East Inshore and East Offshore Marine Plan Areas Evidence and Issues Overview Report 2012

marine management organisation

Contents

Chapter 1: Introduction and background

1.1 Purpose

This report is a collation and assessment of the evidence and issues for the East Inshore and East Offshore marine plan areas (see Figure 1.1). It serves both the planning process (see section 1.5) and the linked sustainability appraisal (SA) process (see section 1.3). The information in the report has been drawn together to set out the evidence and identify the issues relevant to these marine plans and to inform the next steps in the process, i.e. generating objectives and options. The report also meets the requirements for scoping for SA purposes.

A key element of the report and consultation was to draw out the most important issues that are to be addressed by marine planning. There is a clear expectation that marine plans add value to, rather than duplicate, other mechanisms. Some stakeholders were concerned that issues were not refined too far at this stage. As a result, the report contains a range of issues where other measures are 'signposted'. Discussion during the next steps in the planning process will clarify those issues to focus on in drafting a plan for formal consultation by the end of 2012.

1.2 Consultation and revision

A draft version of the report was released for consultation from 24 November 2011 to 10 January 2012 – see 1.5 and 1.6 of the main report for details. For reasons set out below (1.2), which were generally supported by stakeholders, the MMO produced one report that supported both the marine planning and the SA processes.

During the consultation, a series of workshops were held to discuss the draft report, attended by 145 stakeholders. 53 written responses (to the report as a whole, including SA components) were received from a range of bodies including government, industry, non-governmental organisations, statutory consultees, local authorities and international interests. **The contribution of stakeholders who have responded or taken part in discussions during the consultation has been extremely valuable in the production and refinement of this report.**

This revised version has been amended to reflect relevant comments received following the consultation. It is not intended to revise the whole of the report again, instead, any significant new information, including that known to be coming in the near future, will be added as addenda to the report. The MMO will continue to consider evidence and views on issues throughout discussion of the next steps in the planning process while ensuring that there is sufficient stability to enable planning to proceed and plans to be produced. It is clear that further discussion and development is required on some elements of the approach and methods presented, such as the description of futures (end of Chapter 4) and sensitivity analysis (Chapter 5).

Figure 1: Marine plan areas for England[1]

1.3 Overview and general approach

Section 1.6 describes the plan areas and outlines the steps in marine planning. We are committed to marine plans that are based on the best available evidence. To ensure we have gathered this evidence as widely as possible, we have drawn together the range of relevant evidence but also, highlighted the issues that emerged from the evidence. This should inform any discussion of key issues and the next steps in the planning process – helping us to establish a clear vision and objectives for the plan areas.

More specifically, it was considered important to pull together and summarise relevant information on behalf of stakeholders, saving them the task of looking at all the contributing material, and beginning to draw out key implications for the East plan areas. Producing such a report and consulting on it is not a statutory requirement or a formal step in the planning process (although see SA Scoping Report) but we believe that the process and stakeholders have benefited from the adoption of this approach. In keeping with stakeholders' views[2], a single report has been produced covering both the East Inshore and East Offshore plan areas together.

[1] See www.marinemanagement.org.uk/marineplanning/documents/marine_plan_areas.pdf for full sized map.
[2] Statement of Public Participation
www.marinemanagement.org.uk/marineplanning/documents/final_spp.pdf

The Marine Management Organisation (MMO) has analysed a range of evidence including:

- data and information associated with the East Inshore and East Offshore marine plan areas
- information and issues collated from stakeholders including responses from the informal consultation
- national plans and policies that influence the management of the marine areas
- local plans and policies that influence the management of the marine areas.

The approach and methods for collating and analysing these are outlined in Chapter 2. In line with the Government's Marine Policy Statement (MPS), this report covers all the key activities that take place in the marine area, as well as all the environmental, social and economic considerations that need to be taken into account in marine planning.

The resulting outputs are largely presented in Chapter 4. It should be noted that the suggested issues are based both directly on specific points of evidence and indirectly on a reading of the evidence as a whole for that sector, as well as interactions between sectors and sustainability issues. Many of the issues are therefore a synthesised view rather than being directly attributable.

To ensure effective integration between marine plans and others, including terrestrial plans and, in doing so, contribute to achievement of integrated coastal zone management (ICZM)[3], the MMO is working with local authorities and other coastal managers and regulators. This co-operative approach has considered the many existing plans and policies relevant to the East Inshore area The MMO will continue to work with interested parties to understand and address the implications for planning and management at the coast.

In order to undertake planning it is necessary to assess the **potential future changes** in relevant sectors (see end of Chapter 4). These have been amended in response to the comments received in the consultation but it is clear that they will be subject to further discussion and development.

As well as analysing individual activities, including their spatial footprint, it is important that the evidence base considers **the interactions between activities, and also interactions between activities and the environment**[4]. This report includes analysis of some key interactions of relevance to the East Inshore and East Offshore plan areas – see Chapter 5. T**his work continues to be very much in progress, its inclusion is to highlight the approach, illustrate potential key issues arising, including limitations, and stimulate discussion.**

[3] Defra 2011 Marine Policy Statement, p13

[4] For example, Marine Policy Statement (2.3.1.6, 2.4.3) on the need to consider potential cumulative effects. The Marine Strategy Framework Directive will also be relevant - marine planning will need to take into account any relevant targets, indicators or measures aimed at achieving “good environmental status” under the Directive covering a number of 'descriptors' such as those to do with biodiversity, the seabed, generation of noise, and impacts on hydrographical conditions.

1.4 Relationship to sustainability appraisal scoping report

Each marine plan is subject to a SA, including a strategic environmental assessment (SEA) and a Habitats Regulations assessment (HRA).

As part of the SA, a scoping report must be produced. As it was clear that much of the evidence that would inform the scoping report significantly overlapped with the evidence required for the production of the marine plans themselves, a decision was made to produce one report that met the needs of both the marine plan production process and the SA process. In particular, it was felt that producing one report would reduce confusion among stakeholders and reduce the number of documents that stakeholders might need to read and comment on. It also ensured efficiency by avoiding duplication in collating and presenting evidence.

The SA Scoping Report was subject to formal consultation. See Chapter 3 for further details.

1.5 Sources of information

The specific sources of information used in gathering evidence and identifying issues are cited throughout the report including documents and/or, where necessary and possible, views of specific stakeholder interests. More detail on these and how they were assessed is provided in Chapter 2 (also see Annex 1 on data layers) and more specifically for sectors and topics specific information relevant sections of Chapters 4, 5 and 6. It must be made clear that, aside from material and views identified through dialogue with stakeholders, and responses to the consultation the information is largely drawn from existing documents and reports including government policy and strategic publications, existing adopted and draft local plans, and data and information set out in various publications or available through, for example, websites such as the MMO's web portal[5].

Some of the material is drawn from more detailed and in-depth reports and analyses commissioned or produced by the MMO in support of marine planning, such as research on socio-economic issues[6], and detailed collation of plan policies from terrestrial plans. These are accessible directly or through contact details via the MMO website[7]. We need to be careful to avoid duplicating information and descriptive text set out in other reports and projects, such as Charting Progress 2[8], where not essential, instead effectively 'sign posting' to such information and text. This report provides a synthesis and assessment of the information drawn from these sources and some interpretation or re-presentation to highlight points of relevance to marine planning and/or to ensure stakeholders are aware of potential issues that may merit their consideration during the planning process.

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[5] http://planningportal.marinemanagement.org.uk/
[6] Roger Tym and Partners and OCSI. (2011). The East Marine Plan area: maximising the socio-economic benefits of marine planning. Report for MMO. www.marinemanagement.org.uk/marineplanning/se.htm
[7] www.marinemanagement.org.uk/marineplanning/evidence.htm
[8] Defra and UKMMAS, Charting Progress 2, http://chartingprogress.defra.gov.uk/

The report incorporates appropriate evidence and views on issues came forward as a result of the consultation. Further evidence will emerge during the development of the East inshore and offshore marine plans. Where this is known we have highlighted this. We will continue to integrate further evidence as it becomes available while ensuring that there is sufficient stability in the evidence base to enable subsequent steps in the planning process, such as generating options for marine plans, to progress.

1.6 Background

The first marine plans in England will cover the East Inshore and East Offshore areas (see Figure 1 – areas 3 and 4). The East Inshore plan area includes an area of coastline which stretches from Flamborough Head in the north, down to Felixstowe in the south taking in some 6,000 square kilometres of the marine area.

The East Offshore plan area includes the marine area from 12 nautical miles to border territorial waters, a total of approximately 49,000 square kilometres of sea. The Netherlands, Belgium and a small part of France border the East Offshore plan area.

The East Inshore and East Offshore plan areas were selected as the first plan areas in England for a number of reasons which include:

- Major predicted changes in the footprint of activities, particularly offshore wind energy but also marine protected areas, and potentially extractive industries such as aggregates, that are in progress[9] and planned for the region.
- Opportunity to address how best to sustainably manage such changes in a way that takes into account the competing uses, concerns of the local coastal community, and environmental interests of the areas; together with the range of communities, including less well off areas that will benefit from economic confidence in sustainable development.
- The potential for marine plans to contribute to achieving sustainable development in the face of these challenges and changes, taking into account existing activities, multiple pressures, the receiving environment and the varying aspirations of different interests.

Marine plans need to integrate with a range of existing strategic plans. Rather than duplicate plan information and policies, marine plans will signpost to other plans where appropriate and will only cover the same ground where the marine plans are adding new information.

The potential structure of marine plans, and their position within a broader marine planning system, can be seen in Figure 2[10]. Background on the steps in the planning

[9] Marine planning will need to incorporate and build on other initiatives that have already generated decisions and/or which are subject to their own statutory processes, such as identification of Round 3 windfarm zones or work towards designating marine conservation zones.
[10] From Defra (2011) A description of the marine planning system for England.

process and stakeholder engagement is given in sectoins 1.11 and 1.12 of the Main Report.

Figure 2: Structure of marine plans

Chapter 2: Evidence gathering

2.1 Methodology

This chapter outlines the approach and methods used to draw together information for the report, particularly chapters 4 and 5, and supporting annexes, together with some generic material that doesn't readily fit within one sector, such as the overview of stakeholder engagement and assessment of river basin management plans. The information was drawn from four main sources:

- **National policy**: Marine plans should translate the Marine Policy Statement into detailed policy and spatial guidance for each marine plan area. This requires an understanding of the MPS and national policy, including sector-specific documents that underpin or add detail to the MPS including national policy statements. Relevant material has been assessed and summarised, taking account of dialogue with policy owners including government departments and sub-national plans and policies.
- **Stakeholder engagement:** A successful, enabling marine plan will be one that meets the needs and expectations of stakeholders. To that end the Marine Planning Team, including three liaison officers based across the East Inshore and East Offshore plan areas, have attended numerous local, national and international meetings and events, gathering views and information from a wide spectrum of sectors with a range of opinions. These have been logged and summarised to enable analysis for this report.
- **Technical data collation and geographic information system (GIS) analysis:** Working with a range of partners and stakeholders, we have collated a wide

range of datasets related to activities and considerations to be taken into account in marine planning. The data has been used to derive various maps and statistics relating to current and potential future situation (Chapter 4) and to investigate the interaction between different activities and between activities and the environment (Chapter 5). A full list of data used in the MMO's analysis can be viewed in Annex 1 of the main report. Chapters 2 and 5 of the full report detail the data analysis undertaken and the issues found.

- **Sub-national plans and policies:** The evidence base for marine plans should "take in a wide range of sources including existing plans"[11]. Specific attention should be paid to terrestrial plans[12]. Informed by consultation, a process was developed for assessing local development frameworks in particular, but also other plans, such as shoreline management plans. Involving planning authorities and other key stakeholders has allowed us to assess material at the sub-national level that should be considered in marine planning.

2.2 General points from stakeholder engagement

The Evidence and Issues Report draws together a number of strands of evidence, including the views, aspirations and opinions of stakeholders. The Marine and Coastal Access Act 2009 sets out the requirement to involve interested persons in the marine plans, with the Statement of Public Participation (SPP) describing at what stage in the planning process this will occur. Therefore, it is important that this report captures the views of stakeholders in the overall analysis.

These general points have been supplemented by those that emerged from the workshops held in December 2011 (see 2.2 in the main report).

- Since the start of marine planning in the East Inshore and East Offshore plan areas, MMO planners have attended a diverse range of meetings and events throughout the plan area and beyond. Comments and contributions from many parties interested and affected by activities and development in and adjacent to the marine area have been wide ranging. Stakeholders are enthused by the introduction of marine planning, but as this is a new activity in England, there is a degree of stakeholder uncertainty as to what a marine plan will contain, affect, deliver, impact on and support. The MMO will hold local drop-in sessions in February 2012 to give stakeholders a feel for what marine plans will look like and what they will aim to achieve.
- Many sectors have interest in the data-gathering process, and question how any evidence deficiencies will be addressed, and how evidence will be used in delivering marine planning. This report hopes to address these questions. Their comments on the draft of this report have been included where applicable.
- Concerns arise regarding potential stakeholder fatigue, particularly with regard to consultation and overlap with projects managed outside of the MMO by other bodies, such as marine conservation zones, Round 3 wind energy consultations, and time allotted for consultation or contributions. Limitations, particularly due to

[11] Marine Policy Statement 2.3.1.2
[12] The Marine and Coastal Access Act (Schedule 6, Section 3) requires the MMO to take all reasonable steps to secure that any marine plan for a marine plan area in its marine planning region is compatible with development plans.

constrained resources, exist for many stakeholders to make adequate representations. As a result there is a perception some organisations that are better resourced will have better or more significant levels of influence. It should be noted that the MMO is committed to considering all the evidence provided in a consistent way.

- There is a high level of interest in offshore and onshore impacts of renewable energy projects, both visual and environmental. Concerns of note for other activities are displacement of existing activities such as fishing and recreational sailing, and possible effects on tourism through visual impacts. Marine planning is actively considering co-location options to address this, and MMO licensing colleagues will also consider impacts of individual applications.
- The integration of terrestrial and land-based planning systems is seen as essential to ensure the success of marine planning. The introduction of the National Planning Policy Framework, and implications regarding sustainability and the safeguarding of the supply of minerals were seen as important influences.
- Economic benefits of marine development and where they accrue is under scrutiny. Some forms of development are seen as contributing little to economic wellbeing at local level. This will be explored further via our evidence gathering.

We acknowledge the contribution and input stakeholders have made thus far in the planning process and we look forward to this continuing. In particular, further engagement with local enterprise partnerships (LEPs) and with organisations involved with enterprise zones (EZs) will be required as these initiatives evolve.

2.3 Summary of RBMPs and SMPs

River basin management plans (RBMPs)

The Marine Policy Statement (MPS) states that "When developing marine plans the marine plan authority should ensure it has regard to any relevant river basin management plan (RBMP)...and the programme of measures devised for the river basin district which is summarised in each plan."

Therefore an assessment of the marine relevance of RBMP has been undertaken to ensure the relevant policies are taken into account during the marine planning process.

There are two RBMPs in the East plan areas: the Anglian RBMP and the Humber RBMP.

Both plans focus on the following themes that are of most relevance to marine planning guided by the scope of the MPS:

- importance of fish passage for biodiversity
- integration (and balance) between recreational use and protection (and improvement) of designated sites – sites of special scientific interest (SSSIs), special protection areas (SPAs), special areas of conservation (SACs)
- sediment issues including dredging guidance and reduction in diffuse pollution and sediment-based pollutants to improve water quality in order to meet the objectives of the Water Framework Directive (WFD).

Shoreline management plans (SMP)

The Marine Policy Statement (MPS) states that "When developing marine plans, marine plan authorities should liaise with terrestrial planning authorities, drawing on shoreline management plans". An assessment of the marine relevance of SMPs has been undertaken to ensure the relevant policies are taken into account during the marine planning process.

There are six SMPs within the East plan areas, named SMPs 3 to 8. SMP 7 is in draft form. SMPs are developed by coastal groups that are principally made up of local authorities and the Environment Agency, one of whom adopts a leading role in writing the SMP.

Within each SMP, there are a number of policy development units (PDU) which comprise of stretches of coastline. Each unit is given one of the four following management policies:

- Hold the line – maintain the existing defence on its current alignment.
- Advance the line – advance the existing defence line by building new defences on the seaward side of the original defences.
- No active intervention – a decision not to invest in providing or maintaining defences.
- Managed realignment – allowing the shoreline to move backwards or forwards, with management to control or limit movement.

We have produced a high-level matrix to gain an understanding of the impact, if any, of the interaction between management policies and the 11 sectors identified in Chapter 3 of the MPS. This was shared with the Environment Agency and local authorities and is included as an annex to the main report.

To gain a greater understanding of more specific issues identified within SMPs relevant to marine planning in the East of England, we have gathered SMP-specific information from the local authorities and the Environment Agency. Below is a summary of the comments received by an agreed initial deadline based on a series of questions, although further responses are still expected. What would you like or need marine planning to take account of or draw out from your SMP?

- Any marine activity that impacts on coastal processes and has the potential to cause a change, such as increased erosion, in the coastline requires a sound understanding of the existing evidence.
- The impact of increased offshore energy production and related infrastructure on areas in and around areas of coastal defence identified within SMPs.
- SMPs have moved towards a stronger influence from communities and this provides an opportunity for marine plans to utilise these networks to ensure compatibility.

What do you hope marine planning will assist with in the delivery of your SMP?

- Support for SMP policies through marine planning would be beneficial to the licensing and physical works process.

- Consideration of the use of near shore dredged materials to enhance salt marsh or raise land prior to manage realignment schemes and dredged materials for beach recharge. This also links with the desire for beach improvement schemes for the purposes of enhancing tourism.
- Raising awareness of the impact of climate change on the marine environment.
- Ensuring marine and terrestrial planning are clearly linked and working together to take account of coastal change throughout the planning process[13].

What are the linkages between your local SMP and the local RBMP (and any other statutory or non-statutory plans) that marine planning needs to be aware of?

- SMPs 4, 5 and 8 have no contradictory policies with catchment flood management plans.
- Clarity needs to be provided on where marine plans will sit in the planning hierarchy.
- Neighbourhood plans and National Planning Policy Framework have been highlighted as requiring consideration by marine planning when they are introduced.

2.4 Wider plans and policies

Local transport plans (LTPs)

Another type of sub-national plan that may be relevant to the marine plan is Local Transport Plans (LTPs)[14].

- Transport infrastructure is vital to integration of terrestrial and marine activities, a point recognised by the MPS that refers to the need to liaise as appropriate regarding on-shore infrastructure[15].
- Highways authorities, including local authorities, liaise with all parties in preparation of LTPs that recognise transport issues through strategic planning.
- The majority of infrastructure issues addressed within LTPs are of terrestrial concern, specific measures, such as improvement of transport links to and from ports, not cited in this evidence document.
- The MMO will work with ports on matters that that may impact upon their activity and may be strategically dealt with through the plan, with highways authorities continuing to work with ports to ensure landward transport links are sufficient.
- If LTP content raise issues at the appropriate scale to be addressed strategically through a marine plan it would be considered in the production of any marine plan. Early sight of any such opportunity is welcomed.

Regarding the wider role of the MMO, there may be cases where transport links within a local authority be required to liaise with the MMO's Marine Licensing Team, for example where maintenance of transport infrastructure requires a marine licence. These specific, case by case licensing issues will not form features of a marine plan.

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[13] Note: MMO recently completed a socio-economic study which identified local development framework processes in East plan areas and how the MMO may get involved with these.
[14] Defra (2011) A Description of the marine planning system for England, p31 and p77
[15] Defra (2011) Marine Policy Statement, p30

Area action plans (AAPs)

The focus of sub-national analysis has been on plans and strategies such as local development frameworks (LDFs) that provide strategic context to development over a given area assigned to a planning authority.

- These documents, while spatially operating at a smaller scale than that of the marine plan, set out policies in a way that may be likened to what could be expected within a marine plan.
- AAPs establish proposals and policies for the development of specific areas. Examples of AAP use in a marine context include planning for development of infrastructure such as marinas. While AAPs represent change on the coast within the East plan area, they are typically an extension of larger scale approaches set out in LDFs, setting out specific detail to enable development.
- AAPs have not been examined in detail with LDFs used as the primary means of identifying coastal change at the plan scale.
- If AAP proposals raise issues at the appropriate scale to be addressed strategically through a marine plan it would be considered in the production of any marine plan. Early sight of any such opportunity is welcomed.

Estuary management plans, port and harbour plans

For estuary management plans (EMPs) the following method was applied. Note that at time of release this process is ongoing.

