Other future opportunities also exist for the east marine plan areas' heritage sector. There is the potential for portions of the Lincolnshire and Humberside Coastline to be awarded World Heritage status, which will raise its profile and encourage interest and awareness in the coast's heritage.[320] The completion of the King Charles III England Coast Path in North Norfolk[321] (as well as the completion of other sections that fall within the east marine plan areas[322,323]) also has the potential to improve access and visitor numbers, connecting people with unexplored parts of the coast that may not have previously been possible. There are numerous funding opportunities and initiatives available to local authorities, NGOs and community interest groups to integrate protection and management of coastal heritage assets on the east marine plan areas coastline, with significant multimillion pound Government investments available in cultural infrastructure through Levelling Up, UKSPF and other funds. As an example, the Inns on the Edge project,[324] funded by Historic England, has brought together information on the Lincolnshire Coast's history, aiming to improve collective knowledge of historic pubs on the coastline, promote visitor numbers, and better inform the terrestrial planning process. Local councils can also directly support communities to preserve their coastal environment and its associated heritage. The Norfolk Coast Partnership, for example, has supported communities to draft and enact their own nature recovery plans via The Resilient Coast Project.[325]

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319 Historic Environment Forum (n.d.) 'Heritage Skills Demand Group'. Available at: Link

320 BBC (2024) 'Gibraltar Point and Humber: World Heritage status forms submitted'. Available at: Link

321 Correspondence with sector representatives

322 National Trails (n.d.) 'King Charles III England Coast Path - North East.' Available at: Link.

323 National Trails (n.d.) 'King Charles III England Coast Path - East.' Available at: Link.

324 Visit Lincolnshire (n.d.) 'Inns on the Edge'. Available at: Link

325 Norfolk Coast Protected Landscape (n.d.) 'Project Summary' Available at: Link

5.4 Social Perceptions and Benefits of the Marine Environment

The People and Nature Survey for England is one of the main sources of data on how people experience and think about the environment in England (although it does not focus on the marine environment specifically).[326] It has been collecting data since April 2020, with just under 25,000 surveys conducted per year since. Some of the main findings of the Year 3 survey (April 2022 - March 2023), and those relevant to marine environments, are as follows:

- Visits to green and natural spaces
  - Almost two in three (65%) adults had visited a green and natural space in the previous 14 days;
  - When asking people to report on visiting frequency in the last 12 months, almost seven in ten (69%) spent free time outdoors in green and natural spaces at least weekly in the last 12 months;[327]
- Places that people visit
  - Gardens and urban/local green spaces were particularly important for spending time outdoors: 77% of adults with access to a garden said they spent time in it at least once per week;
  - Outside of gardens, around 30% of adults spent time by rivers and 25% of adults spent time by beaches during the last month;
  - Going to the beach/other coastline/sea has the largest seasonal spikes out of the five types of green and natural spaces shown
- Reasons for visiting a green and natural space
  - Getting fresh air and physical health and exercise were the main reasons for people taking a visit to a green and natural space
  - 56% of adults visited a green and natural space to get fresh air, 51% for physical health and exercise, 36% for mental health and wellbeing, 29% to walk a dog, and 28% to connect to nature/ watch wildlife

For the regions relevant to the east marine plan areas, namely the East of England, East Midlands, and Yorkshire and the Humber, some of the main findings are as follows:

- Frequency of visits
  - When asked "In the last 12 months, how often, on average have you spent free time outside in green and natural spaces?", 69% said at least once a week (compared to 71% in England as a whole), 18% between twice a month and once every 2-3 months, 9% said less often, and 4% said never.
- Places that people visit
  - When asked whether they had visited a "beach / other coastline / sea" during the last month, 27% said Yes (69% said No, 4% did not answer), compared to 25% in England.
- Impacts on mental health and wellbeing

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[326] Natural England, Defra (2024) 'The People and Nature Surveys for England'. Available at: Link.

[327] The difference in the estimates between the two questions is potentially due to people overestimating their frequency of visits across the year.