- EMPs are produced by a group of organisations all of whom have an interest and/or stake in an estuary. They bring together many of those with an interest in an estuary to reach a consensus on the sustainable use of that estuary. EMPs are non-statutory and all the major estuaries in England have one.
- We have initially looked at the Humber EMP and the Wash EMP. The plans have been reviewed for policies that marine planning need to have regard to, with excerpts extracted from the document for future analysis within the marine planning process.
- As part of this process, we recognise the need to examine sector led documents such as Port Master Plans and, where in place, are seeking to integrate the review of these documents with the MP review process.

Chapter 3: Introduction and approach to the SA process

Background and principles

Sustainability appraisal (SA) considers the economic, social and environmental impacts of an emerging plan (the three dimensions of sustainable development). The aim of SA is to identify a plan's likely significant adverse effects and take steps to avoid and/or mitigate these as well as identify opportunities to maximise the plan's sustainability.

The requirement for SA in the marine plan process is outlined in the Marine and Coastal Access Act 2009, which stipulates that all marine plans are subject to SA, and that it is undertaken in line with the procedures prescribed by the EU Strategic

Environmental Assessment (SEA) Directive[16]. Published government guidance on SEA[17] (hereafter referred to as the Practical Guide) has been followed in developing the approach to this SA in order to ensure compliance with the SEA Directive.

SA differs from SEA in that it gives greater consideration to socio-economic issues (although the SEA Directive refers to a possible need to consider issues such as 'population' and 'human health').

Both through professional analysis underpinned by scientific understanding, and supporting more effective stakeholder engagement, SA should lead to plan-making being scrutinised from a greater number of angles and perspectives than it might otherwise be. This helps to drive the development of a more holistic and ambitious plan.

The SA process

The stages in the SA process have been developed to take into account the five procedural stages (A to E) of SEA outlined in the Practical Guide[17].

The scope of the SA (Stage A)

Currently, plan-making is at the evidence gathering stage with a view to using this evidence to develop plan options in the near future. At this stage there is also a need to establish the scope of the SA. Scoping involves identifying those sustainability issues that will (and will not) be the focus of the forthcoming appraisal.

It is important that scoping is informed by the views of stakeholders. To facilitate this, the earlier draft of this report set out the proposed scope of the SA for stakeholder comment therefore allowing stakeholders to highlight further issues that should be within the remit of the SA (as well as perhaps highlight issues of lesser importance that might be excluded from consideration in order to ensure a concise and well focused appraisal).

It is anticipated that the SA will cover both marine plans (the East Inshore and East Offshore plans) in tandem. The study area for the SA corresponds with the boundaries of the two marine plans as identified in Figure 1 together with a consideration of any effects that may occur in neighbouring areas.

Topics to be covered in the SA

The 2005 UK Sustainable Development Strategy sets out a series of guiding principles for sustainable development (see Figure 3.3 in the main report). The topics to be addressed in the SA have been developed with these principles in mind together with the requirements of the SEA Directive.

The topics to be considered are as follows:

- air and climate
- communities and health (including equality issues)

[16] Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment
[17] ODPM et al. (2005) A Practical Guide to the Strategic Environmental Assessment Directive

- geology and geomorphology (coastal processes)
- cultural heritage
- ecology
- economy
- landscape and seascape
- water environment.

Under each topic consideration will be given to a range of sustainability issues. One important point to note is that under the communities and health topic it will be possible to give clear and explicit consideration to equality issues, so there is no need to undertake a separate equalities impact assessment (EqIA).

Many of the SA topics identified overlap, and an effect in relation to one topic may also result in a direct or indirect effect to a number of other topics. Climate change, for example, is one particular cross-cutting issue that is relevant to all the topics identified. The marine area is particularly sensitive in this respect and close attention will be paid to the inter-relationships between these topics throughout the SA.

For further stages of SA process please see Chapter 3 of the main report.

Chapter 4: Key marine activities

This section addresses the activities outlined in Chapter 3 of the Marine Policy Statement (MPS), which includes Marine Protected Areas (see explanation in 4.1). It specifically focuses on the East Inshore and East Offshore plan areas – the first two plan areas for England. It provides background information and scene setting for each of the sectors, drawing together and summarising evidence and issues that have emerged based on data and information, national context and policy, relevant existing plans at a sub-national level, and discussions with stakeholders. See Chapter 2 of the main report for detail on the approach to gathering this information.

Each section:

- summarises the key evidence for that sector, including national context and policy, sub-national plans and policy, data and information
- sets out issues that have emerged from this evidence and stakeholder dialogue, including issues for delivery of the sector, issues for other sectors, and issues for sustainability
- provides a breakdown of current and future issues, where possible.

4.1 Designated sites including marine protected areas

Relevance to East plan areas

The East plan areas include a wide range of habitats, species and other features of conservation importance. As a result, they include a significant proportion of the designated marine protected areas (MPAs) around England and will gain more in the near future. In particular:

- **Current**: significant proportion of the area of sites designated as special protection areas (SPAs) (approximately 42 per cent) and special areas of conservation (SACs) (approximately 78 per cent) around England, together with a substantial coverage at the coast and of the intertidal by sites of special scientific interest (SSSIs) (just under 40 per cent by area of those around the coast of England).
- Just over a third of the two plan areas, by area, is either SAC or SPA or both (as some SACs and SPAs overlap).
- There are a number of important Ramsar sites, including the Humber estuary and The Wash.
- **Future**: further SPAs may be designated but the potential location and extent of these has yet to be determined.
- **Future**: there will be a number of marine conservation zones (MCZs) designated but how many and what proportion of the twelve recommended MCZs (rMCZs) (6 per cent of the total plan areas) progress towards designation is unknown.

It should be noted that there are designated sites adjacent to the East plan areas boundaries to the north and south.

Please note: These figures were calculated by the MMO using GIS analysis of features contained within the boundary of the plan area.

Figure 4.1: Marine Protected Areas

January 2012
This map has been produced using the ETRS89 Coordinate Reference System

marine management organisation

Figure 4.2: Other designated sites intersecting with the East plan areas

January 2012
This map has been produced using the ETRS89 Coordinate Reference System

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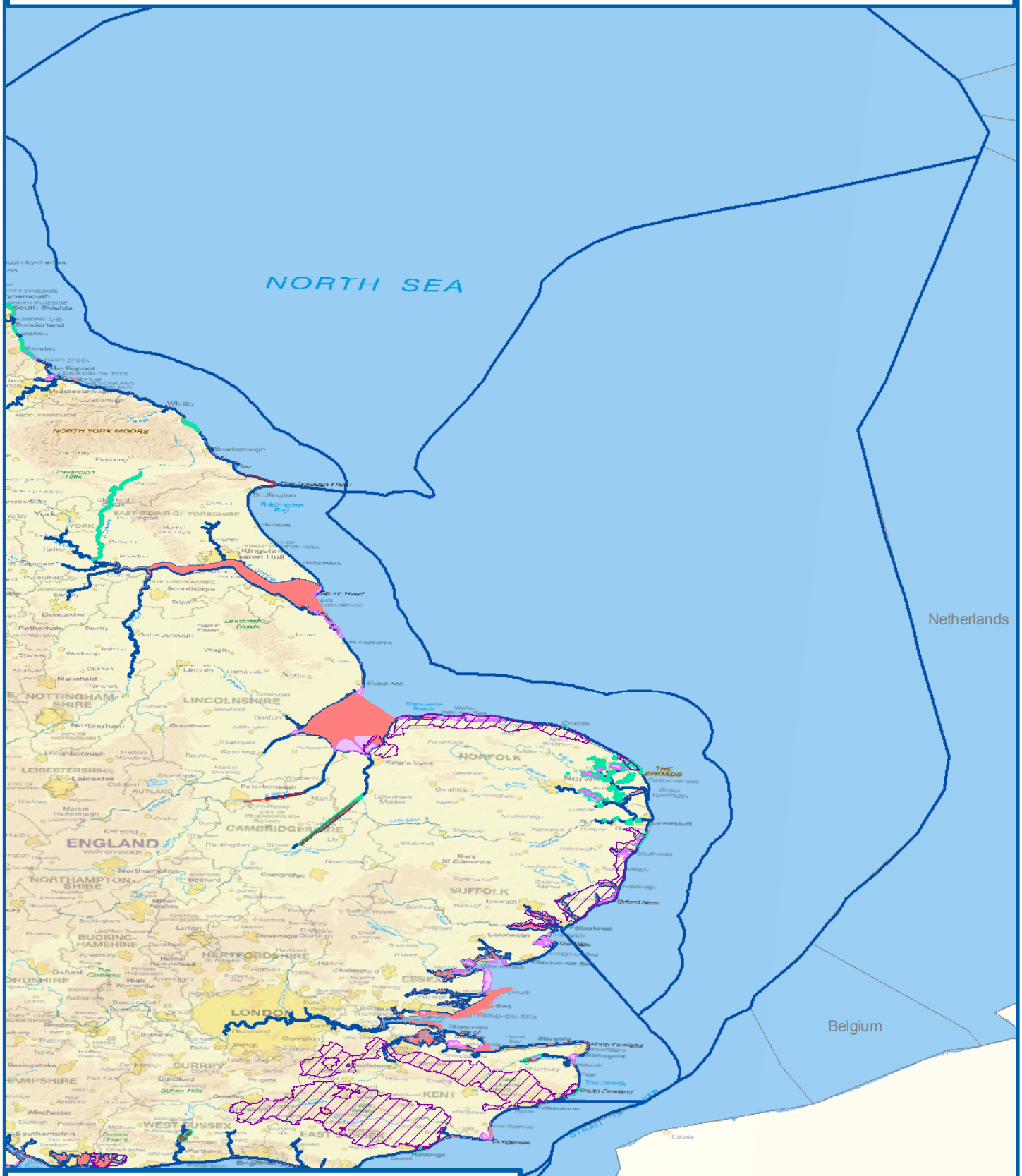

Issues for delivery of MPAs (and other designated sites)

- The management of existing sites is largely provided for by statutory protection requirements and management measures implemented by competent and relevant authorities. The main relevance for marine planning is to take account of existing sites and understand and assess the implications of new MPA (and other designated site) proposals. Marine planning should provide a framework or planning policy context for site-based measures. The need for, and nature of, this support needs to be determined and will be driven by advice from the statutory nature conservation bodies but could include:
    - integration of conservation objectives set out in the MPA to assist decision making and implementation of the management requirements of specific designated sites
    - ensuring that activities and decisions outside of sites take account of the delivery of individual MPAs and an ecologically coherent network, including cumulative and cross-boundary considerations
- Attention must be paid to the type of designated site under consideration as the legislation and protection applying to it will vary. Equally, different conservation features have very different protection requirements and therefore the range of management measures also varies. This type of information will be essential when considering co-location of activities within designated sites. An example is the degree to which wind energy development and SACs or SPAs can be co-located or not[18].
- The need to help ensure that sites have appropriate protection prior to designation
- The designation of new conservation sites in conjunction with development of offshore wind alone is a major change in spatial usage, although the exact size of the change is currently unknown. This imminent extra competition for space and potential implications for human activities is likely to be a key issue for marine planning. Indeed, competition for space may mean there are limited or no alternatives for site selection.

Issues for other sectors

- Pending confirmation of MCZ designations and management measures, there is potential for some degree of effect for ongoing and new activities and development, although a stakeholder-led process with the MCZ project groups to identify recommended sites has sought to minimise this. The degree to which this is the case will depend on a number of factors including conservation objectives. This is being considered further through the impact assessment (IA) for MCZs.
- An initial, high level IA and consultation undertaken by the MCZ projects indicated that there might be few situations where developments or activities, such as shipping, are deemed to have a real impact on sites. However, this requires further assessment, such as it did not address cumulative effects, as part of refining the IAs to accompany advice from Natural England and JNCC. The IA is taking into account existing activities on the 127 rMCZs and reference areas, and whether or not these activities will be compatible with the features for which the sites are identified.

[18] The Netherlands, for example, has taken the policy decision to avoid co-locating wind farms in SACs and SPAs. It is for the UK to determine what it considers the most appropriate approach.

- In the meantime, stakeholders from several sectors have raised remaining concerns, or at least uncertainty, about possible effects including displacement and the prolonged period in which this uncertainty will remain. Clearly the final advice may have a potentially profound effect on the location and distribution of activities and, therefore, potentially issues for marine planning to address. Whilst marine planning cannot give formal consideration to MCZs until they are out to public consultation, it would be prudent to take note of them informally in analysis to inform marine planning. The MMO and Defra, with Natural England and JNCC, will continue to work closely together in taking forward both processes.
- While any resulting implications would be largely a matter for individual MCZ management and related licensing, there are likely to be issues that marine planning will play a part in addressing, such as the consequences of the increased area of protection and any knock on effect for areas and activities outside of the sites, measures outside of sites relevant to sites, including licensing and enforcement requirements. However, the need for, and ability to, act will be founded in the legislation underpinning the particular designated site.
- Concern has been raised by some stakeholders about any management measures applying equally to foreign fishing vessels as UK vessels. While as much an issue in general as for implementation of MPAs, Defra has previously stated that fishing restrictions will not be imposed unilaterally on UK vessels before they can be applied to EU vessels.

Issues for sustainability

- Further work is needed to determine the relevance and potential basis of national MPAs for mobile species – Defra is commissioning such work. While this is an issue for Defra and Natural England or JNCC, any resulting advice or actions may have implications for marine planning.
- Cumulative and cross boundary impacts of developments need to be considered. Marine plans can help guide the licensing process to ensure that cumulative effects of developments do not impact on MPAs although there are substantial gaps in our understanding of such impacts.
- Designation of MCZs and subsequent management of those and other MPAs needs to consider the impact (positive or negative) on economic regeneration of coastal communities, such as Lowestoft through opportunities as a service centre for the offshore industry or continued operation and development of the port of Felixstowe. A recent socio economic study undertaken for the MMO[19] should contribute to such considerations.
- MPAs and designated sites can provide direct and indirect societal and economic benefits, such as through the ecosystem services provided by the features that they protect. One example is the importance of saltmarsh habitat for fish nurseries. These should be picked up through individual site impact assessment and management. However, it is anticipated that marine planning will also consider this more widely[20].

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[19] Roger Tym and Partners / OSCI (2001) Maximising the socio-economic benefits of marine planning for English coastal communities [online] available @ www.marinemanagement.org.uk/marineplanning/documents/se_national.pdf

[20] UK National Ecosystem Assessment (2011) “The UK National Ecosystem Assessment Technical Report. UNEP-WCMC, Cambridge” and references therein

- Habitats and species present within MPAs that are not 'designated' may need to be considered in marine planning, depending on advice from JNCC and Natural England, and addressed through a combination of licensing and management measures.

4.2 Defence and national security

Relevance to East plan areas

The Ministry of Defence (MoD) provides military defence and, where appropriate, security for the people of the UK and overseas territories. Defence activities that utilise the marine environment, directly or indirectly, in support of operational capability are diverse, including vessels and aircraft, HM naval bases, surface and sub-surface navigational interests, underwater acoustic ranges, maritime and amphibious exercises, coastal training ranges and coastal test and evaluation ranges.

The MoD contributes to the marine sector by providing survey data, employing people throughout the UK in support of its operations in the marine environment, including through HM naval bases and MoD ranges and coastal estate. In some coastal locations the MoD is the major employer in the region.

- **Current**: Almost half of the combined East plan areas' space is indicated as being related to defence activity. Specifically, much of this space is dedicated to Air Force air to air training areas, the majority of which do not extend to sea level. There are also two coastal air weapon ranges used for practise bombing in the East plan areas and there is a submarine exercise area off Flamborough Head, on the boundary between the North East and East areas.
- **Future**: A National Maritime Information Centre (NMIC) is being established that will provide a comprehensive picture of potential threats to UK maritime security in UK national waters. It will build links with international partners to allow the UK to develop a global maritime picture. The NMIC will provide the Government with a single picture of maritime activity, bringing together intelligence and monitoring carried out by the UK Border Agency, HM Coastguard, police, Royal Navy, Foreign and Commonwealth Office, Marine Management Organisation (MMO) and other agencies.
- **Future**: Future defence commitments and activities are difficult to predict. Many existing defence commitments are likely to continue for the foreseeable future including the need for exercise and practice areas and firing ranges. The scale of many existing activities is likely to alter as a result of the Strategic Defence and Security Review. Terrorist threats to the UK and its citizens are still an active consideration and will require flexibility within the MoD and partners, to take account of any shifts in activity or methodology deployed by those with terrorist intent.

Figure 4.3: Defence and national security activity

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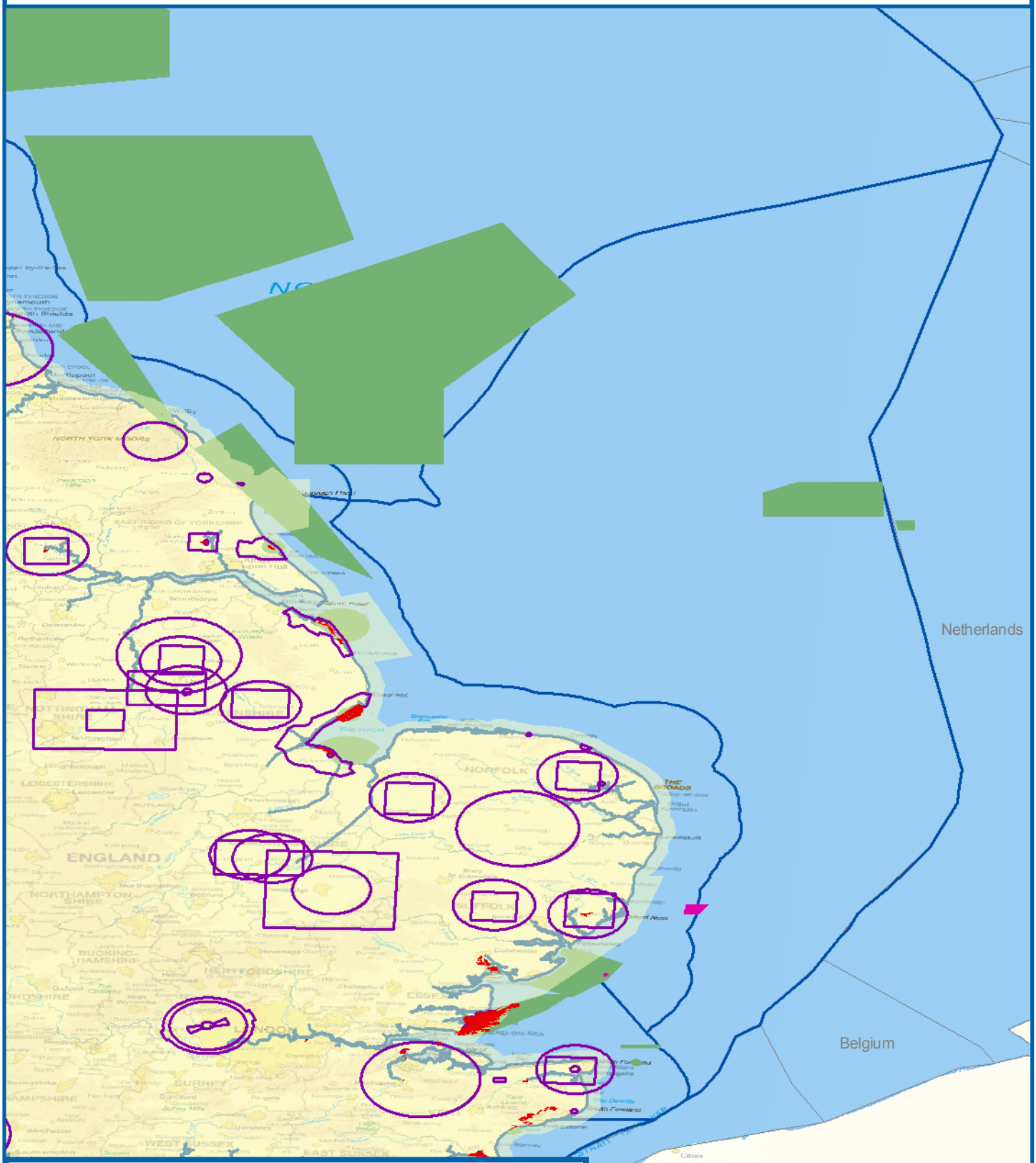

- MMO Marine Plan Areas
- MoD Estates within 5km of Mean High Water
- Munitions Dumps
- Safeguarding Data within 5km of Mean High Water
- Military Low Flying Zones
- Military Practice Areas

Issues for delivery of defence and national security

Future impacts of this marine activity will be driven by national policy with changes (such as in relation to sea training activities) shaped by home defence policies (such as surveillance and monitoring of UK waters) and military activities abroad. It is anticipated that the key decisions regarding defence will be taken at the MoD, and that the marine planning process will reflect any changes in location of defence activities[21].