- When asked how much they agreed or disagreed with the statement that green and natural spaces generally are “good places for mental health and wellbeing”, 89% agreed or strongly agreed, which is the same as in England. 2.1% said they disagreed or strongly disagreed, compared to 2.4% in England.[328]

Although the health statistics from the ONS demonstrate the relatively poorer health of coastal communities compared to their inland counterparts, paradoxically coastal areas are generally intrinsically healthier. The 2021 report on health in coastal communities states that “once socio-economic and demographic characteristics are accounted for, those living closer to the coast report better health on average than their inland counterparts”.[329] The report highlights that there are mental health and physical health benefits to living near the coast which are not merely the result of selective migration. These may include better access to outdoor spaces for exercise, social contact and lower air pollution.

A 2019 MMO publication[330], which included focus groups and interviews, explored the health and wellbeing benefits of coastal recreation and barriers to access in the south east marine plan areas. The study found that coastal areas are attractive environments for recreation, being associated with relaxation, spending time with family and friends, special foods and memorable sights and experiences which parents generally want to share with their children.

However, the study found that visiting and spending time at coastal locations is also associated with anxieties, for example about children getting lost or drowning. People with children often worry about the provision and quality of facilities on the coast such as toilets, changing rooms and shelter. These concerns and anxieties may be a barrier to visiting the coast and tend to be highest for parents of younger children or children with special needs. Other reasons for not going to the coast for recreation are dirty and poorly maintained beaches, anti-social behaviour (real or perceived) and inadequate transport provision.

Analysis of Monitoring Engagement with the Natural Environment (MENE) survey data from 2009-2015 in this study found that only 10% of visits to natural environments were made to seaside resorts or towns or other coastal locations (90% of visits were made to countryside locations or to natural environments in towns or cities). Field research found that issues encountered by people with children when preparing to visit the coast include concerns about safety in the coastal environment, poor transport and infrastructure and lack of information about options for activities.

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[328] The other options given were “Prefer not to say”, “Don’t know” or “Neither agree nor disagree”.

[329] Department of Health and Social Care (2021) ‘The Chief Medical Officer’s Annual Report 2021: Health in Coastal Communities’. Available at: Link

[330] MMO (2019a) Baseline Social Information for Marine Planning: Health and wellbeing benefits of coastal recreation and barriers to access (MMO1132). By CEP, ICFAvailable at: Link

Another 2019 MMO publication on seascape value, quality and links with sense of place[331] found that seascapes in northern Devon generate a range of feelings associated with sense of place among coastal residents. This includes feelings of being restored, connectedness to nature, and place attachment including place identity and place dependence. This coastline was perceived as vitally important for wellbeing, providing unique places for clarity or peace of mind, revealing strong connections and attachments to particular places; for recharging batteries; putting things into perspective, and removing negative feelings and stresses. Section 5.3 on the Heritage (Assets) Sector includes more discussion on the value of seascapes and their contribution to a sense of place for coastal communities in the UK.

6. Measuring Changes to the Baseline that can be Attributed to the Marine Plans

Measuring changes to a socio-economic baseline which can be attributed to a marine plan is a complex exercise. The main difficulty concerns isolating the socio-economic impacts that arise from marine planning from the socio-economic impacts that arise from other 'external' factors, i.e. changes and impacts that would have happened anyway in the absence of marine planning (the "intervention"). These 'external' factors, to name a few, include macroeconomic changes, demographic changes, market forces, and political context. These socio-economic changes that would have occurred without the intervention are often referred to as 'deadweight' in evaluation terminology[332], and can be significant in size.

The Magenta Book[333] advocates for the use of experimental/quasi experimental approaches for designing counterfactual scenarios. These involve the use of a control scenario to test against the intervention. To test what the impact of marine planning has been, requires choosing either a time period that took place before marine planning was implemented in England, or a location with highly comparable economic structures, socio-economic demographics and policy context to the east marine plan areas. Achieving either of these is very difficult in this context. Choosing a time period prior to the implementation of the first Marine Plan in England (i.e. before 2014) is unsuitable due to the significant changes to the marine economy that have occurred since 2014. For example, in 2013 the UK offshore renewables sector had a capacity of just 733MW[334] – by 2023, this had increased to 14.7GW (over 20 times the size).[335] The marine economic context has changed so significantly in the last 10 years that choosing a time period pre-2014 would not give an accurate picture of what impacts the marine plans may have had, as many of the changes are likely to have been

[331] MMO (2019b) 'Baseline Social Information for Marine Planning: Seascape value, quality and links with Sense of place (MMO1132)' by CEP, ABPmer, ICF. Available at: Link

[332] Harding, WB. (2023) 'Understanding additionality and deadweight'. Available at: Link

[333] The Magenta Book is a central government guidance on evaluation that sets out best practice for departments to follow.

[334] European Wind Energy Association (2013) 'The European offshore wind industry – key trends and statistics 2013'. Available at: Link

[335] RenewableUK (2023) 'UK Wind Energy Database (UKWED)' Available at: Link

outside of the control of the marine plans. Choosing a comparable geographical location, meanwhile, is also very difficult in this case. All of England's coast has a Marine Plan – there is therefore no marine area within England that can be chosen as a suitable control. The only nation which could feasibly be used as a control, due to comparability in its marine sector, is Scotland. Scotland, however, also has a marine planning framework, publishing its National Marine Plan in 2015.[336]

MMO's Approach to Monitoring for the North East, North West, South East and South West Marine Plans[337] clearly states that for some outcomes or portions of outcomes (such as a higher rate of employment), it will be challenging, if not impossible, to assess whether the change can be attributed solely toward marine plans. Indeed, the report states that when the MMO is to report on outcomes (of marine plans), the focus is exclusively on how marine plans have contributed to an outcome. Contributions are not described in the context of other contributing measures, with no exploration of the reasons as to why a wider outcome has or has not been achieved. It is thereby clear that it will be very difficult to measure how much of the change in the socio-economic baseline can be attributed to marine plans as opposed to other factors also at play, particularly given the nature of the metrics used in this socio-economic baseline – GVA, employment, number of businesses, and the social baseline indicators.

MMO's existing approach to monitoring[338] has a set of indicators that are used to monitor the outputs, outcomes and impacts of marine plans. The socio-economic baseline information collected in the current study is of relevance to the following indicators in the MMO's existing approach to monitoring (outlined in the Annex[339]):

- **Indicator 11 (Marine industry growth related to the sustainability and diversification of the sector):** This indicator has two sub-indicators that were measured in the current study: number of businesses, and number of people employed in a particular sector. To these two sub-indicators, the sub-indicator of GVA, also measured in the current study, could be added.
- **Indicator 12 (Change in the number of coastal tourism businesses within the plan area)**: The number of businesses could not be determined in the current study as UK-wide figures for this indicator are not reported.
- **Indicator 13 (Office for National Statistics sectorial employment statistics derived from marine activity SIC codes):** This data was collected for the majority of sectors in this study.
- **Indicator 16 (A reduction in proportion of proposals securing approval that could significantly adversely affect visual resource and marine character).**
- **Indicator 29 (Change in gross value added for marine plan relevant SIC codes):** This data was collected for the majority of sectors in this study.

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336 Scottish Government (2014) 'Scotland's National Marine Plan'. Available at: Link

337 MMO (2020) 'North East, North West, South East, and South West Marine Plans Approach to Monitoring'. Available at: Link

338 MMO (2020) 'North East, North West, South East, and South West Marine Plans Approach to Monitoring'. Available at: Link

339 MMO (2020) 'North East, North West, South East, and South West Marine Plans Approach to Monitoring Annex of Indicators'.

- **Indicator 33 (Changes in operating offshore renewable energy projects and capacity in MW in the marine plan areas):** This data was collected in the current study and is outlined in section 4.7.