Issues for other sectors

- The MoD ensures facilities, including radar facilities, exercise and range areas are not compromised by any form of development either on or offshore. This is managed through a formal consultation process with prospective developers in addition to involvement with MMO and the Department of Energy and Climate Change (DECC).
- The MPS requires marine plans to take full account of the individual and cumulative effects of marine infrastructure on MoD interests.
- Use of the marine environment will recognise, and integrate with, defence priorities, including the strengthening of international peace and stability and the defence of the UK and its interests including protection of key sea-lanes[22].
- Use by the MoD of coastal land for military activities precludes all other activities, limiting development opportunities.

Issues for sustainability

- The MoD is committed to the protection of the natural and historic environment and therefore does not seek to be exempt from environmental legislation unless it restricts essential operational capability.
- Where they occur, the socio-economic benefits should be recognised when developing marine policy and planning[23].

4.3 Energy production and infrastructure development

Energy production and infrastructure development includes oil and gas, renewable energy, grid connection, carbon dioxide capture and storage (CCS), and nuclear.

4.3.1 Oil and gas

Relevance to East plan areas

Oil and gas extraction is a key strand of energy policy and implementation activity at the UK level and is the most economically valuable activity in English waters. While production from UK fields is declining, indigenous production is expected to continue to satisfy about half of the UK's oil and gas demand in 2020. Maximising the economic recovery of UK oil and gas resource sustainably is a priority in the UK's energy supply and energy security strategies.

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[21] MMO (2011) Maximising the socio-economic benefits of marine planning for English coastal communities – p40
[22] MoD (2011) The Strategic Defence and Security Review and British Shipping
[23] MMO (2011) Maximising the socio-economic benefits of marine planning for English coastal communities – p40

The East plan areas are significant for hydrocarbons (mainly gas) around England.

- The areas account for 75 per cent of gas production in England[24], with nearly 75 per cent of oil and gas infrastructure around England situated in East plan areas (mainly offshore) including 3,485 pieces of gas infrastructure and over 6,600 km of pipelines[25].
- Licensed blocks cover 39.7 per cent of the East Offshore plan area and 8.4 per cent of the East Inshore plan area but not all of these blocks, or the whole area within blocks, is currently in use, with proven hydrocarbon fields only covering 4.2 per cent by area.
- Limited information is available on long-term future exploration but 126 licence blocks are expected to be in use or to have been explored for gas by 2030, some of which may lead to production from new fields and new infrastructure (this may be partially dependent) capacity for sub-sea tie back to existing infrastructure).
- Underground gas storage in salt caverns occurs at Aldbrough in East Yorkshire and as the UK becomes more dependent on imported gas, storage infrastructure is likely to increase significantly in the East plan area.
- Decommissioning has already been completed for some fields in the plan areas and represents both a challenge and opportunity in the future.

[24] DECC (2010) Gross gas production figures (https://www.og.decc.gov.uk/information/bb_updates/appendices/Appendix10.xls)
[25] MMO (2010) Strategic Scoping Report

Figure 4.4: Oil and gas

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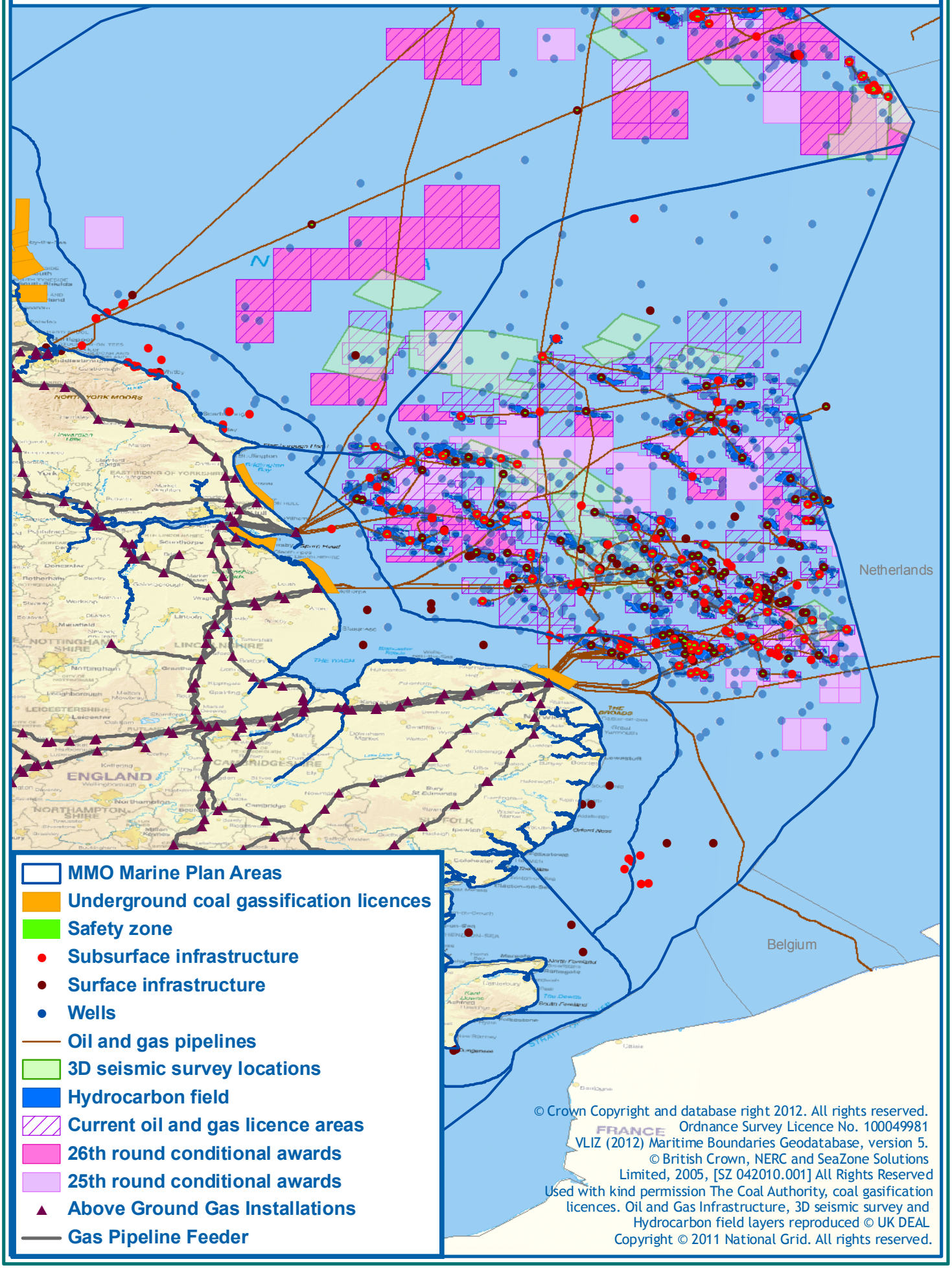

Issues for delivery of oil and gas

Current issues, including interaction with other sectors and the environment, tend to be dealt with through the licensing rounds, supporting strategic environmental assessment (SEA), and subsequently at an individual project level during assessment of permit applications.

However, due to the policy direction, and current presence of gas in the plan area, exploration for and production of gas will be one of the key issues for marine planning in East plan areas, both presently, and potentially into the future. Future importance could also be linked to CCS development. Future investment by the sector will determine the sustained productivity of the UK Continental Shelf[26]. There is a need to accommodate the requirements of oil and gas alongside other industries will be important for the East plan areas, while taking account of environmental considerations, including potential cumulative effects, such as from noise.

Due to the increasing need for imports of gas and for storage (including indigenously produced gas), infrastructure, such as gas terminals, is likely to be needed to help with delivery of this aspect of gas supply.

When wells have been drilled but not put into use, they are either plugged and capped (putting them permanently out of use) or they are suspended, in order that they may be used in the future. Plugged and capped wells do not present an issue as long as their presence is known so other seabed users can factor this into their activities. Suspended wells have a presence on the seabed surface, whereas plugged and capped wells do not. Suspended wells can present issues for users of the seabed such as trawlers, who may snag their nets upon them or damage the wellhead. There are significant numbers of suspended wells in the plan areas, though the position of these is known and actively managed by the industry, in conjunction with other users of the sea.

Although of more relevance to the sector-specific regulation of oil and gas extraction than marine planning, there is significant learning for the sector from the Deepwater Horizon incident as detailed in the final report of the Oil Spill Prevention and Response Advisory Group. Progress has already been made, including the unveiling of the OSPRAG capping device[27].

Issues for other sectors

Oil and gas infrastructure, together with safety and exclusion zones, excludes other activities although the footprint of individual installations may be small.

- It is likely that more gas infrastructure will be needed to exploit new fields. Such an increase may conflict with the Round 3 wind energy zones and determine where wind development may be located (as not all of the area in the zones is required to deliver the target zone capacities for Round 3). An increase in infrastructure may also impact on other sectors.

[26] Oil and Gas UK (2011) 2011 Economic Report
[27] www.oilandgasuk.co.uk/knowledgecentre/OSPRAG_Capping_Device.cfm

- The Civil Aviation Authority CAP764, 'Policy and Guidelines on Wind Turbines' states that a 9 nautical mile consultation zone is needed around offshore helidecks. This allows for discussion on the safe operation of helicopters between those operating helidecks or proposed helidecks (in this case oil and gas developers) and other sectors wanting to use an area within the 9 nautical mile consultation zone.
- It is anticipated that the amount of wave and tidal energy being generated will increase markedly up to and beyond 2020. It is important for marine planning to take account of appropriate locations for such developments alongside more established uses of marine space and to recognise the timescales and stages against which the sector is likely to progress, including the lead time for grid and infrastructure development.
- An increase in areas occupied by hydrocarbon infrastructure and safety zones combined with increase in the footprint of other sectors, particularly renewables, aggregates and potentially MPAs may have implications for other sectors, particularly shipping and fishing.
- Potential growth in on-shore facilities including ports to decommission structures may impact on the availability of facilities and supply chains for other sectors.
- The location of infrastructure such as suspended wells needs to be fully communicated to other industries, in order to minimise hazards associated with them.
- There may be opportunities for oil and gas infrastructure to be used for carbon capture and storage, which can also enhance oil and gas recovery from functioning fields.

Issues for sustainability

- Pressures exerted by this activity typically include:
    - direct pressures on biodiversity (scour around legs)
    - noise and vibration (both during construction and operation – link to biodiversity)
    - visual impact (link to seascape)
    - potential for pollution where incidents occur (link to biodiversity, air quality and water quality)
    - emissions from flaring (links to air quality) – see chapter 6 in the main report.
- The scale of impact of individual oil and gas installations is relatively small and in some cases time-limited (for example, solely during the installation, and operation phase), though the scale of a project will dictate the impact.
- Pressures are usually dealt with at a sectoral SEA and individual project level. The potential increase in pressures and impacts from any increase or change in gas exploration and production, including in combination with other activities, will need to be considered whether within the existing regulatory regime or marine planning.
- Decommissioning: There has been much debate in recent years about the impact of these operations on the environment, on the health and safety of workers, the costs involved and the technology required[28]. Decommissioning and the timeframes for doing this are becoming more of an issue, as over the

[28] www.oilandgasuk.co.uk/knowledgecentre/decommissioning.cfm

next thirty years, the number of redundant oil and gas installations is due to rise significantly as, “around 500 [oil and gas] installations are expected to be decommissioned over the next three decades[29]. There is however, considerable uncertainty in relation to the size and timing of decommissioning activities[30].

4.3.2 Renewable energy

Relevance to East plan areas

The East of England plan areas include the sites of 23 per cent of the current offshore wind installations and have the majority (70 per cent of planned English Round 2 sites and over 88 per cent of planned English Round 3 sites) of all future areas where wind farm development will be licensed in UK waters.

Indications from The Crown Estate's Seabed Licensing Programme show potential offshore generation output could be as high as 32 GW with the majority of this provided from wind energy, as a result the footprint for renewable energy installations would increase significantly.

Offshore wind energy production must rise significantly from current levels of output of 1.5 GW to circa 18 GW by 2020, and it is expected that it will make up the majority of marine renewable energy up until 2020.

Due to the availability of wind resource and the technical feasibility in relation to water depth, wind speed and size of site, the vast majority of the offshore wind energy potential exists in the East Offshore area. In order to use this resource, there is a planning need to ensure the Round 3 wind energy leasing areas are developed in a sustainable way.

The Crown Estate has established three major wind energy development zones in the East Offshore area – Dogger Bank (north), Hornsea (middle), and East Anglia (south) – see Figure 4.5

By 2020, the UK government expects offshore wind electricity generation to have increased by at least tenfold and possibly by as much as twenty times its current level[31]. As most of this is in the East plan areas, this represents a significant factor in marine planning for this area.

Opportunities exist and will continue to grow for job creation associated with the construction and maintenance of the offshore renewable industry, in particular those communities which are classified as more deprived. Areas around the Humber are beginning to come forward with proposal sites for large scale renewable construction with potential associated employment for local people. Similar possibilities are emerging at Lowestoft and Great Yarmouth as well as in other areas both within and outside of the plan areas. (Scunthorpe, TATA steel supply for offshore wind projects, and the National Renewable Energy Centre (Narec) renewables development in Northumberland).

[29] Defra (2011) UK Marine Policy Statement. TSO, London. p31.
[30] www.oilandgasuk.co.uk/knowledgecentre/technical_perspective.cfm
[31] DECC (2010) Renewable Energy Roadmap.

The Humber Renewable Energy Super Cluster Enterprise Zone could also be a key part of achieving targets set out in the Renewable Energy Roadmap, benefiting from reduced business rates and less restrictive land planning requirements[32] [33].

Marine plan authorities will need to liaise, as appropriate, with terrestrial planning authorities to ensure the development of any necessary on-shore infrastructure. Focus for necessary agreements to be reached should include:

a) converter stations and sub-stations, to support offshore electricity generation and connection to the national grid
b) appropriately developed and placed ports and harbours to support construction and maintenance as well as other infrastructure such as roads.

Looking at the evidence, it is possible to say that there is the potential for offshore wind to become the dominant energy activity in the plan areas, based on:

- geographical area covered (though this is turn dependent on a number of factors such as device type and size, spacing and opportunities for co-location)
- government policy and legal commitments.

This suggests that marine renewable energy will be one of the key policy issues for marine planning.

[32] http://www.hm-treasury.gov.uk/press_96_11.htm
[33] http://vanel.org.uk/regen/2011/08/humber-estuary-renewable-energy-super-cluster-enterprise-zone-approved/

Figure 4.5: Renewable energy - activity areas

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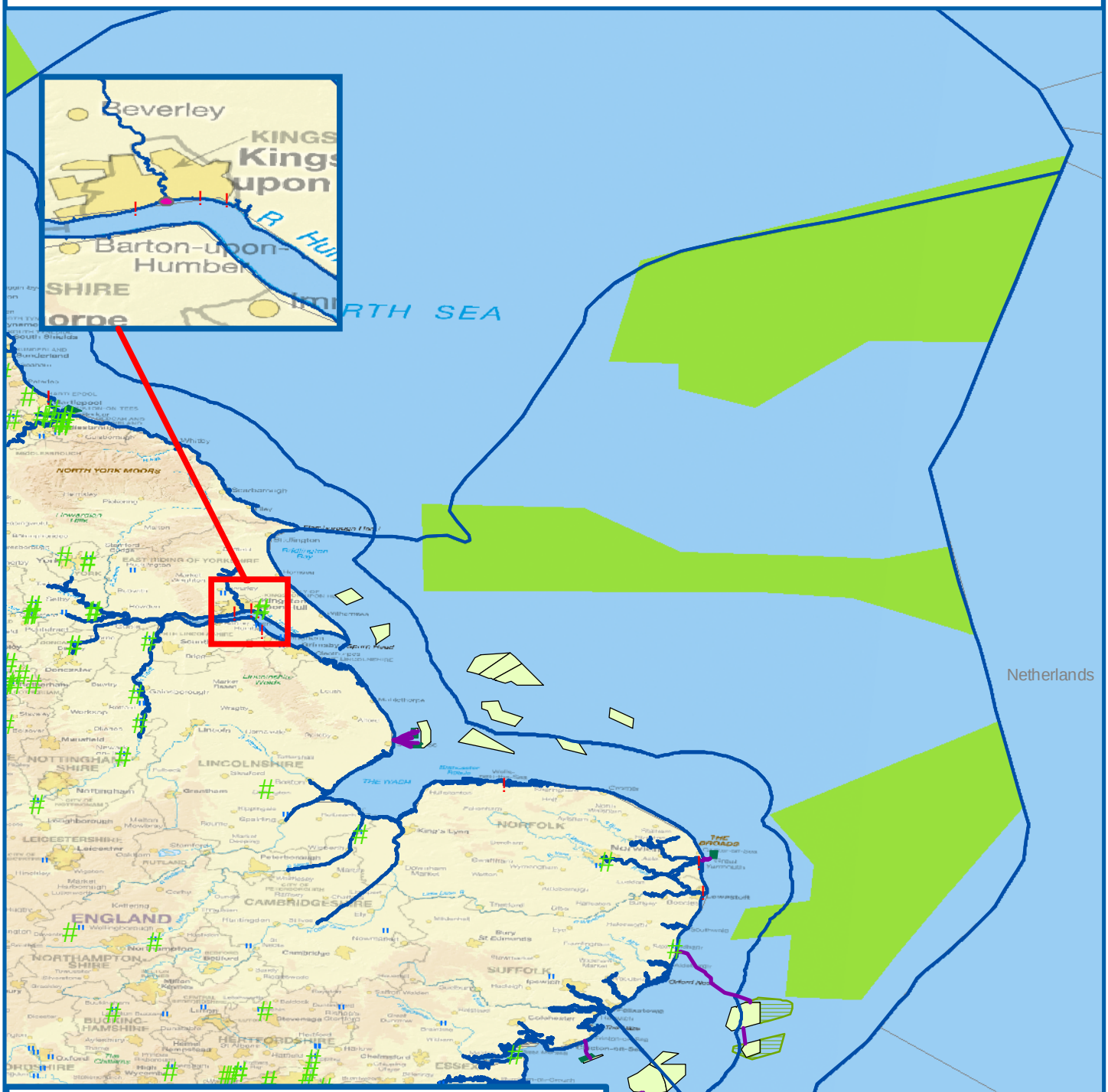

Figure 4.6: Potential tidal stream resource for energy production

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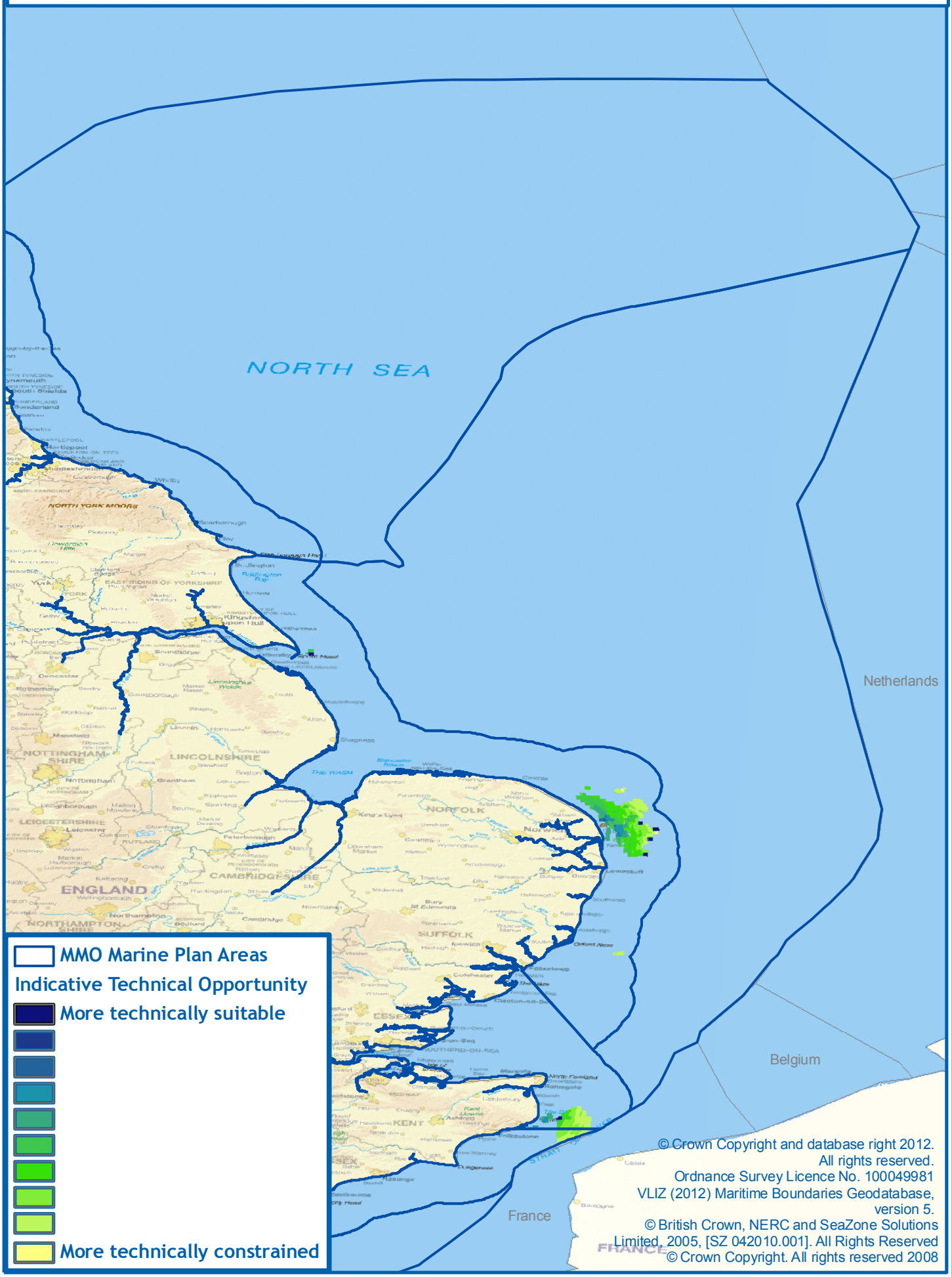