Qualitative measures which explore the impact of marine planning can be used to qualitatively attribute changes to the socio-economic baseline by identifying the extent to which stakeholders perceive activity co-existence and compatibility to have occurred, and the extent to which stakeholders are aware of Marine Plans and use it to support decision-making. These include, for example:

- **Indicator 9 (Marine plan monitoring survey responses identify the extent to which stakeholders perceive predicted specific outcomes (both policy and non-policy) to have occurred).**
- **Indicator 31** (**Key informant statements describing the value or effects or marine plans, the marine planning process or marine planning tools**),

7. Summary and Conclusions

The economic overview of the east marine plan areas, which states GVA, employment and number of businesses for all of the sectors included in this study, is outlined in Table 15. The renewable energy and oil and gas sectors are the two largest sectors in terms of GVA, by a significant margin. The renewables sector is of particular importance to the east marine plan areas, contributing 70% of the entire GVA of all sectors included in this study, and employing half of the renewable sector's workforce across the UK. This sector is indeed expected to grow, with planning consents granted for further development in the east marine plan areas.

Despite being smaller in absolute economic value (GVA) and employment, it is important to recognise the sectors which are critical to the coastal communities and livelihoods within the east marine plan areas. Fishing, for example, is central to the cultural heritage and sense of place of many towns along the east marine plan areas coastline, whilst also contributing to the local tourism sector and acting as an important element of people's livelihood who practice fishing. It is also important to recognise the economic importance of sectors included in this study in terms of their indirect impact and contribution toward sectors not included in this study (such as construction and retail). For example, marine aggregates (of which 44% are extracted in the east marine plan areas) are critical to the construction industry in the UK. The ports and shipping sectors, meanwhile, are integral to the functioning of the country, supporting industries such as manufacturing, retail, food, and energy production. The importance of these contributions may not be reflected in the GVA estimates produced in this study but are a key consideration for policymaking and marine planning.

In terms of future growth, as already noted, renewable energy is a significant area forecasted to grow over the next 20 years in the east marine plan areas. There is also potential for expansion in marine aggregates, ports, shipping, carbon capture and storage, tourism and recreation, whilst the nuclear sector is set to increase in size substantially with the two new nuclear reactors in Sizewell (Suffolk). With the right level of support and targeted investment, sectors such as tourism and recreation can help to revitalise regions for which there is an absence or decline in industry and employment opportunities. Many of the sectors also face a number of challenges, notably climate change, but also changing market conditions (e.g. increases in raw material prices) and an uncertain policy future.

In socio-demographic terms, compared to England overall, the east marine plan areas are characterised by an older population with a higher proportion of White people (+12.2% points), a higher proportion of people with no qualifications (+4.6% points), a higher proportion of economically inactive (+3.6% points) and retired (+5.1% points), and a lower proportion of people identifying as being in ‘very good health’ (-5.6% points). Stretch S1 (from Wells-next-the-Sea to Great Yarmouth) has the highest percentage of 65+ year olds (28.8%) by quite some margin, whereas stretch N1 (from Bridlington to north of the River Humber) has the lowest (21.1%). The east marine plan areas also have a relatively low GVA per person compared to England as a whole. Coastal communities, including those in the east marine plan areas, suffer from poorer health, lower digital and physical connectivity, and lower incomes, than their non-coastal counterparts. Future marine planning should therefore aim to address these issues faced by coastal areas, targeting levelling up and identifying opportunities for growth in coastal communities.

Whilst it has not been possible to apportion the national value of the heritage sector to the east marine plan areas and associated coastline, it is clear that it contains a wealth of heritage assets as well as activities that are key to not only adding economic value (e.g. via the tourism sector) but are an important aspect of the lived experience of dwelling in the east marine plan areas’ stretch of coast, and to a sense of place. New datasets for logging and locating heritage assets means that this is an area which is expected to grow in the east marine plan areas over the next 20 years. Climate change, notably sea level rises, is a threat to the coastal heritage sector of the east marine plan areas. However, opportunities also exist including the support of the sector through grant funding, that promotes understanding and appreciation of the value of heritage assets and traditional heritage activities through cultural events.

The social benefits of spending time in the marine environment are clearly evidenced by a series of studies conducted in this area, as outlined in section 5.4 of this report. Spending time in the natural environment has clear physical and mental health benefits, with people choosing to visit green spaces for these reasons. People note feeling restored and feeling connected to nature, and depend on nature for their sense of identity. A 2019 MMO publication[340] found that coastal areas are attractive environments for recreation, being associated with relaxation, spending time with family and friends, special foods and memorable sights and experiences which parents generally want to share with their children. This is also exemplified by the importance of the marine recreation (outlined in section 4.11) and heritage assets (section 5.3) sectors in the east marine plan areas.

Studies have shown, however, that coastal trips can also be associated with feelings of anxiety, such as fears of children getting lost or drowning in marine environments. Coastal areas can also suffer from inadequate transport provision, and people worry about the provision and quality of facilities on the coast such as toilets, changing rooms and shelter. These are areas which future marine planning should seek to address to

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[340] MMO (2019a) ‘Baseline Social Information for Marine Planning: Health and wellbeing benefits of coastal recreation and barriers to access (MMO1132)’ By CEP, ICF. Available at: Link

both increase the number of people visiting the coast and crucially improve the quality of those visits. This is particularly important in areas of the coast that suffer from higher levels of deprivation, and where health and wellbeing needs are the highest. Marine environments can have significant social benefits to these more deprived areas, but access and infrastructure issues must be addressed in order to facilitate this.

Measuring future changes to a socio-economic baseline that can be attributed to marine planning is challenging because of the difficulty in isolating its effects from changes that may have happened regardless of the intervention. Previous MMO reports have suggested that use of an experimental approach to quantitively assess the impact of marine planning is impossible due to this challenge and because there is a lack of a suitable counterfactual scenario. Instead, this report has suggested an approach which could be used to qualitatively inform an estimate of the impact of marine planning on changes in the socio-economic baseline and laid out an outline of an evaluation framework to test the causal pathways by which this may happen.

7.1. Gaps and Uncertainties in the Available Socio-economic Baseline

As discussed in Section 4.16, data sources for economic indicators used to describe the marine sectors are subject to varying degrees of confidence and this should be taken into account when individual statistics and findings from the study are used for marine planning and policy formulation.

Though the ONS have produced data from an Annual Business Survey which contains GVA figures for all of the sectors included in this study and specifically for the geographic area of the east marine plan area, this data was not used due to there being a significant degree of overlap between sectors and a lack of clarity with regards to the methodology that was used. For this data source to be used going forward to monitor socio-economic change and/or progress in the area, the methodology used would need to be reviewed.

Below are some of the key data gaps and limitations of the study for each of the economic sectors:

- **Marine Aggregates**: GVA for the sector was estimated by using historic figures from 2014 for GVA, and extrapolating to the current year using extraction amounts in the east marine plan areas now compared to that year. Therefore, the potential change in the market value of the marine aggregates themselves since 2014 was not accounted for.
- **Aquaculture**: Most of UK aquaculture is concentrated in Scotland. Therefore, Scotland has a lot of granular data on aquaculture, but this is not case for England. The data used in this report was Seafish data, which rather than being their own data, was data that was extracted from other reports. One mapping exercise was conducted for Dorset and the South coast, therefore one recommendation to fill the current data gaps in aquaculture is to replicate this for the east marine plan areas.
- **Commercial Fishing**: The latest available fish processing data from Seafish was for the year 2020 – more up to date information was not available.