Figure 4.7: Potential wave resource for energy production

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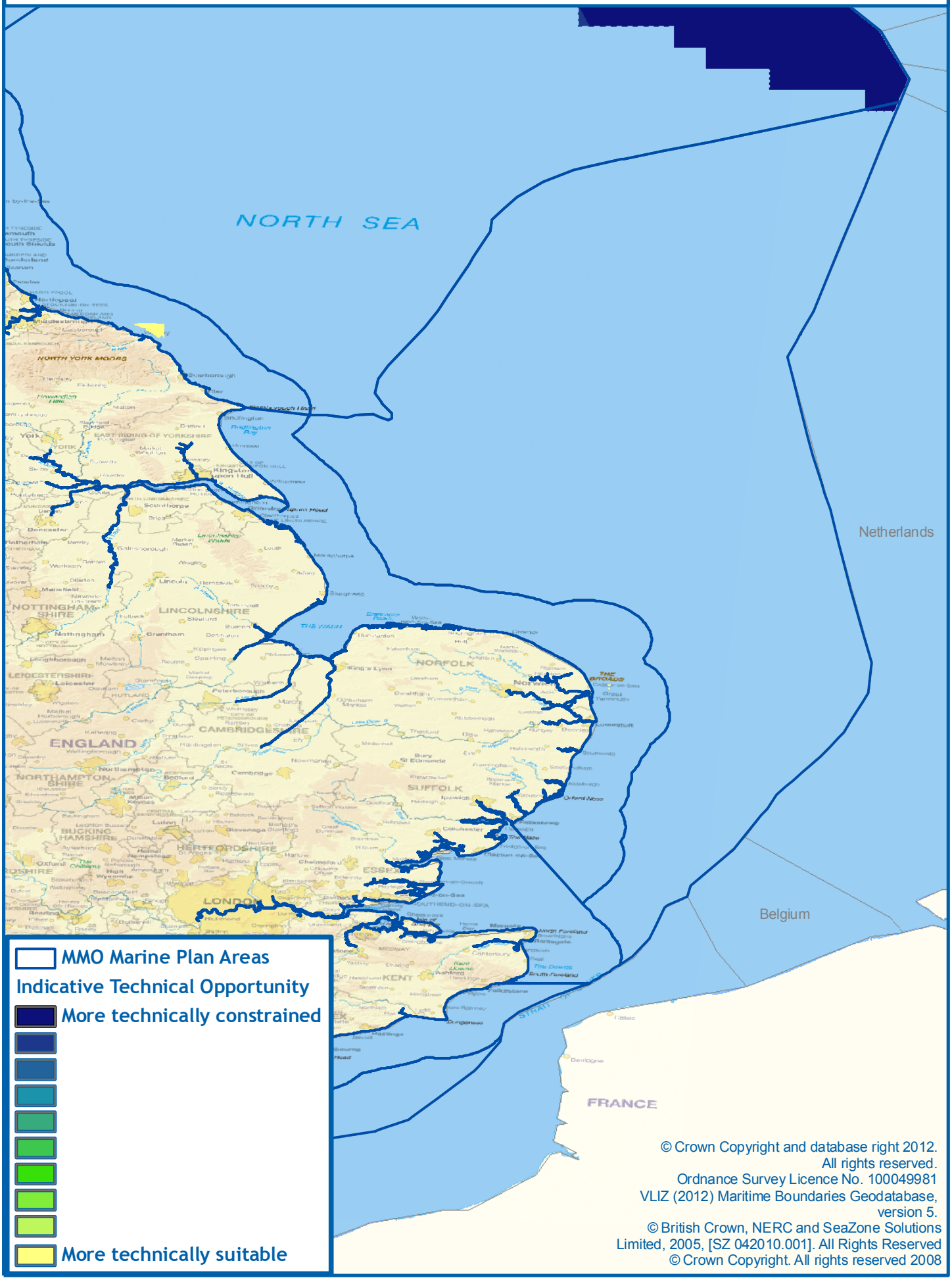

Issues for delivery of renewable energy

- Providing more certainty in terms of space and location for wind energy development is required so that investors and developers gain confidence and commit to financing and building wind farms.
- Timely development of the offshore electricity network is vital to help ensure the continued development of offshore renewable energy.
- Round 3 wind zone developers need to work together, and with authorities, to determine the cumulative effects of development across the three zones in the East Offshore area as well as any cumulative effects associated with developments in bordering seas.
- Cable routes will need to be identified to enable connection of offshore wind farms to land based grid system and landfall opportunities Cable corridors may be beneficial and could be considered as part of the routing to shore subject to operational constraints. See also section 4.7.
- Renewable energy sites will need to take account of existing and future designations. Management measures of future MPAs will need to be fully taken into account, which may have an impact on the extent, location and type of development within these areas including that location and extent of Round 3 wind farms.

Issues for other sectors

- Potential for adverse effect on ability to develop oil and gas fields due to the requirement for relevant safety zones and overall footprint, in accordance with Civil Aviation Authority guidance on helicopter movements around offshore helicopter destinations, flight paths to existing (and any future) sites would need to be considered[34].
- Ports and shipping may be adversely affected by any expansion in the deployment of renewable energy generation. Consultation between sectors will prove essential if trade with ports within and adjacent to the plan areas are not to suffer any adverse impacts on their commercial viability. Benefits may accrue from the expansion in deployment of renewable energy installations.
- Deployment of renewable energy devices must be planned sustainably to ensure any effects on fishing activity are minimised.
- The tourism and recreation industry may be affected by the location and siting of new substations associated with cabling coming onshore. Visual impacts of any new coastal substations and converter stations would need careful consideration to ensure both access to the coast and enjoyment of coastal areas and the overall socio economic benefits of these activities are not undermined by new offshore associated onshore developments. Anecdotal evidence exists of the deployment of renewable energy devices stimulating tourism related activities such as sightseeing, with boat trips being run from local ports out to renewable energy sites.
- Opportunities for co-location with MPAs and other activities need full consideration in order to maximise the use of space. Further work on co-location opportunities is required to ensure best use is made of the marine area, including oil and gas, fisheries, aggregates and shipping. Co-location with MPAs may be possible; but may not be practical if operation and maintenance activities are severely constrained (see also 4.1 'Issues for other sectors').

[34] http://www.caa.co.uk/docs/33/Cap764.pdf

Issues for sustainability

- Mitigating climate change depends on low carbon energy so the sustainable development of offshore wind farms is essential.
- Negative pressures exerted by this activity differ by renewable energy technology type and are usually dealt with at a project level, but typically include:
    - noise and vibration (both during construction and operation) – links to biodiversity
    - visual impact – links to seascape and through that to tourism
    - impacts on navigation – links to shipping
    - impacts on biodiversity (bird strike, scour around pilings) – links to biodiversity
    - exclusion of other activities – links to fishing, aggregates and shipping
    - resource use pressures (decrease in wave height and frequency) – links to coastal processes.
    - damage or degradation to existing historic environment[35]
    - cabling and associated impacts (EMF etc) – links to biodiversity and aggregates
- The seascape of any marine area must be considered with the development of offshore wind turbines and associated land-fall cabling/sub-stations.
- The Infrastructure Planning Commission (IPC), working with local planning authorities (LPAs), will need to determine permit applications for land based infrastructure associated with marine renewable energy. The MMO's Licensing team will also need to work with LPAs when determining consent applications for non-NSIP projects. In terms of impacts on designated features, there are a number of designations to be considered including protected species, SSSI, Ramsar sites, SPAs, SACs, national nature reserves (link to marine ecology and biodiversity), together with others such as the historic environment.
- Land-based renewable energy clusters that are proposed to serve the major offshore wind farms in the East plan areas, such as Humber Renewable Energy Super Cluster, will bring about a large amount of extra shipping traffic, adding to the intensity and diversity of shipping in the East plan areas.
- Potential employment opportunities may make significant contributions to the economic wellbeing of many of the coastal communities in and adjacent to the plan areas, through manufacturing, installation and maintenance activities.
- The potential development of a co-ordinated offshore energy grid.
- The cumulative impact on **all sectors** of renewable energy installations and their associated structures[36].
- Interactions with other sectors and the environment, tending to be dealt with at an individual project level during assessment of licence applications.

[35] www.offshorewindfarms.co.uk/Pages/Publications/Archive/Cultural_Heritage/

[36] [36]

http://ec.europa.eu/energy/renewables/grid/doc/north_sea_countries_offshore_grid_initiative_mou.pdf

4.3.3 Carbon capture and storage

Carbon capture and storage (CCS) is an important part of the UK's plans for low carbon energy, enabling fossil fuels to be used without emitting significant volumes of carbon dioxide.

CCS is planned to have a positive net contribution in reducing human induced carbon emissions, having an abating effect on climate change impacts. It will allow fossil fuel energy generation to be part of the UK's low carbon, secure energy future. The CCS industry could ultimately result in the UK importing carbon dioxide from other countries for storage due to the relative abundance of potential storage sites compared to adjacent countries. This could become an important source of revenue generation for the UK economy. This could result in the CCS sector in the UK being worth up to £3 billion a year by 2030, sustaining up to 100,000 jobs[37]. Many industrial carbon dioxide emitters have no other option than to store carbon dioxide to reduce their emissions.

Relevance to East plan areas

The East plan areas represent the greatest opportunity for CCS development in the English marine area. This is as a result of the concentration of the majority of the Bunter Sandstone formation aquifers and the existing oil and gas infrastructure opportunities for storage in the East plan areas. These opportunities for storage are spatially restricted. The potential storage sites in the East plan and adjacent areas are shown on Figure 4.8. The figure includes data on aquifer structures and the Bunter sandstone formation reservoirs from a study by the British Geological Association[38]. Oil and gas data from UKDeal was used to identify hydrocarbon fields where production has ceased as well as interest areas for enhanced hydrocarbon recovery.

An additional broad interest area has been highlighted as a number of developers have expressed interest through the EU's NER funding project in storage sites here. It should be noted that none of these sites are currently used for CCS and that their inclusion is intended to be indicative of potential areas where CCS may develop.

Storage is possible within some active oil and gas fields as part of enhanced hydrocarbon recovery. This would involve the introduction of carbon dioxide to an aquifer, displacing the hydrocarbons, allowing their recovery under pressure. This has the potential to increase hydrocarbon production and there are international examples of the successful operation of enhanced hydrocarbon recovery.

[37] Clean Coal: an industrial strategy for the development of carbon capture and storage across the UK, DECC, 2010
[38] 'Industrial carbon dioxide emissions and carbon dioxide storage potential in the UK', BGS, 2006

Figure 4.8: Potential opportunity for carbon capture and storage

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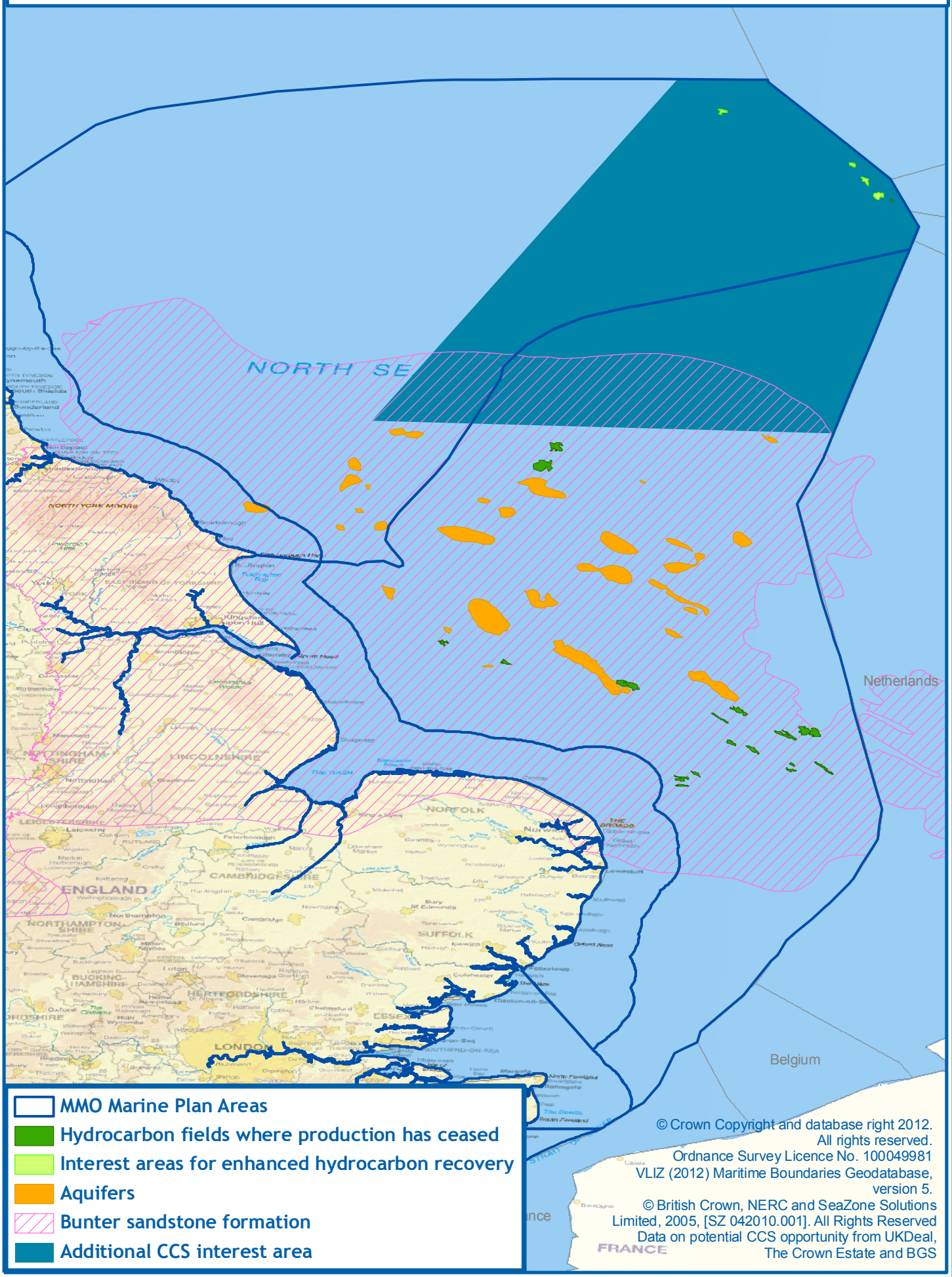

Issues for delivery of CCS

- An important issue for delivering CCS is the general access to finance and continued policy and developmental funding support from Government. As the CCS industry is at an early operational project stage in England, plans will need to be flexible enough to support the sector given that the characteristics of its future development are not yet known.
- A detailed assessment of the varying characteristics and suitability of different storage sites and there availability for future use in CCS would be beneficial to the development of the sector. Initial research has been carried into the most likely locations where the sector will develop. The MMO would be supportive of efforts to carry out further research. Inferences on the likely broad location of the transport infrastructure that will be required to link capture and storage sites could be made following such research. DECC's current CCS research programme being worth £125 million.
- The commercial sensitivity of information on the decommissioning programme of oil and gas fields could be limiting to the CCS sector in identifying suitable project sites.
- An assessment of the likely total carbon dioxide storage requirement to decarbonise energy generation and industrial processes, would be beneficial to the planning process and the achievement of policy goals on CCS by supporting future projections of spatial use. The MMO supports research to quantify the storage requirement and is aware of the UK Storage Appraisal Project (UKSAP) that was commissioned by the Energy Technology Institute in September 2009 to assess the UK's offshore carbon dioxide storage capacity, publishing its findings during 2012.
- As described in more detail under the section 'Potential Future Situation', there is a need to develop a network of infrastructure for transport (onshore and offshore) and storage for carbon dioxide that would maximise the availability of CCS to carbon dioxide emitting sites. The current inflexibility and location of the majority of existing oil and gas infrastructure means new pipelines will need to be laid. Storage facilities in saline aquifers will also require new infrastructure.
- There is a challenge for the CCS industry in terms of timing and access to decommissioning programme information to ensure it is able to use appropriate oil and gas infrastructure in the UK before it is decommissioned. This infrastructure is unlikely to be able to remain dormant for long due to the costs of maintenance and the requirements for operators to decommission such sites. Dialogue between the oil and gas and CCS sectors will be required to achieve co-ordination. In addition, the suitability and safety of the existing infrastructure for this novel use would need to be assessed.

Issues for other sectors

- Where appropriate, the use of existing oil and gas infrastructure to develop CCS projects would be beneficial in terms of cost saving and minimising the disruption to the environment and communities surrounding the infrastructure. The significant existing oil and gas infrastructure, such as pipelines and platforms, in the East marine plan areas represents an opportunity to achieve this re-use. It should be noted that the re-use of existing infrastructure is not without spatial implications on other activities, as the decommissioning of the infrastructure would liberate space for other activities.

- There is the possibility for CCS and oil and gas to co-locate via enhanced hydrocarbon recovery.
- Any new CCS platforms may need helicopter access and therefore, certain activities could be spatially restricted around the platforms in line with current guidance for the oil and gas industry issued by the Civil Aviation Authority (CAP764).
- There is potential, although thought to be limited, for competition for sites between natural gas storage and CCS as some sites would be suitable for both.
- There is potential for competition for space between new CCS pipelines and oil and gas pipelines, telecommunications or electricity cables for distribution networks or connecting renewable energy sites. Marine utility corridors could be developed to utilise the same infrastructure, or spatial corridor, potentially minimising the collective space used for such infrastructure, and impacts on the natural environment whilst maximising available space for other uses Co-operation between developers would be essential to achieve such corridors.
- The transport of captured carbon dioxide is expected to be largely via pipelines, however it is possible that carbon dioxide may also be transported by ship to storage sites.

Issues for sustainability

CCS projects will be subject to Environmental Impact Assessment at the project level and are covered by the DECC Offshore Energy Strategic Environmental Assessment 2[39]. There are also environmental and financial requirements placed on CCS developers by the CCS Directive[40].

- The CCS Demonstration Programme allows the UK to demonstrate international leadership in mitigating greenhouse gas emissions[41].
- Removing carbon dioxide emissions from fossil fuel energy generation and industrial processes will reduce the potential for further acidification of the marine environment[42], and allows for the retention of fossil fuels in the UK energy mix, whilst significantly reducing the associated carbon emissions, thereby contributing positively to energy security.
- If expansion of CCS meets government policy targets then it could provide significant employment opportunities via construction and maintenance, and for the ports and shipping sectors. For the CCS sector, this has been estimated as 100,000 jobs[43].
- Leakage at the sea bed from a properly selected and managed storage site is thought to be extremely unlikely[44] [45]. If a leak were to occur, it is unlikely that any impacts would be either widespread or long-term, taking into account the dilution or buffering capacity of the marine environment[46]. It is possible for injected

[39] www.offshore-sea.org.uk/site/scripts/consultation_download_info.php?downloadID=16
[40] At chapter 4
[41] UK Marine Policy Statement, HM Government, 3.3.34, 2011
[42] UK Marine Policy Statement, HM Government, 3.3.34, 2011
[43] Clean Coal: an industrial strategy for the development of carbon capture and storage across the UK, DECC, 2010
[44] UK Marine Policy Statement, HM Government, 3.3.35, 2011
[45] Intergovernmental Panel on Climate Change, Special Report on Carbon Capture & Storage, 2005
[46] Blackford, J.C. et al Regional scale impacts of distinct CO2 additions in the North Sea, Marine Pollution Bulletin 56 (2008), pp1461-1468

carbon dioxide to migrate underground, further research in the area of storage site monitoring and potential environmental impacts of carbon dioxide discharge into the marine environment is ongoing, and will further the understanding and assessment of risk in the future.

- Co-location of CCS and oil and gas via enhanced hydrocarbon recovery leads to permanent storage of the carbon dioxide, some benefits of this are the potential to increase energy security, raising revenues from oil taxation and the deferral of decommissioning costs and liabilities.
- Although most infrastructure will be offshore, sub-sea and therefore, having limited visual impact, there is some potential for impact where new pipelines need to be laid in the coastal zone[47].
- There is the risk of physical damage to seabed features, biota and features of archaeological interest during pipeline construction. These issues need to be considered on a case-by-case basis.
- Several of the environmental impacts of CCS will be similar to those for oil and gas extraction described in section 4.3.1. For example, there is the potential for CCS to have similar noise and vibration impacts to those of hydrocarbon operations that may place pressure on local biodiversity. These impacts are summarised as:
    - impulsive from seismic survey and piling during installation and decommissioning activities
    - semi-continuous or continuous from turbines, drilling rigs, production facilities or vessels[48]
- Where new infrastructure is required, the effects of drilling discharges will need to be mitigated in line with best practice from other sectors.
- During operation, there may be effects on electrically or magnetically sensitive species from subsea power cables due to the electromagnetic fields created[49].
- The British Geological Survey (BGS) reported that having storage sites offshore will reduce the risk of potential contamination of onshore drinking water aquifers from the stored carbon dioxide[50].
- The decommissioning liabilities placed on a CCS developer are set out in the CCS Directive and differ from those placed on oil and gas developers.

4.3.4 Nuclear energy

Relevance to East plan areas

Nuclear power has been a significant contributor to the UK energy mix for the last 50 years and national policy sees this role continuing, especially given the low carbon emissions associated with nuclear power. One site is located in the East Inshore plan area:

- Sizewell B is forecast to be in use until 2035 and its rated output is 1.1 gigawatt.

[47] DECC: UK Offshore Energy Strategic Environmental Assessment, 2011
[48] DECC: UK Offshore Energy Strategic Environmental Assessment, 2011
[49] DECC: UK Offshore Energy Strategic Environmental Assessment, 2011
[50] Industrial Carbon Dioxide Emissions and Carbon Dioxide Storage Potential in the UK, British Geological Survey report for Dept for Trade & Industry, 2006

- The role of nuclear power on the coastline bordering the East Inshore area is forecast to increase, given the anticipated completion of Sizewell C in 2020s.

Given the decisions over siting have already been made and that regulation of operating plants is already in place the locational implications of nuclear for marine planning are clear spatially. As a result, only a very few issues emerge of relevance to planning. The marine plan will need to draw attention to the location of such issues but they will be addressed through the project-level assessment and licensing. The marine plan will also note relevant planning policies and conditions that would apply to any development.

Nuclear power is regulated by the Health and Safety Executive, Environment Agency and in terms of decommissioning, the Nuclear Decommissioning Authority.

Issues for the sector

- Though locations of sites for new nuclear are known and use existing sites, the scale of impacts listed under' Issues for sustainability' is unknown and will need to be addressed as proposals develop
- Any impacts from nuclear new build may need to be addressed with those from other sectors in a consideration of cumulative effects
- Nuclear power is regulated by the Health and Safety Executive, Environment Agency and in terms of decommissioning, the Nuclear Decommissioning Authority. The HSE's role will be part of a new statutory body, the Office for Nuclear Regulation, as stated on their website,

  "On 8th February 2011, a written ministerial statement by the Rt. Hon. Chris Grayling MP announced the Government's intention to bring forward legislation to create a new independent statutory body outside of the HSE to regulate the nuclear power industry. The new statutory corporation will be known as the Office for Nuclear Regulation (ONR) and will take on the relevant functions that were carried out by the Health and Safety Executive and the Department for Transport. The ONR will be a new independent regulator, formally responsible in law for delivering its regulatory functions. The creation of the ONR will consolidate civil nuclear and radioactive transport safety and security regulation in one place."[51]

Issues for other sectors

- Under normal operating conditions nuclear power stations will have little impact on other marine activities, though there may be issues for the receiving environment of any water discharges, regulated and controlled by the Environment Agency.
- During the construction phase, there may be implications for other activities, such as for aggregates, where new construction is likely to use local, possibly marine, sourced aggregate.
- Nuclear new build presents economic opportunities for potential supply chain businesses, including those proximate to plants.

[51] www.hse.gov.uk/nuclear/background.htm

Figure 4.9: Nuclear power stations

January 2012
This map has been produced using the ETRS89 Coordinate Reference System

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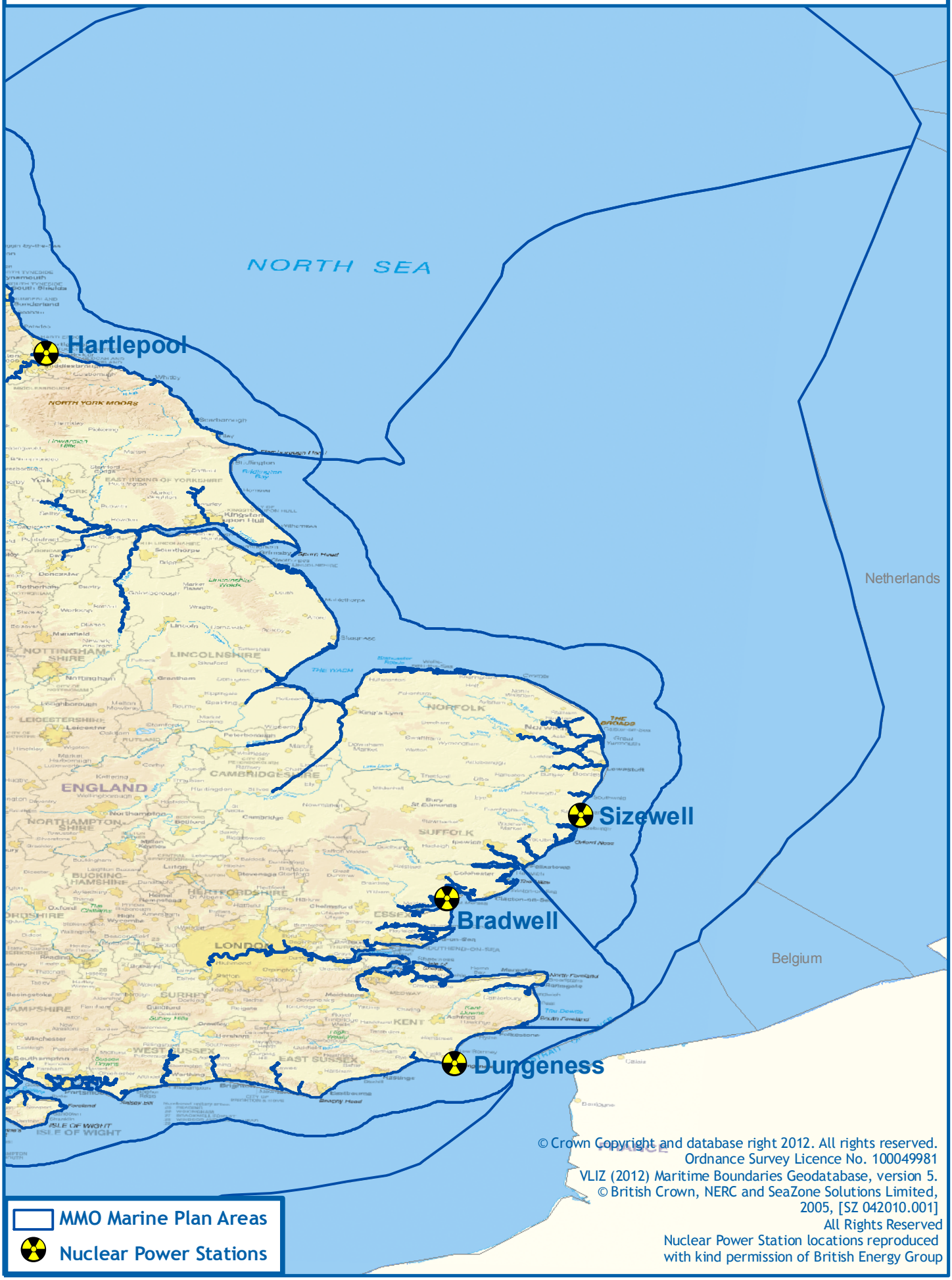

Issues for sustainability

- The nuclear power NPS highlights a number of impacts from nuclear power:
    - flood risk
    - water quality and resources, including temperature changes to water and radionuclide emissions – see chapter 6 figure 6.43 in the main report
    - coastal change and impacts upon this, including from temperature changes in water
    - biodiversity and geological conservation
    - landscape and visual impacts
    - socio-economic
    - human health and well being.
- Following the Fukushima nuclear power plant incident, the UK government commissioned the Health and Safety Executive (HSE) to review the safety of nuclear power plants in the UK, in order to minimise the chances of a similar incident. The HSE found that there were no changes needed to the National Policy Statement for Nuclear Power Generation

4.4 Ports and shipping

Relevance to East plan areas

The East plan areas currently include the UK's busiest port and the sector offers significant growth prospects, which gives an opportunity to increase employment rates in deprived coastal communities.

- **Current**: Around 22 per cent[52] of major UK ports are in the East plan areas, with 55 million tonnes handled by Grimsby and Immingham (12 per cent of national traffic).
- **Future**: It is likely that further port expansion, as implied by documents such as the DECC Renewables Prospectus[53] and/or development will occur to take into account growth in renewables industry and to accommodate growth described in national forecasts.

With 95 per cent of the UK's international trade arriving or leaving by sea, there is a clear need to recognise the strategic economic importance of ports and shipping activities in the plan. In the context of existing and future marine industries, while taking account of environmental considerations, it will be important for the East plan areas to facilitate current activity levels and proposed growth.

[52] Data from UK Major Ports Group based on membership.
[53] DECC (2009_ Renewables Prospectus

Figure 4.10: Ports and shipping

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This map has been produced using the ETRS89 Coordinate Reference System

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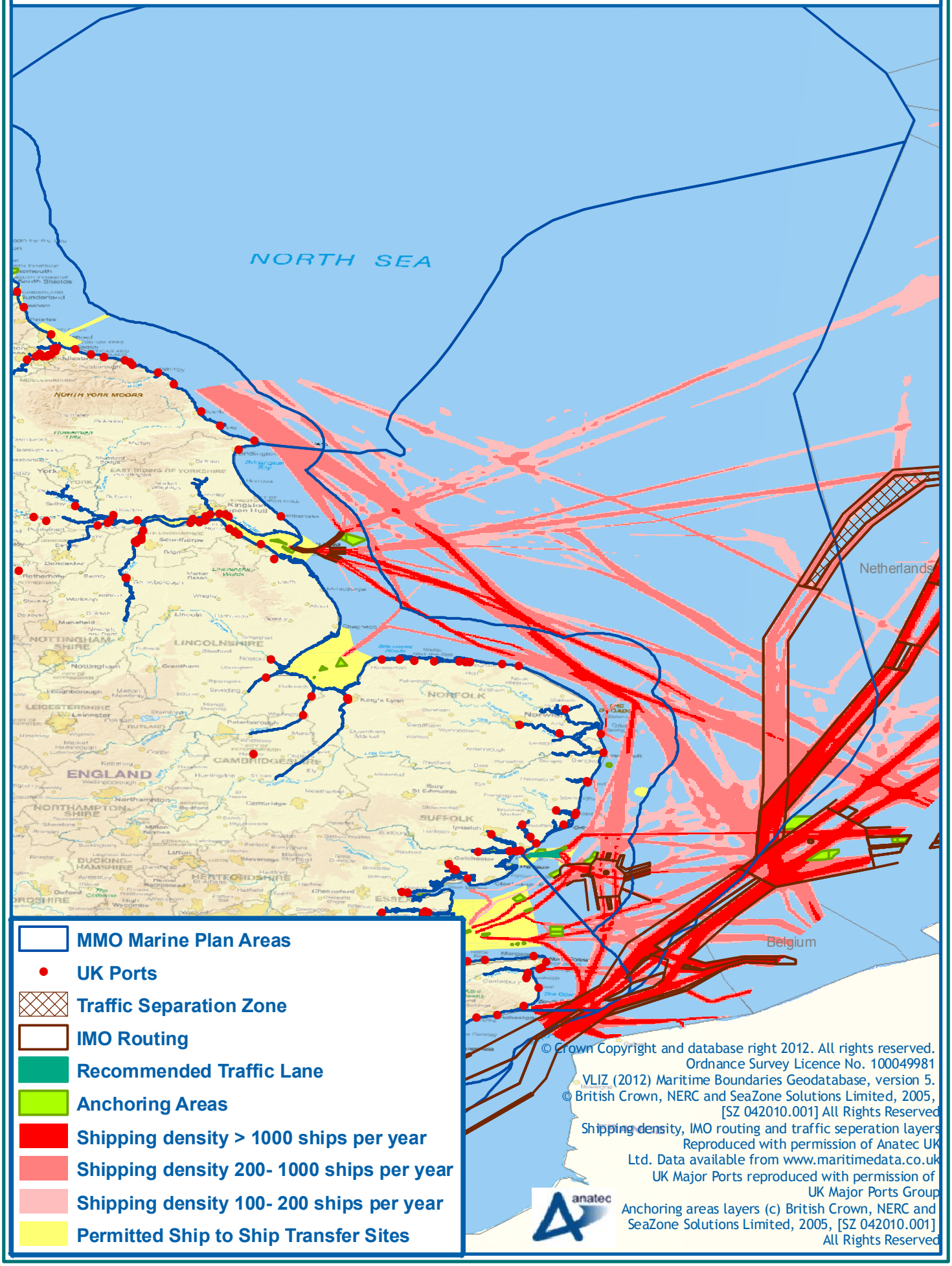

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Issues for delivery of ports and shipping

The NPSP is a relevant consideration for the MMO[54] and the Infrastructure Planning Commission (IPC) is required to begin with a presumption in favour of development unless other conditions apply[55]. However, this presumption is set in the context of a development being consistent with relevant sustainability objectives, the Marine Policy Statement (MPS) refers to a presumption in favour of sustainable development[56].

The protection of navigation routes contributing to delivery of safe shipping, is of paramount concern and a major factor supporting port growth, particularly taking in to consideration the predicted increase in both vessel size and frequency of movements, and any growth of offshore renewables must consider this. Negative impacts to navigation may disrupt shipping patterns, increasing travel time and fuel use by shipping.

Marine planning needs to consider the interaction of shipping with other users of marine space and vice-versa. Where planning identifies the need to restrict surface navigation or make changes to IMO recognised routing measures, these would need to be agreed through established national and international channels[57].

A marine plan will need to be aware of action being taken to realise IMO convention such as protection of freedom of navigation under UNCLOS, integrating and supporting measures where appropriate. This is particularly true in the context of marine planning that takes into account a wide range of activities that individually and cumulatively may have significant impact on the use of space in the East plan areas.

The expected increases in traffic at the Port of Felixstowe[58], (much of which is likely to route through the East Inshore and Offshore plan areas), will require consideration in the marine plan. This should recognise that while the East Inshore and Offshore plan will not apply directly to the Port of Felixstowe, shipping activity to and from the port will need to be accounted for in these plans.

Issues for other sectors

- Ports and shipping are both dynamic sectors, responding closely to market forces. For this reason, marine planning should seek to be as flexible as possible to allow appropriate responses as economic forces dictate, while taking account of other economic, social and environmental factors.
- An increase in extraction of marine won aggregates may necessitate suitable port facilities to allow landing and, where necessary, processing. This has the potential to contribute to maintaining or increasing port profitability and related

[54] DfT (2011) National Policy Statement for Ports, p5
[55] DfT (2011) National Policy Statement for Ports, p17
[56] Defra (2011) marine Policy Statement, p15
[57] Approval sought from relevant UK government departments and agencies, including the Department for Transport (DfT), Maritime and Coastguard Agency (MCA) and Foreign and Commonwealth Office (FCO), before submitting proposals to IMO for agreement by all 169 member states.
[58] as previously mentioned, a port of national significance situated just outside the East marine plan area

employment, but may also present an opportunity cost related to other sector use of ports.

- Energy production and infrastructure development offer opportunities for expansion and diversification in ports through offshore industry growth and support for construction of onshore power plants. However, potential competition for space at sea that may arise from development of offshore energy installations, particularly large scale renewable deployment including Round 3, may adversely impact upon safe operation and competitiveness of shipping operation, such as a result of re-routing. To ensure proper consideration of safety of navigation, marine planning should be informed by relevant guidance covering interaction between renewable and shipping activity such as that issued by the MCA (such as Marine Guidance Note 371[59]). Any negative impacts would, to a degree dependent upon the diversification of operations in the future, be felt by ports.
- The tourism and recreation sector is supported through berthing of cruise liners and passenger routes to mainland Europe. There is scope for this to increase but a balance needs to be maintained as port expansion may need to be considered alongside onshore tourism on waterfronts. Increases in both commercial shipping and recreational craft activity may increase the risk to safety of navigation as space is squeezed.
- Marine planning has, and will continue to, work closely with terrestrial planning authorities[60] to enable integration of growth in ports and shipping with necessary terrestrial infrastructure development including transport and energy (particularly in the context of the increasingly important role ports play in relation to marine renewable energy). Where relevant and practical, reference should be made to future development planned (see Annex 6) concerning sub-national policy).
- There is the potential for future MPAs to be co-located with areas of shipping activity.
- There is potential for the expansion of ports to impact upon designated areas; however there is opportunity for such impacts to be mitigated through terrestrial planning and marine licensing processes (such as meeting requirements of the Habitats Directive).
- Potential growth in sub-sea cabling and pipelining in the marine area could lead to an increased need to develop a mechanism to reduce possible impact from anchoring by vessels in emergencies, by identifying emergency anchorage areas.

Issues for sustainability

- Shipping is a very efficient means of transport, with low carbon dioxide (CO_2) emissions per tonne of cargo moved per kilometre compared with other modes[61] with further efficiencies expected[62].

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[59] Maritime and Coastguard Agency (MCA) (2008) Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response Issues

[60] As well as being set out as an issue for consideration in the Marine Policy Statement, this approach is consistent with the duty to cooperate applying to planning authorities as per clause 110 of the Localism Act (2011).

[61] Defra (2011) Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting: Methodology Paper for Emission Factors

[62] Further efficiencies will arise as a result of implementing legally binding obligations reduce CO_2 emissions from international shipping resulting from agreement at the IMO in 2011.

- The scale of impact from shipping varies by type. The extent of noise and air pollution is dependent on shipping density.
- A number of air quality management areas (AQMAs) can be found around large ports in the Humber and Felixstowe as well as around Ipswich and the Wash[63]. Wider air quality issues for shipping are identified in Chapter 6 of this report, including details on the North Sea SOx Emission Control Area (SECA).
- Pollution incidents and individual vessel accidents have the potential to have extensive impacts due to the volume of materials transported on modern vessels.
- Future port development related to offshore renewable energy has the potential to bring significant social benefits to communities via related employment (directly and via the supply chain), a consideration that must be viewed in the context of potential environmental changes that may be bought about through such development.
- Negative pressures exerted by this industry include:
    - airborne noise at ports and underwater noise at ports and during steaming[64]
    - accidental pollution unlawful operational discharge, such as oil, waste or sewage, physical damage caused by groundings or collisions
    - sulphur and nitrogen oxide emissions[65].

4.5 Marine aggregates

Relevance to East plan areas

The East plan areas currently include the busiest area in England for marine aggregate extraction in terms of tonnage dredged, licensed area and area dredged and a significant proportion of future search areas.