- **Defence and National Security**: No economic data (e.g. GVA, spending output, number of employees) was available for this sector. Specific details of activities in the east marine plan areas was not available due to this being classified information.
- **Dredging and Disposal**: As previous baselining exercises have found, there was a lack of economic data to estimate GVA, employees and number of businesses. Significant overlap with other sectors such as ports makes the exercise of estimating GVA just for the sector more difficult.
- **Ports and Shipping**: The latest available national GVA figures are from 2019. Data on the number of businesses is not sufficiently discrete by geographic area to be able to estimate number of businesses using Nomis UK business count data.
- **Energy – Renewables**: GVA had to be estimated using capacity data and a figure for GVA per GW of renewable energy capacity. There was conflicting information on the number of operating sites in the east marine plan areas, and stakeholders interviewed had information on their specific offshore sites, but not for the industry as a whole.
- **Energy – Nuclear**: Although data from the Nuclear Association was valuable, there is a lack of data on the number of businesses in the nuclear energy sector.
- **Energy – CCUS**: Due to the fact the CCUS sector is an emerging technology and sector, all the data reported was relevant to the future growth and development of the sector rather than describing the sector in current terms. There was also difficulty in finding figures on employment and investment related to research & development in the sector.
- **Energy – Oil and Gas**: The research team were not able to find data on the exact number of oil and gas sites in operation in the east marine plan areas, and specific information on how much oil and gas each site was producing. This data if available could be used to more accurately estimate GVA of the oil and gas sector specifically in the east marine plan areas.
- **Marine Recreation**: Though British Marine produce valuable data on the marine recreation sector, no data on this sector is reported by the UK government. Therefore, a judgement needed to be made to determine what data reported by British Marine was directly relevant to the marine recreation sector. Data on employment and number of businesses is also not reported, therefore these were estimated using the method outlined in report MMO1075. This data might need to be updated or reviewed, or even replicated for each marine plan area.
- **Subsea Telecommunications Cabling:** There is currently no reliable method to apportion GVA for subsea telecommunications cabling specifically from GVA for overall telecommunications. There is also currently no SIC code for subsea telecommunications cabling specifically. There is also a lack of available data on cables either under construction or planned. Further work on this sector should focus on engaging stakeholders in the sector to gather primary data on this sector.
- **Coastal Tourism:** The UK reports data on GVA, employment and number of businesses for tourism as a whole rather than coastal tourism specifically – this is a key limitation. The EU Blue Economy report included GVA of UK coastal tourism until 2020, but stopped reporting UK figures after Brexit – the latest reference year is therefore from 2018. Similarly, employment is not reported for the UK, therefore employment was estimated using the method outlined in report MMO1075. The number of businesses was too difficult to estimate because tourism overlaps with other sectors such as retail, recreation and hospitality. Whilst employment can be

apportioned using FTEs, businesses whose primary functions are in a different sector (but still contribute to tourism) are difficult to apportion.
- **Wastewater Treatment:** No clear data gaps identified from the research as the ONS data source was deemed robust and complete.

Regarding data to inform the socio-economic baseline of the area, the data available is regarded as being of good quality. However, if the inland boundaries between marine plan areas was pre-established, this would give a definitive list of LSOAs to use for analysis going forward for the east marine plan areas. The ONS Nomis database would then serve as a very useful tool to monitor socio-economic change of the east marine plan areas into the future.

7.2. Redefining the Marine Plan Area Boundaries

Section 2.3 of the report outlines the geographical area covered by the east marine plan areas as it is currently defined, including where the northern and southern boundaries are currently drawn.[341] This study has found, however, that the way the boundaries of the east marine plan areas have currently been defined by the MMO is a source of confusion when it comes to describing and quantifying economic activity in the east marine plan areas, in particular when it comes to the southern boundary.

The problem is as follows. The way the southern boundary of the east marine plan areas has been drawn and defined means that this boundary currently bisects the shipping channel for the ports in the Haven, namely Felixstowe, Ipswich, Harwich and Mistley. The study has found, however, that the whole of the Haven estuary is in fact a single functional marine area, and therefore the entire estuary, and the ports within it, should all be included and fall within one plan area, not two. This would also make sense from a marine planning perspective. Splitting the Haven estuary into two (as the current boundary does) is causing confusion and is also potentially leading to economic activity either being double counted (if the same shipping activity, for example, were to be counted in both the east and the south east inshore plan area) or being underestimated (if that same shipping activity, for example, is counted in neither).

The MMO marine plan areas map includes a note in the key saying “Plan area boundaries are described as defined following the Defra consultation on marine plan areas and are indicative, with further refinement expected as the marine planning process is implemented.”[342] Therefore, one potential solution to this problem would be to redraw and redefine the southern boundary of the east marine plan areas so that instead of coming ashore at Landguard Point, it did so at Clacton or some other location, such that all the Haven ports and associated traffic were clearly in the east marine plan area, and not the south east inshore plan area to the south.