- **Current**: Just over 50 per cent of tonnage extracted comes from the East plan areas, from 28 licensed areas covering about 790 square kilometres (active dredge area approximately 363 square kilometres).
- **Current**: 44 per cent dredged tonnage is delivered to mainland Europe, 37 per cent to the Thames Estuary, 9 per cent to the Humber region and ports on the rivers Tyne and Tees.
- **Current**: Almost 28 per cent of aggregates extracted from the Humber region (Source BMAPA regional charts) are landed in the Humber, Tyne and Tees regions.
- **Current:** 99.8 per cent of aggregates extracted from the East Coast region (Source BMAPA regional charts) are landed outside of the East Coast.
- **Current:** Aggregates also satisfy demand for coastal defence works and beach replenishment, with 0.55 million tonnes being supplied to the Lincolnshire Coast in 2010.
- **Future:** It is likely that demand for aggregates will grow for coastal defence purposes and beach nourishment along the Lincolnshire, Norfolk and Suffolk coastlines to meet aspirations identified in Shoreline Management Plans.

[63] Defra, http://aqma.defra.gov.uk/maps.php, (Accessed November 2011)
[64] European Commission (2008) Marine Strategy Framework Directive
[65] Defra (2000) The Air Quality (England) Regulations 2000

- **Future**: It is likely that further licence areas for aggregates extraction will be required within areas of high resource potential, given the continuing importance placed on marine sources of aggregates, the relative importance of the plan areas for potential new prospecting and exploration areas and factoring the possibility of a reduction in land-won aggregate.
- **Future**: Some extraction, primarily for gravel is moving to sites off the south coast; however this is being offset in the East plan areas by an increased demand for coarse sand from licences off the East coast.

This indicates that marine aggregates will be one of the key policy issues for marine planning, both now and in the future as there is a need to consider the development of new licence areas in response to anticipated market demand across the lifetime of the marine plan and beyond. The need to accommodate the requirements of this sector, alongside existing marine industries, while taking account of environmental considerations, will be important planning issues for the East plan areas, due to the current volume of activity.

Figure 4.11: Aggregate extraction

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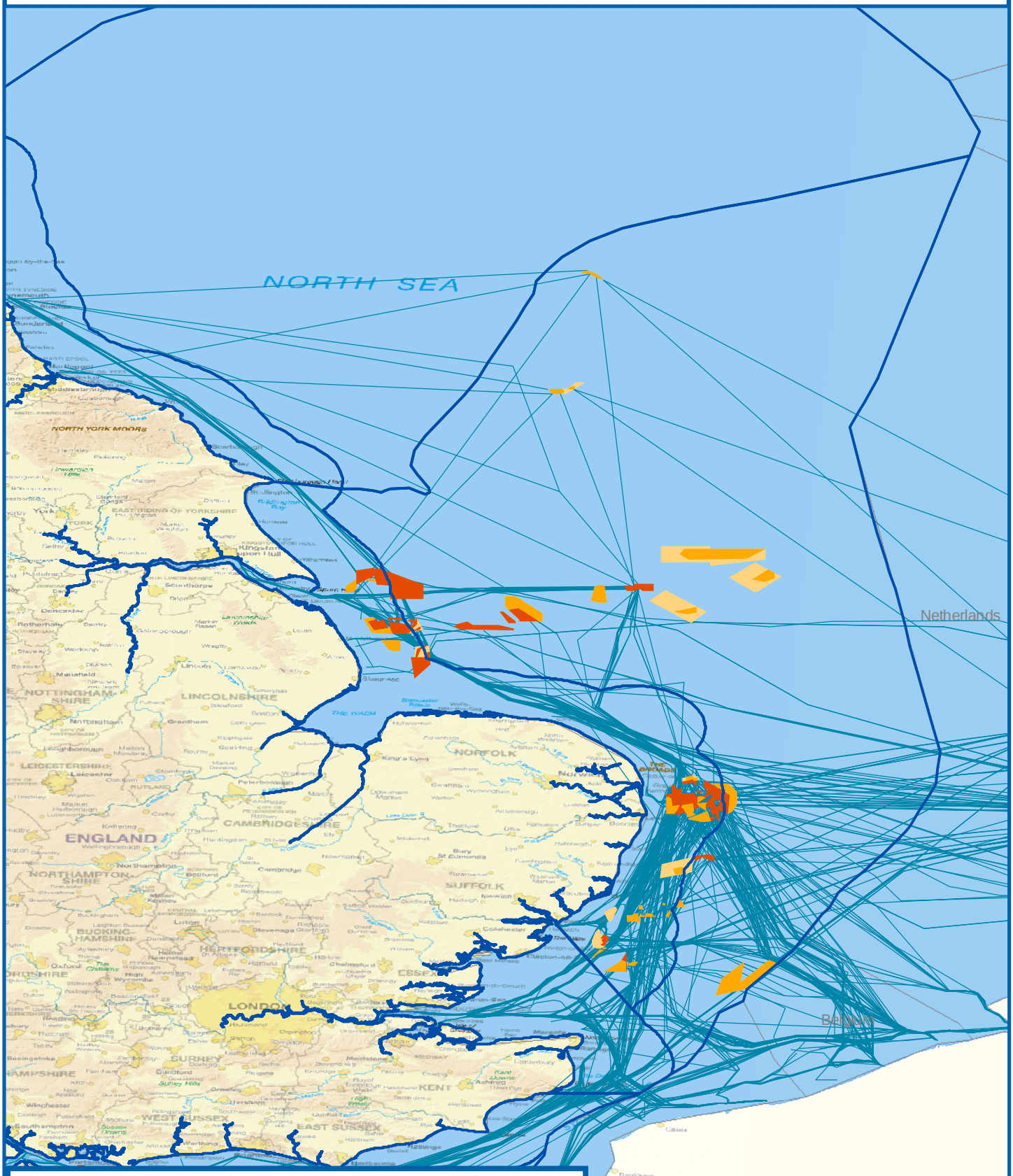

- MMO Marine Plan Areas
- Aggregate Lease Applications to The Crown Estate
- MMO Aggregate Extraction Licence
- Aggregate Prospecting or Options
- Dredger Transit Routes

Issues for delivery of marine aggregates

- The current approach provides some strategic assessment (such as Regional Environmental Assessment (REA)) and thence a robust licensing process defines extraction areas, their likely lifespan, and addresses implications for other sectors and the environment.
- National policy for minerals tends to focus on strategic statements, with little prescriptive guidance as to how to achieve outcomes including expected contribution from different regions CLG anticipate a 14 per cent growth in marine won sand and gravel nationally[66]. Looking ahead, there are no discernible historic trends between the state of the economy and tonnage dredged. Therefore, it is difficult to predict the likely required size of future licence areas.
- Policies in SMPs for beach nourishment and coastal defence offer opportunities for the industry and marine plan development should recognise this.
- Ongoing work is identifying the distribution of potential resource for future extraction and possible MSAs which need to be considered pending confirmation of need.
- Marine plan development should take into account the likely remaining productive lifespan of existing licensed areas, including in assessing the effect of other issues/sectors, and future opportunities for aggregates extraction.

Issues for other sectors

Further work needs to consider impacts on other sectors, including:

- fisheries: given existing pattern of activity (although tends to be addressed by existing mechanisms)
- renewables: assessment in support of Round 3 wind takes account of existing aggregates, may be an issue for further rounds of wind development and new aggregate extraction areas with potential expansion of activity conflicting with possible grid connection corridors for round 3 wind farm developments – telecommunications cabling could also be affected given an anticipated increase in deployment of associated submarine cabling
- ports and shipping: the main issue is ensuring sufficiently sized facilities and infrastructure for landing aggregates and onward transportation – this is particularly important if demand for marine won aggregates increases
- oil and gas: the potential to impede exploration of and potential production from new sites.

Issues for sustainability

- Aggregate extraction can cause a number of pressures on the environment including:
    - physical disturbance and direct removal of seabed and indirect effects on sediment movement, and an increase in suspended sediment, with resulting affects on seabed biota, on species feeding on this, such as seabirds, fish, marine mammals, and on nursery grounds particularly for cod, herring and whiting

[66] Department for Communities and Local Government (2009) National and regional guidelines for aggregates provision in England 2005 – 2020, p5

- marine ecology and biodiversity : potential for sediment plumes to affect flora and fauna
- potential increase in noise affecting sea mammals although this is considered in the scoping process which ultimately determines whether it is a significant issue that has to be considered at the site specific Environmental Impact Assessment
- disturbance or degradation of cultural heritage assets or archaeological remains.

The existing regulatory regime ensures such issues are taken account of and will continue to do so in the future. Marine planning needs to consider how to take account of such issues in planning for future aggregate areas, including potential cumulative effects between different aggregate areas (building on REAs) and with other sectors.

The work of the MALSF has greatly increased our understanding and management of these potential effects.

The dissemination of research on the effects of aggregate extraction and the management of this activity by the International Council for the Exploration of the Sea (ICES)[67] working group, on the effects of extraction of marine sediments on the marine ecosystem, has enhanced minimisation of these effects through more effective management.

4.6 Marine dredging and disposal

Dredging is an enabling activity which is essential to the functioning of ports and marinas, positive factors include:

- safe access and egress to ports and harbours for all users
- supporting future port development
- facilitating the construction of pipelines, outfalls and tunnels
- underpinning defence activities including those of the fleet of the Royal Navy and Royal Fleet Auxiliary
- maintaining sedimentary systems (beach nourishment and salt marsh restoration, soft sea defences).

Harbour authorities typically have a statutory power enabled by specific legislation to dredge in connection with the maintenance and improvement of channels. There are two main types of dredging[68].

Maintenance dredging 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.

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[67] International Council for the Exploration of the Sea (2008), Report of the Working Group on Effects of Extraction of Marine Sediments on the Marine Ecosystem (WGEXT)
[68] http://assets.dft.gov.uk/publications/topics/ports-4/goodpracticemarineoperations.pdf

Capital dredging can take the form of deepening or widening an existing channel. Or it may take the form of enabling an entirely new channel to facilitate access to a new facility. Capital dredging involves improvement of access for example to allow bigger and deeper vessels, longer optimum tidal windows and the provision of passing places.

Relevance to East plan areas

The port of Felixstowe has the largest levels of marine dredging in or immediately adjacent to the East plan areas due to reconfiguration of the southern part of the port, enabling it to provide over four kilometres of deep-water container facilities, increasing capacity by nearly 50 per cent. Maintenance dredging around the south-east bank of the Humber Estuary is also a feature of the East Inshore area.

The number of identified disposal areas is higher than the number of dredged areas and they also occupy a larger spatial extent. In the East Inshore area disposal areas are concentrated in The Wash, Norfolk Broads and at the mouth of the Humber. A single disposal ground in the East Offshore area is situated north east of the Strait of Dover.

Going forward the main consideration for marine planning will be the linkages with the development of ports, the specific dredging implications for a specific port development and the conservation of the marine environment.

Figure 4.12: Dredging and disposal areas
(MMO Licensed areas January 2012)

January 2012
This map has been produced using the ETRS89 Coordinate Reference System

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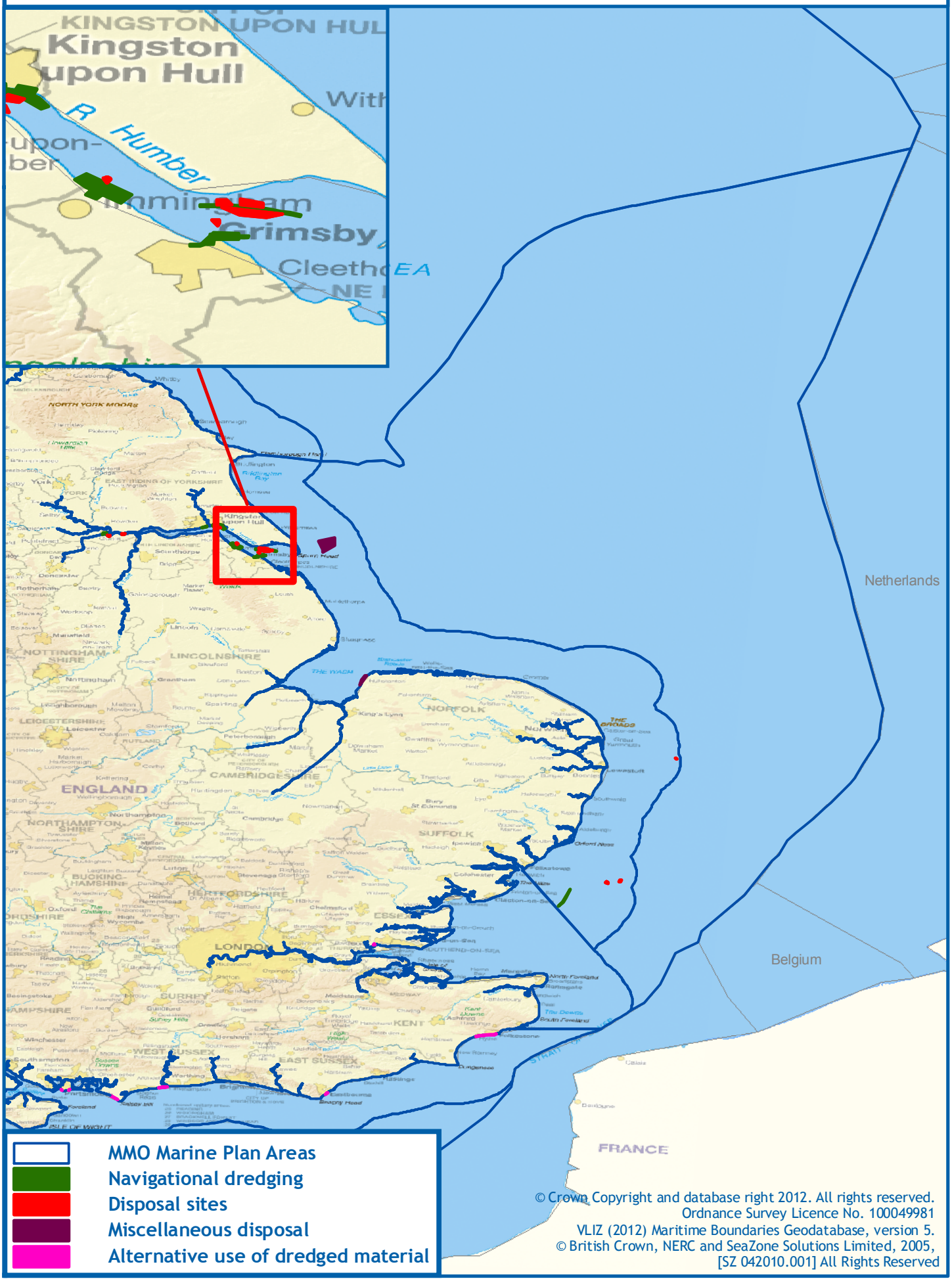

Issues for delivery of marine dredging and disposal

The requirement to maintain navigable ports through the creation, maintenance and development of channels, berths and docks to benefit social and economic factors while taking account of environmental concerns is an important consideration for the MMO. Potential environmental impacts such as substrate removal, alterations of bottom topography and contaminated sediments can be balanced with the environmental benefits such as saltmarsh, mudflat and beach creation and replenishment. The MMO though marine planning and its licensing system will aim to balance such impacts to ensure a sustainable future for ports and the marine environment.

Issues for other sectors

Directly, dredging creates no identified issues for other sectors though it is the case that sectors enabled by this activity, predominantly ports and shipping, may create issues.

Issues for sustainability

While maintenance dredging and disposal is undertaken by many ports, berth operators and marinas, to maintain safe, navigable channels, it can generate pressures including:

- potential risk to marine life and ecology through changes in water quality (relating to changes in chemistry and turbidity), noise and physical disturbance
- the release of contaminants (legacy of industrial pollution)
- impacts on designated nature conservation areas (potential destruction or destabilisation)
- degradation of heritage assets through direct or indirect physical activity
- effects on a coastal landscape and or seascape (for example, maintenance through beach nourishment or disturbance of subsea features at spoil grounds)
- changes to natural sedimentary systems via physical changes to contributing structures, such as alteration of channel depths.

4.7 Telecommunications cabling

This section includes some commentary on power cabling. Also see the Renewables section (4.3.2)

Relevance to East plan areas

The East plan areas are significant for telecommunication cables, in particular:

- nearly 20 per cent of the submarine cables in the English marine plan areas (second only to the South West areas in volume) and with a high traffic value
- a significant number of cables to various landfall sites along the East Inshore area and a considerable number of cables from outside the plan area which pass through the East Offshore area
- an anticipated growth in cables to and beyond 2020 given the existing networks and substation infrastructure

- government policies which highlight the vital role envisaged for telecommunications to support the economy directly and indirectly (such as financial services and education sectors), and population density.

Current issues, including interaction with other sectors and the environment, tend to be dealt with at an individual project level during assessment of licence applications.

This suggests that telecommunications cabling will be one of the issues for marine planning, both now and in the future as demand increases for data speed and quantity, taking account of requirements such as spatial distribution to allow execution of cable maintenance, potential cable recovery and increase in cables being laid alongside existing and future marine industries and environmental considerations.

Figure 4.13: Submarine cables

January 2012
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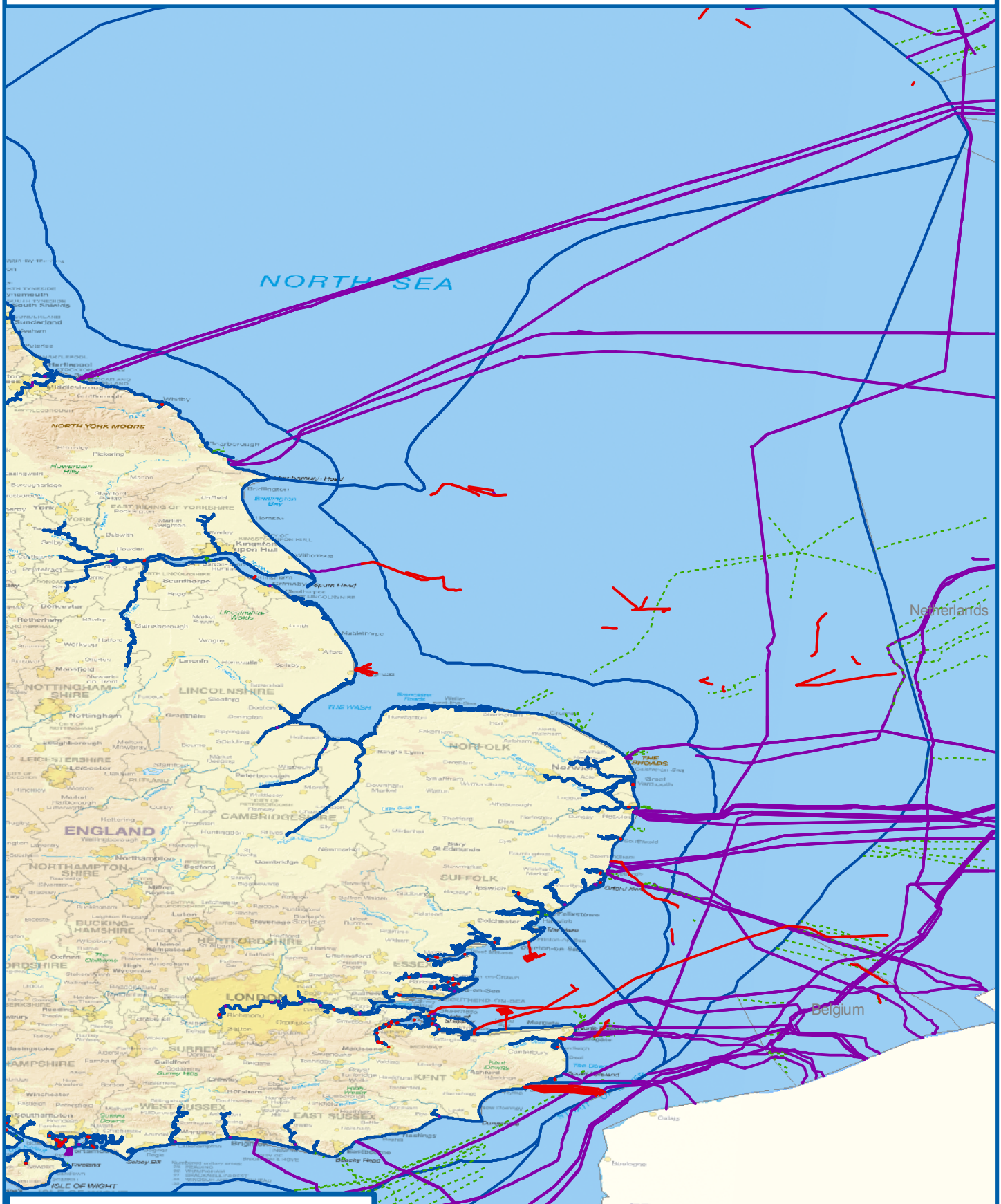
marine management organisation



Issues for delivery of telecommunications cabling

- It is important for marine planning to take account of appropriate locations for such developments alongside other uses of marine space[69].
- However, while there is anticipated growth in the plan areas, it is difficult to quantify the amount and location of increase in cables. It may therefore be challenging to take account of potential future sites in planning. Subsea cables UK (Formerly UKCPC) are developing guidance on an approach to cable laying and separation distances in collaboration with the Crown Estate which is expected in Spring 2012. Instead, cables are likely to be considered on a case by case basis through assessment of licence applications. Implementation of cable corridors is an option that could accommodate future growth. An approach to this possible solution could include other countries and other sectors such as renewables and oil and gas.
- The United Nations Convention on Law of the Sea (UNCLOS) articles[70], especially 56, 58, 77, 78 and 79, allow for cables to be laid at sea with limited reasonable constraints suggested by the sovereign state outside the 12 nautical mile limit in the Exclusive Economic Zone. Laying of cables beyond the 12 nautical mile limit cannot be refused if the cable is international in nature i.e. are passing through waters but not landing on the sovereign state. Marine planning will need to consider implications of any examples for the plan areas. , and potential benefits of integration with other sectors[71]. The Ofgem report on Offshore Transmission Coordination supports the financial benefits of having a joined up approach[72].

Issues for other sectors

While potential issues, including interaction with fishing, aggregates and shipping in relation to damage to cables and their installations (risk of anchor strike, dredging up of cables) are addressed through conditions in licensing, the potential future growth of cables raises issues that might be addressed through planning, noting policy set out by government.

- Other sectors that may be particularly affected by cables, in respect of constraining development and with possible resulting exclusion or displacement, are the following, although collaborative working with these sectors should help to mitigate effects:
    - shipping (anchor strike) and identified emergency anchorages
    - fishing (possible displacement and possible un-viability for certain elements pursuing inshore grounds in smaller vessels through exclusion zones around cabling and cable protection measures such as rock armouring)

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[69] Department for Business, Innovation and Skills BIS Professional and Business Services – a vision for growth www.bis.gov.uk/assets/biscore/business-sectors/docs/10-798-professional-business-services-2020-vision-for-growth.pdf (accessed October 2011)
[70] www.un.org/depts/los/convention_agreements/texts/unclos/UNCLOS-TOC.htm
[71] Marine Planning are liaising with National Grid for a useful dataset relating to landfall sites as well as working with Subsea cables UK for the most up to date on cable locations.
[72] www.ofgem.gov.uk/Networks/offtrans/pdc/pwg/OTCP/reports/Documents1/TNEI-7098-03-Asset%20Delivery%20Workstream-Release-15-12-2011.pdf (section 2.8.3)

    - aggregate extraction
    - renewables, especially cables from and within wind farms
    - oil and gas pipelines
    - certain categories of marine protected areas (MPAs).
    - MoD related subsea cables and infrastructure
- However, collaborative working with these sectors should help to mitigate the effect.
- Cables on the UK Continental Shelf and surrounding waters can be subject to risk of damage. Although this can be through natural causes, human activity is the main cause of submarine cable faults due to damage caused by fishing trawlers and anchors. Given the increased activity in the UK marine area there is a risk that the number of incidents may increase[73].
- There needs to be a better understanding among relevant industries and the communication of guidelines to ensure both the safety of these cable installations and safe access to them for maintenance purposes[74].
- In doing so, consideration needs to be given to the economic benefits of telecommunications and the disbenefits of limiting installation of new cables or risking damage to installed infrastructure[75].
- Another consideration is the European SuperGrid (defined as “a pan-European transmission network facilitating the integration of large-scale renewable energy and the balancing and transportation of electricity, with the aim of improving the European market"[76]). This consideration is supported to some extent in the Marine Policy Statement[77].

Issues for sustainability

- Pressures exerted by this activity, principally disturbance to habitat during laying of cables and maintenance of cables, are usually dealt with at a project level. The habitat and seabed type will largely define the nature of any impacts which, in any case, tend to affect relatively small in area and are transient in nature. Environmental impact of recovery and removal of cables should also be a consideration.
- The potential effect of any predicted increase in cables in combination with other sectors, such as renewables cables or oil and gas pipelines, that cause the same pressure, i.e. the cumulative impact, will need to be considered in marine planning although the footprint of the activity may be relatively small the overall impacts may vary depending on the location.
- More information on the environmental aspects is available in Chapter 6 of the main report.

[73] Defra (2010) UK Marine Policy Statement, p41
[74] Defra (2010) UK Marine Policy Statement, p41
[75] Defra (2010) UK Marine Policy Statement
[76] http://www.friendsofthesupergrid.eu/
[77] Defra (2010) Marine Policy Statement, p35 paragraph 3.3.28

4.8 Commercial fisheries

Relevance to East plan areas

Activity is seen in three key areas:

- commercial fishing at sea and on the foreshore by licensed operators
- secondary activities including processing and retailing of catch and refined products
- support activities such as vessel construction and servicing and fishing gear manufacture and repair.

In terms of the distribution of fishing activity, potting activity targeting primarily crabs and lobster, occurs all along the coastline and offshore with some nomadic shellfish activity in the East Offshore area with specialist inshore fisheries for cockles and other bivalves occurring in the Wash. In the Southern North Sea the majority of UK fishing effort is by English vessels and flag vessels operating under UK quotas. The beam trawl fishery for sole in the East plan areas involves Anglo-Dutch vessels with the UK brown shrimp fishery taking place as a component of a larger international fishery.

Catch composition is changing with warm water species increasing in frequency of catch and their area of distribution.

Over half of the plan area (56 per cent) is defined as high intensity spawning areas for plaice with over a third high intensity spawning areas for sandeels and whiting with over 11 per cent a high intensity nursery ground for cod.

Opportunities for co-location with MPAs and other activities need full consideration in order to maximise the most efficient and sustainable use of space. Further work on co-location opportunities is required to ensure best use is made of the marine area, including fisheries, aggregates and renewables.

A table illustrating landings by weight to major ports in the plan area is at Annex 8 to further show fishing activity in the plan area.

Figure 4.14: Inshore fishing activity- static gears with confidence values (inset)

Janyary 2012
This map has been produced using the ETRS89 Coordinate Reference System

marine management organisation

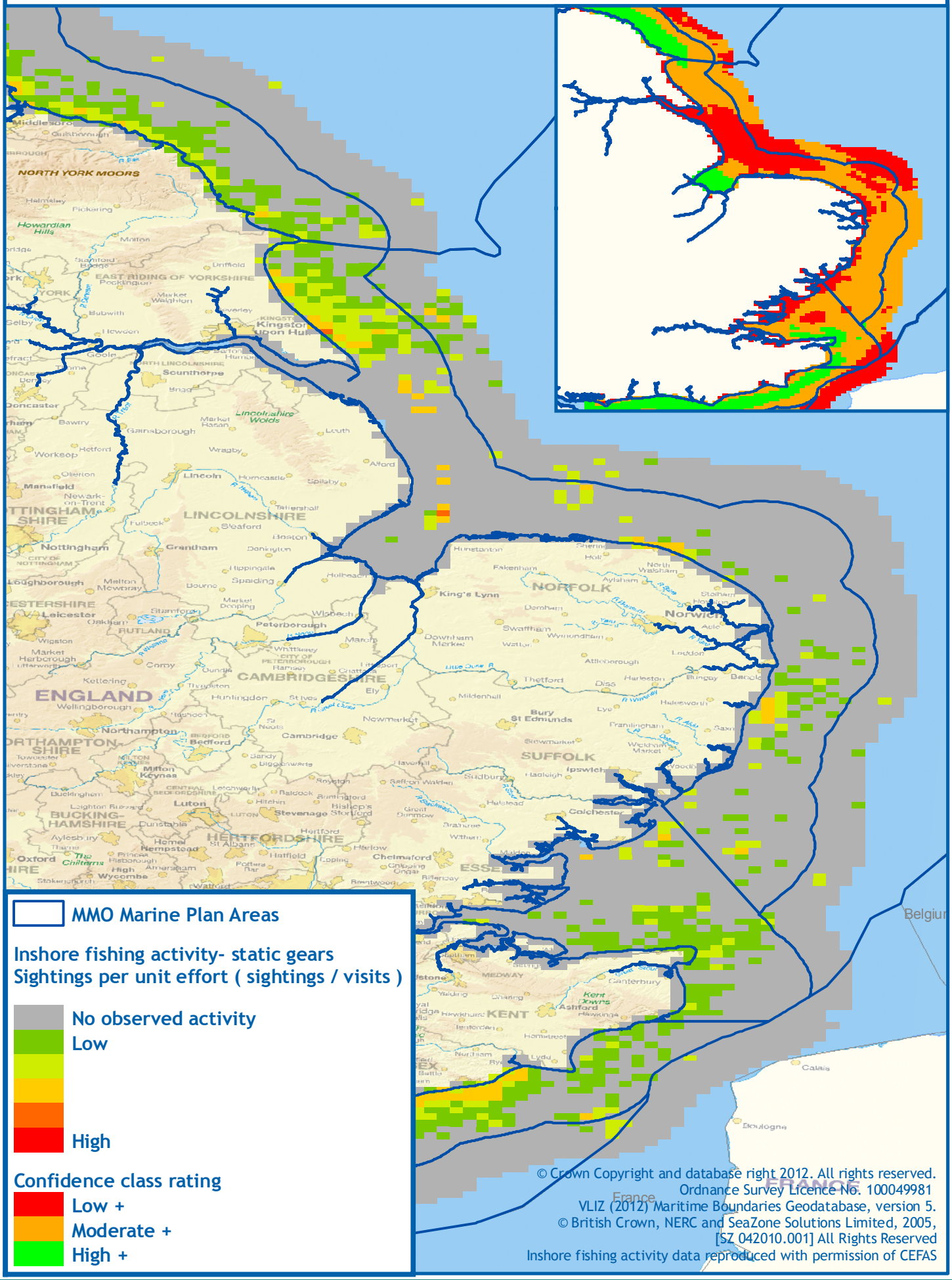

Figure 4.15: Inshore fishing activity- mobile gears with confidence values (inset)

January 2012
This map has been produced using the ETRS89 Coordinate Reference System

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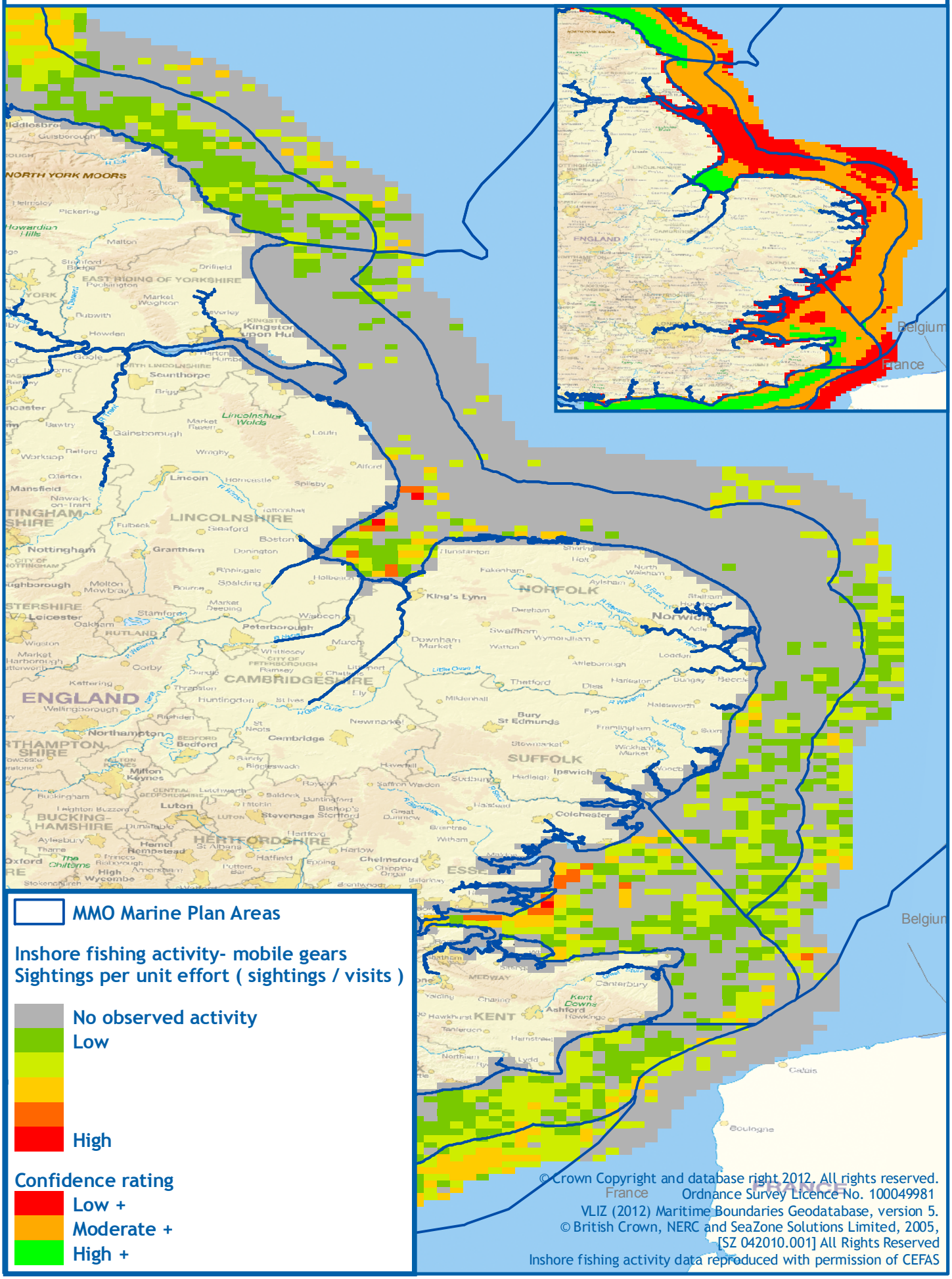

Figure 4.16: MMO UK fishing activity- mobile gears (tonnes of live weight landed from 2007-2010)

marine management organisation

Please note: this map should only be viewed in conjunction with the explantory paragraph of text describing the limitations of the MMO fishing activity data

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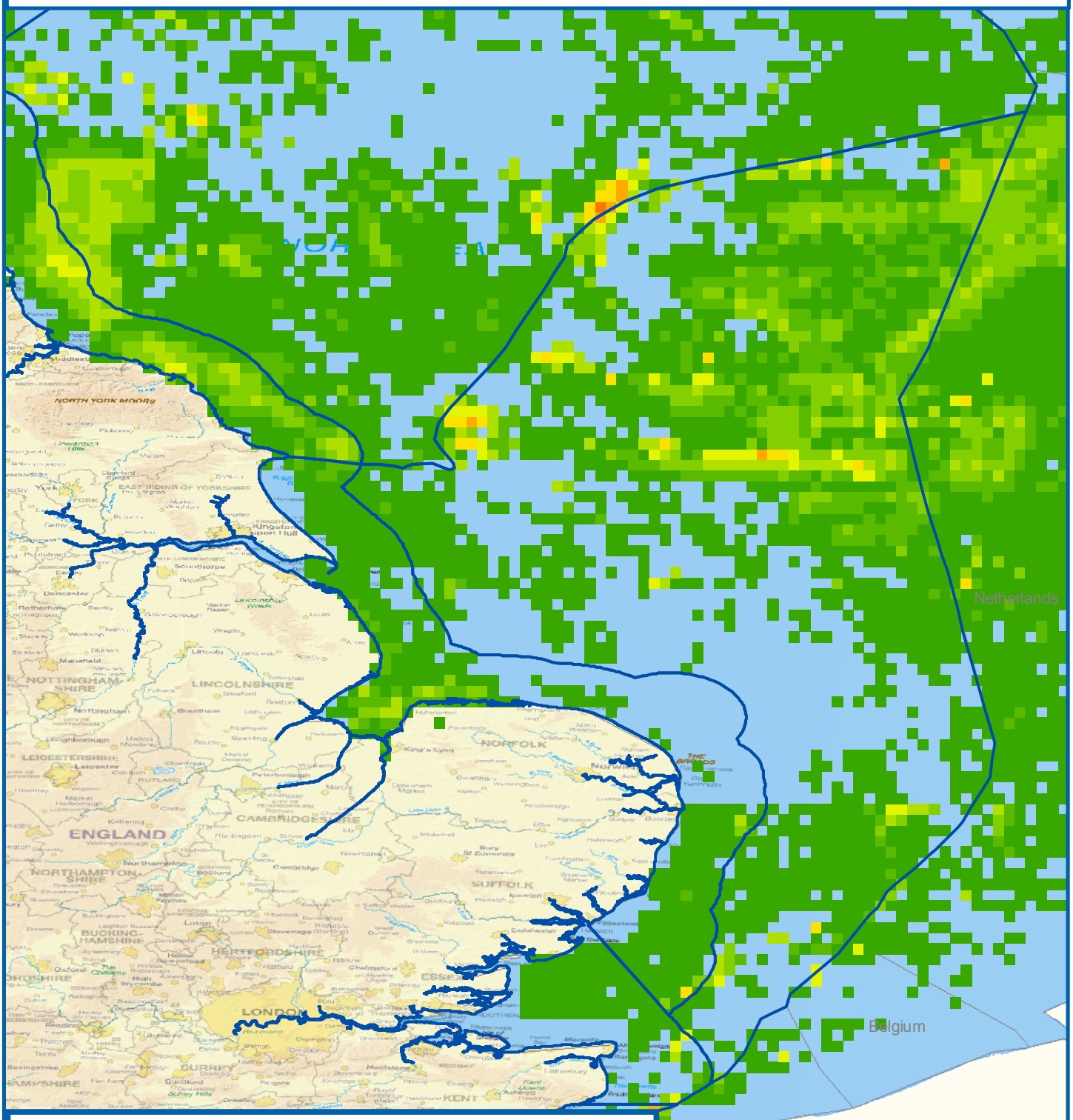

MMO Marine Plan Areas

MMO UK fishing activity 2007-2010
(tonnes of live weight landed- mobile gears)

- 0 - 10
- 11 - 20
- 21 - 40
- 41 - 80
- 81 - 160
- 161 - 320
- 321 - 640
- 641 - 1280
- 1281 - 2560
- 2561 - 5120

Figure 4.17: MMO UK fishing activity- static gears (tonnes of live weight landed from 2007-2010)

marine management organisation

Please note: this map should only be viewed in conjunction with the explantory paragraph of text describing the limitations of the MMO fishing activity data