A similar guiding principle could be applied to other marine area boundaries across the country that may also need to be redefined, such that any other estuaries across

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[341] Sections 4.5 (Dredging and Disposal), 4.6 (Ports), 4.11 (Marine Recreation) and 4.12 (Shipping) outline how the boundary has been treated in each sector, given the context and activity of each specific sector.

[342] MMO (2014) Marine Plan Areas in England. Available at: Link.

the country are treated as single functional marine areas and consistency is ensured across economic sectors and across plan areas.

APPENDIX

Table 27: Socio-economic indicators by geographical area/division

	Indicator	Stretch of east marine plan areas: N1	N2	C	S1	S2	East marine plan areas	Region (ITL1): East	East Midlands	Yorkshire and the Humber	England	Year of data
	Population	563,728	449,613	573,889	244,405	401,578	**2,233,213**	6,297,779	4,855,469	5,468,487	56,326,000	2020
	Number of LSOAs	353	277	310	150	241	**1,331**	3,614	2,774	3,317	34,753	2011 census
Gross Value Added	GVA (£bn)	£13.3 bn	£10.2 bn	£13.6 bn	£4.3 bn	£10.5 bn	**£51.9 bn**	£171 bn	£118 bn	£133 bn	£1,830 bn	2021
	GVA/person (£/person)	£23,644	£22,599	£23,768	£17,573	£26,107	**£23,244**	£27,210	£24,385	£24,388	£32,488	2021
	GVA/LSOA (£m)	£37.8 m	£36.7 m	£44.0 m	£28.6 m	£43.5 m	**£39.0 m**	£47.4 m	£42.7 m	£40.2 m	£52.7 m	2021
Gender	% Male	49.40%	49.10%	49.10%	48.90%	49.10%	**49.10%**	49.00%	49.20%	49.10%	51.00%	2021
	% Female	50.60%	50.90%	50.90%	51.10%	50.90%	**50.90%**	51.00%	50.80%	50.90%	49.00%	
Age	% of 0-19 year olds	22.00%	21.50%	22.80%	19.20%	21.40%	**21.70%**	23.00%	22.80%	23.30%	23.00%	2021
	% of 20-64 year olds	56.80%	55.30%	56.50%	52.70%	54.90%	**55.60%**	57.30%	57.70%	57.60%	58.40%	
	% of 65+ year olds	21.20%	23.20%	20.80%	28.40%	23.50%	**22.70%**	19.60%	19.40%	19.00%	18.40%	
Ethnicity	% Asian, Asian British or Asian Welsh	1.90%	2.00%	5.80%	1.30%	2.80%	**3.10%**	6.40%	8.00%	8.90%	9.60%	2021
	% Black, Black British, Black Welsh, Caribbean or African	1.00%	0.40%	1.50%	0.60%	1.60%	**1.10%**	2.90%	2.70%	2.10%	4.20%	
	% Mixed or Multiple ethnic groups	1.30%	1.00%	2.00%	1.30%	2.60%	**1.70%**	2.80%	2.40%	2.10%	3.00%	

	% White	94.70%	95.90%	89.30%	96.30%	92.00%	**93.20%**	86.50%	85.70%	85.40%	81.00%	
	% Other ethnic group	1.10%	0.60%	1.40%	0.50%	1.00%	**1.00%**	1.40%	1.30%	1.40%	2.20%	
Education	% No qualifications	21.60%	24.30%	24.50%	21.90%	20.10%	**22.70%**	18.10%	19.50%	20.60%	18.10%	2021
	% Level 3 and below	42.20%	43.90%	43.10%	43.50%	43.10%	**43.10%**	42.00%	42.60%	41.10%	39.90%	
	% Level 4	26.10%	21.70%	22.10%	24.60%	27.00%	**24.20%**	31.60%	29.10%	29.50%	33.90%	
	% Apprenticeship	7.10%	7.00%	6.50%	7.00%	6.70%	**6.80%**	5.50%	6.00%	6.10%	5.30%	
	% Other qualifications	3.00%	3.10%	3.80%	3.10%	3.00%	**3.20%**	2.80%	2.80%	2.60%	2.80%	
Economic status	% Economically active: Employed	54.50%	51.90%	57.10%	49.60%	54.90%	**54.15%**	58.80%	56.80%	55.20%	57.40%	2021
	% Economically active: Unemployed	3.50%	3.20%	3.00%	3.00%	2.90%	**3.10%**	3.00%	3.00%	3.40%	3.50%	
	% Economically inactive: Retired	25.10%	27.80%	24.30%	32.30%	27.50%	**26.63%**	22.90%	23.10%	22.90%	21.50%	
	% Economically inactive: Student	4.50%	3.40%	3.30%	3.20%	3.40%	**3.60%**	4.50%	5.70%	5.80%	5.60%	
	% Economically inactive: Looking after home or family	4.60%	5.00%	5.00%	4.60%	4.50%	**4.80%**	4.60%	4.30%	4.90%	4.80%	
	% Economically inactive: Long-term sick or disabled	4.90%	5.70%	4.30%	4.70%	4.20%	**4.70%**	3.40%	4.10%	4.70%	4.10%	
	% Economically inactive: Other	3.00%	3.00%	3.10%	2.80%	2.70%	**3.00%**	2.80%	2.80%	3.20%	3.10%	

Claimants	% Claimant count as a proportion of economically active residents (16+)	5.20%	5.20%	4.70%	4.50%	3.80%	**4.70%**	3.50%	4.10%	5.10%	4.60%	2023
Life Expectancy	Life expectancy: Male	N/A	N/A	N/A	N/A	N/A	**N/A**	79.8	78.6	77.9	78.9	2020-2022
	Life expectancy: Female	N/A	N/A	N/A	N/A	N/A	**N/A**	80.4	79.5	78.7	79.7	
General health status	% in very good health	44.10%	41.50%	42.70%	41.20%	44.20%	**42.90%**	48.30%	46.20%	46.20%	48.50%	2021
	% in good health	35.10%	35.40%	36.90%	36.60%	35.90%	**35.90%**	34.60%	34.80%	34.30%	33.70%	
	% in fair health	14.70%	16.20%	14.60%	16.10%	14.40%	**15.10%**	12.50%	13.60%	13.70%	12.70%	
	% in bad health	4.70%	5.40%	4.40%	4.90%	4.30%	**4.70%**	3.60%	4.20%	4.50%	4.00%	
	% in very bad health	1.40%	1.60%	1.30%	1.40%	1.10%	**1.40%**	1.00%	1.20%	1.30%	1.20%	
Households by deprivation dimensions	% of HHs not deprived	46.20%	42.90%	43.30%	43.60%	46.60%	**44.60%**	49.60%	48.10%	46.80%	48.40%	2021
	% of HHs deprived in 1 dimension	34.10%	35.40%	36.80%	36.50%	35.00%	**35.50%**	34.00%	33.90%	33.70%	33.50%	
	% of HHs deprived in 2 dimensions	15.60%	17.10%	16.00%	15.90%	14.60%	**15.80%**	13.20%	14.30%	15.10%	14.20%	
	% of HHs deprived in 3 dimensions	3.90%	4.50%	3.70%	3.80%	3.50%	**3.90%**	3.00%	3.50%	4.10%	3.70%	
	% of HHs deprived in 4 dimensions	0.20%	0.20%	0.20%	0.30%	0.20%	**0.20%**	0.20%	0.20%	0.20%	0.20%	
Index of multiple deprivation (IMD)	Proportion of LSOAs in most deprived 10% nationally	0.25%	0.22%	0.07%	0.10%	0.09%	**0.14%**	N/A	N/A	N/A	0.10%	2019 (England 2020)

	Average IMD score	27.7	29.2	24.1	23.9	21.8	**25.7**	N/A	N/A	N/A	21.7	