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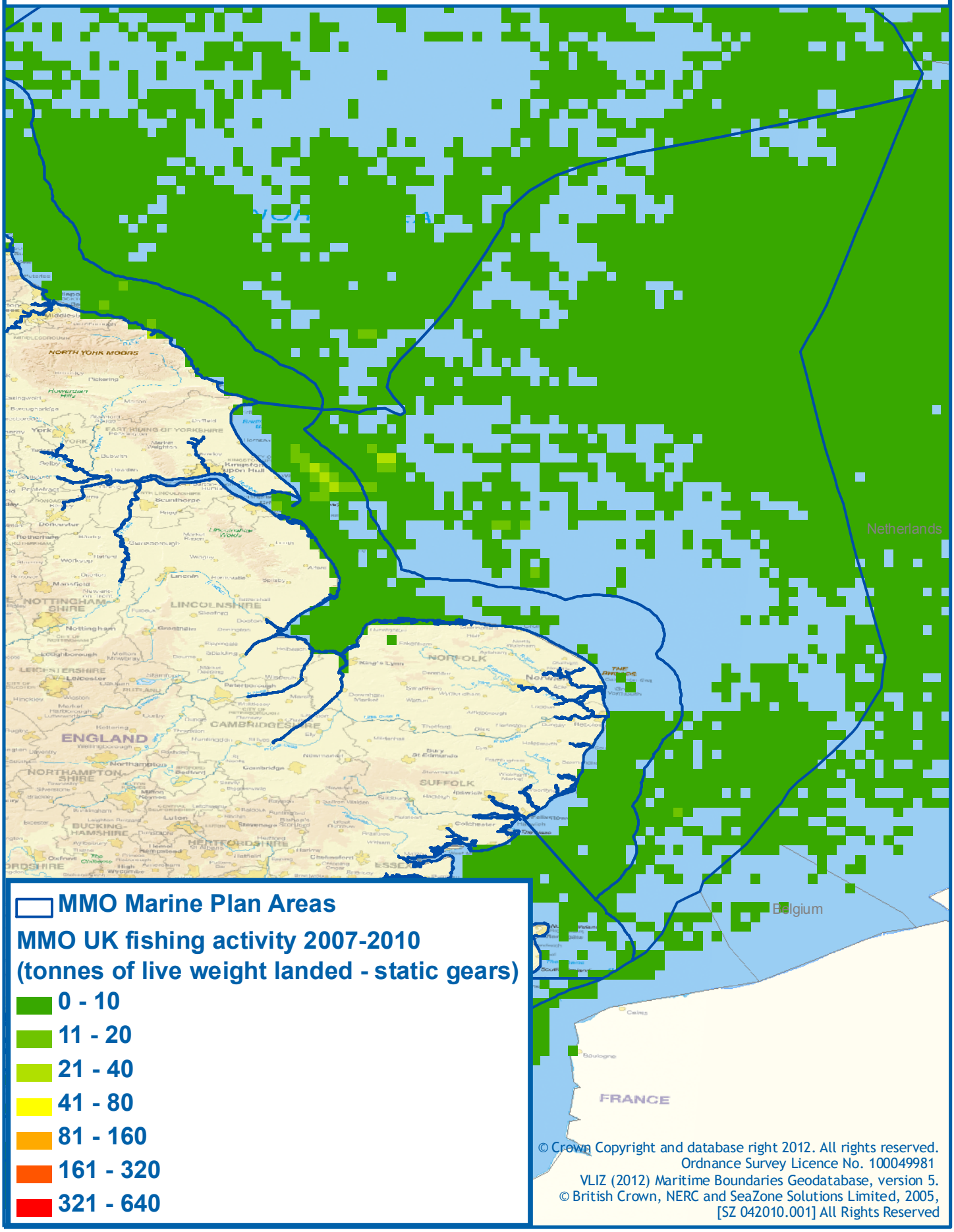

Figure 4.18: High intensity nursery areas

November 2011
This map has been produced using the ETRS89 Coordinate Reference System

marine management organisation

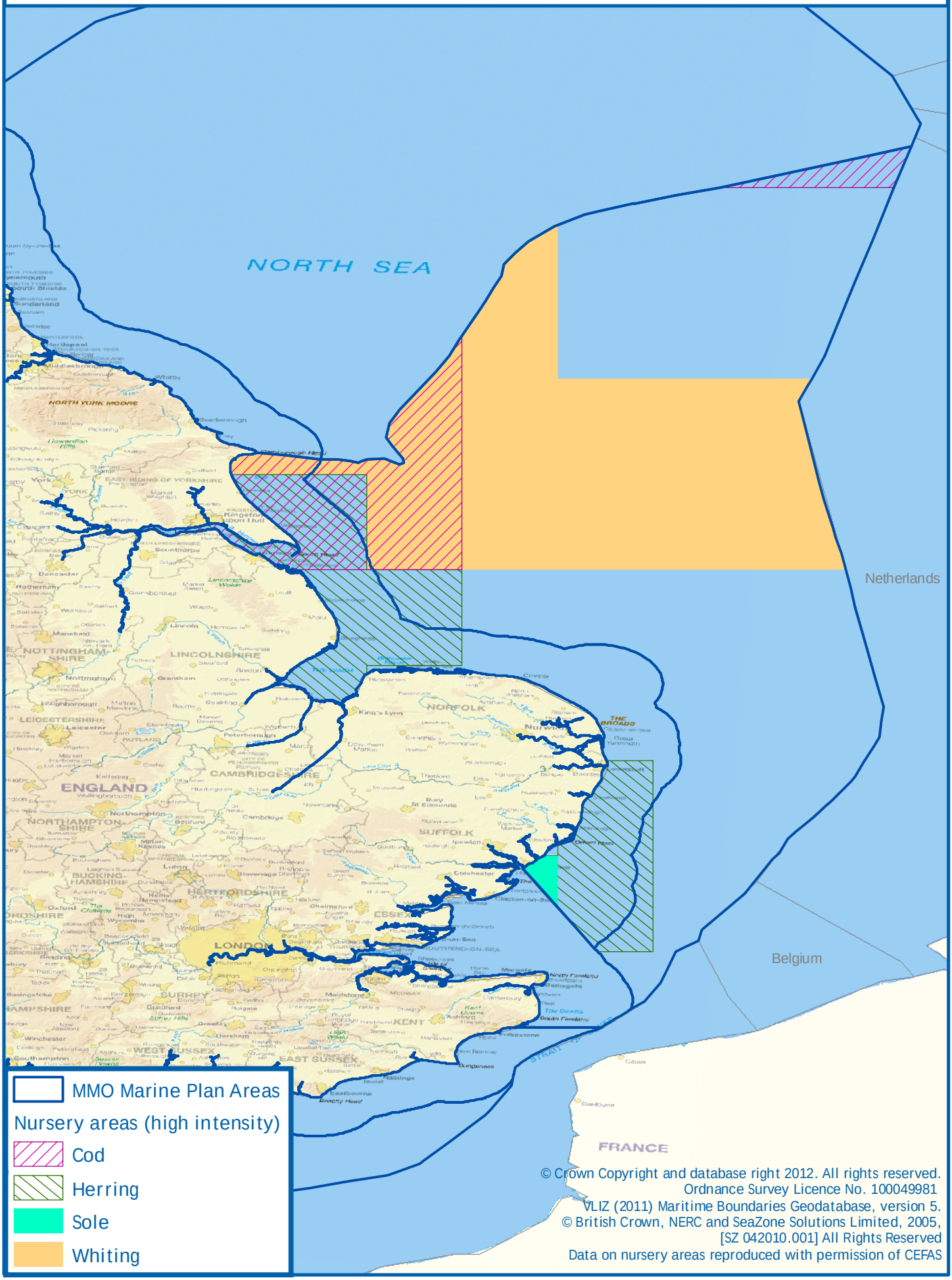

Figure 4.19: High intensity spawning areas

November 2011
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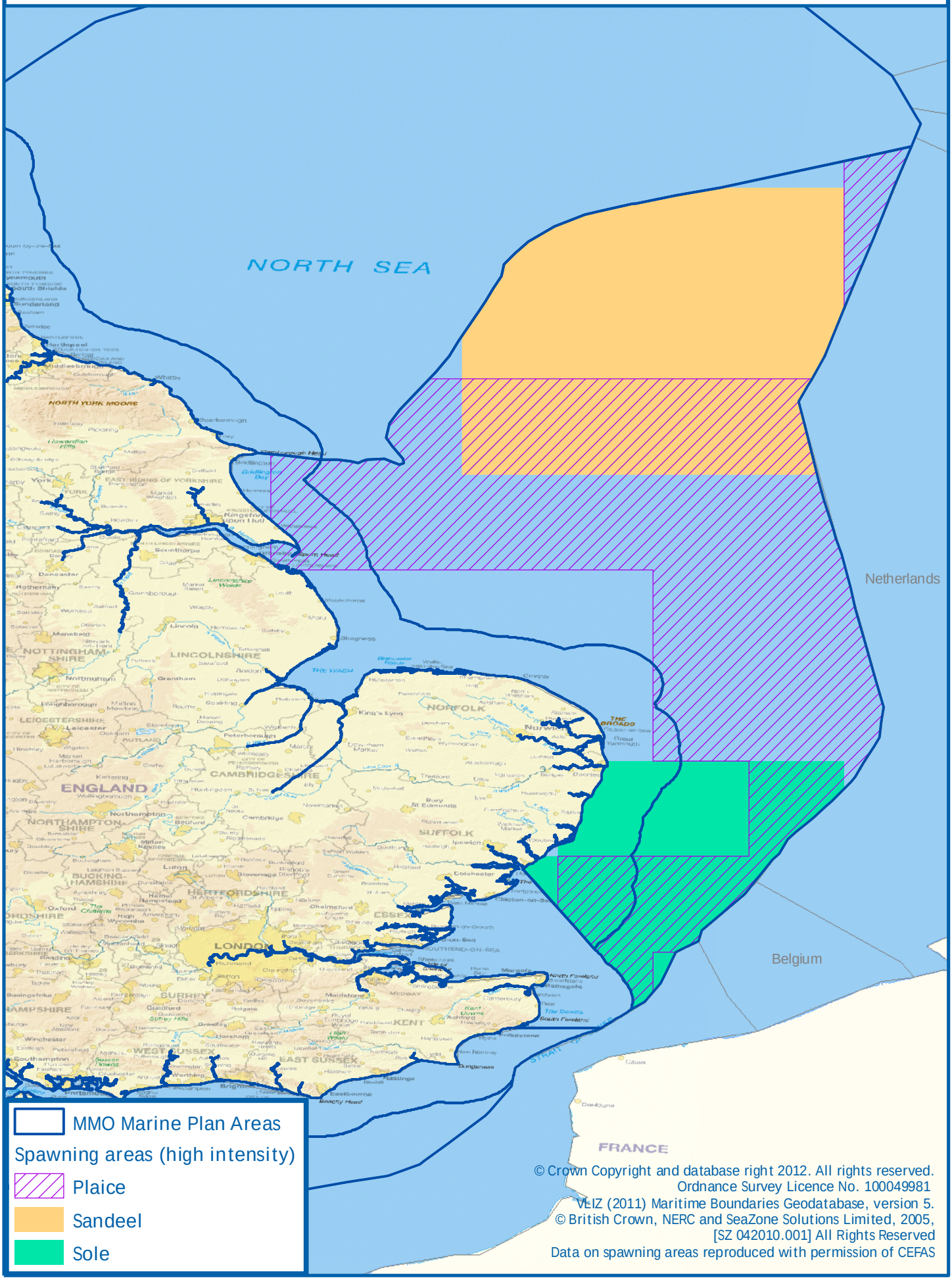


Figure 4.20: MMO fishing activity by E.U. vessels (ex. UK) (time spent in minutes 2007-2010 - mobile gears)

marine management organisation

Please note: this map should only be viewed in conjunction with the explantory paragraph of text describing the limitations of the MMO fishing activity data

January 2012. This map has been produced using the ETRS89 Coordinate Reference System

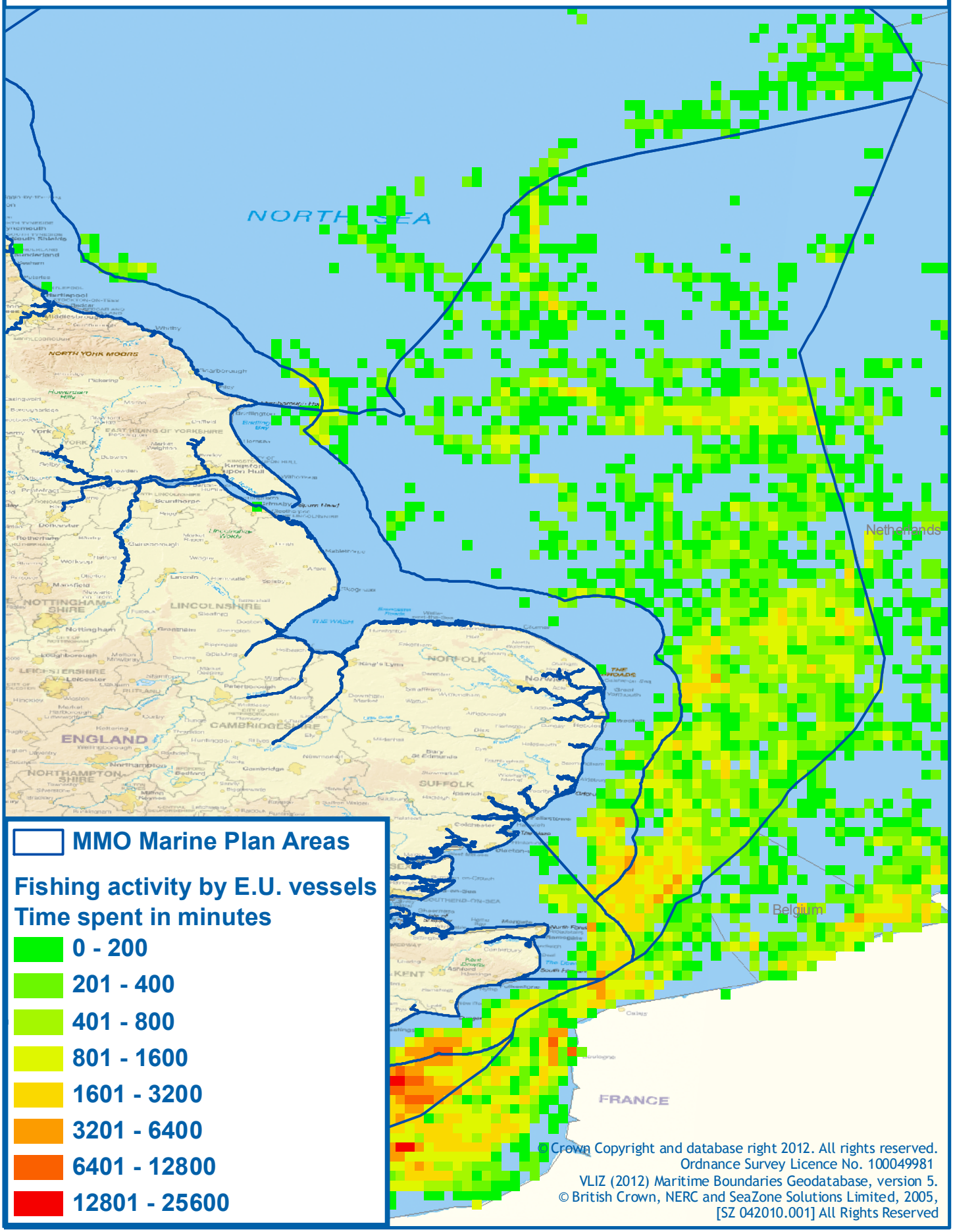
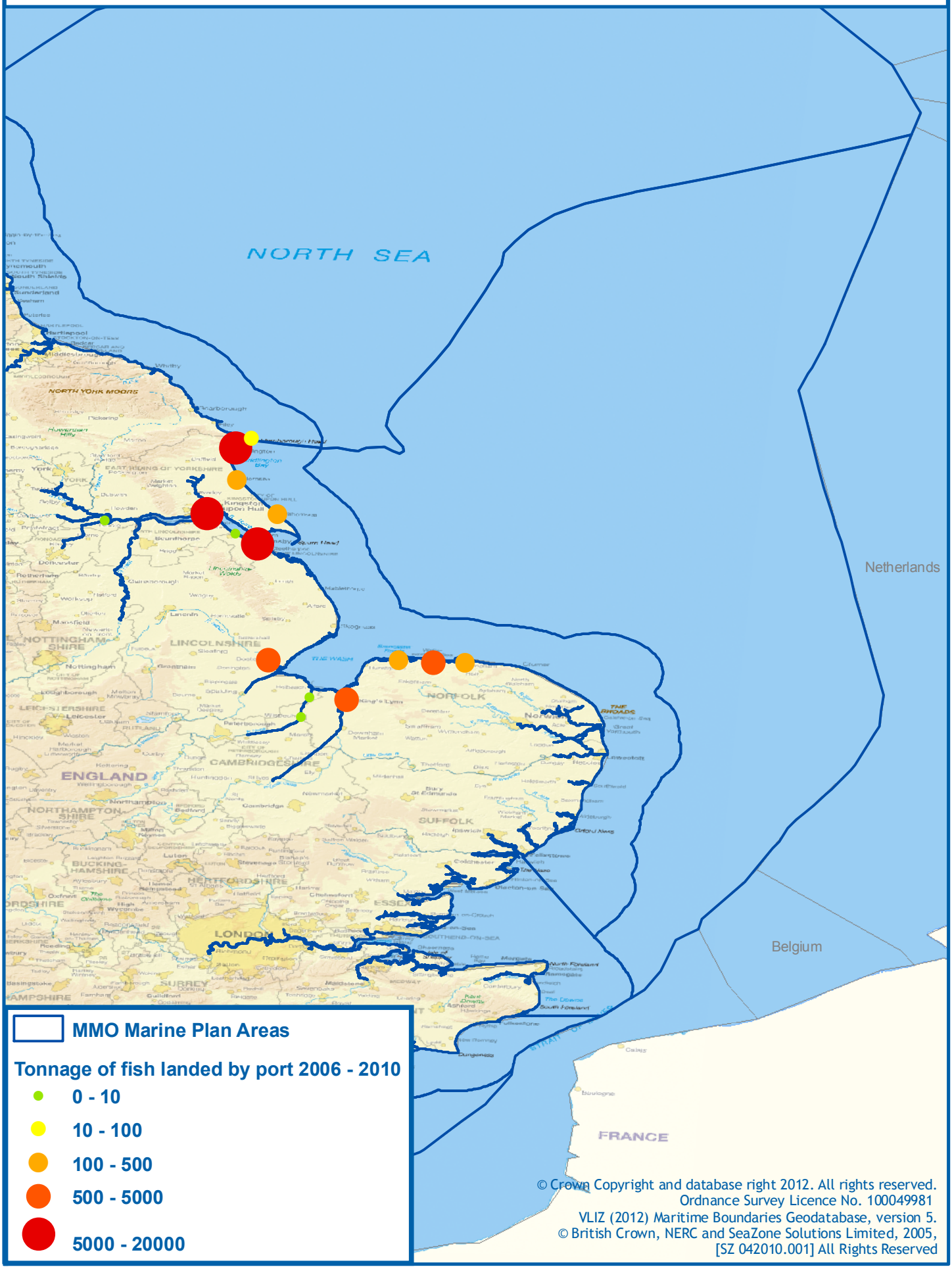


Figure 4.21: Tonnage of fish landed by port 2006 - 2010

January 2012. This map has been produced using the ETRS89 Coordinate Reference System

marine management organisation



Issues for delivery of commercial fishing

- Local development frameworks in the East plan area offer no specific support through defined policy to the fishing sector. Therefore marine plans must be produced in accordance with the Marine Policy Statement and its aim to support the continued existence of the UK's inshore and offshore fishing industry within the development of the marine plans[78].
- Stock levels, reform of the Common Fisheries Policy (CFP) and decentralisation of fisheries management, including the growth of regional fisheries management reflecting local conditions, will have major influence in the future.
- Renewable energy deployment: The potential increase in the deployment of offshore wind energy should take account of current and future fishing activity.
- Some activities may be able to co-exist within the proposed wind development zones but a concerted effort will be required from both wind farm developers and fishing interests to deliver outcomes that are mutually beneficial to all.
- MPAs: Any potential management measures or reference areas may affect investment within the sector. Depending on measures applied fishing activity may be restricted, redirected in terms of methods used or displaced as a result (see also section 4.1).
- Ports and shipping growth of activities in non fishing sectors such as renewable energy and or diversification into the leisure sector and marina creation may have adverse effects on the industry through reduction of in-port facilities for fishing vessels and their related activities. Some positive outcomes of non fishing sector port and harbour do exist, such as at Wells-next-the-Sea.
- Sub-sea cabling may have an impact on fishing activity and result in displacement and possible un-viability for certain elements pursuing inshore grounds in smaller vessels through exclusion zones around cabling and cable protection measures such as rock armouring.
- Aggregate extraction sites need to be selected with care, mindful of existing fishing activities with spawning and nursery grounds in particular.
- Socio economic impacts on the sector will need careful consideration. Some grounds are exploited by vessels with limited range and are of prime importance to smaller local communities, and may be particularly sensitive to spatial conflict.
- Water quality has potential to influence landings particularly in estuarine and intertidal areas.

Issues for other sectors

The list of issues for delivery of commercial fishing highlights that the sector potentially interacts with a large number of other sectors. It follows that fishing may pose issues for delivery of those sectors. Specific further issues to be noted include:

- access to grounds and transit routes may have negative impacts for renewable energy developers
- shifts in fishing methodology from trawling to seine netting for example may require a differing approach from renewable energy developers to support any such change within proposed development sites
- cable transit routes should be routed away from areas of prolific fishing activity.

[78] Defra (2011) UK Marine Policy Statement, p41, Section 3.8.1.

Key issues for sustainability

- CFP reform may potentially make the greatest contribution towards raising levels of sustainability within the industry and is eagerly awaited by the sector. Public interest in the delivery of locally supplied and sustainable food is also likely to play a part and this may favour some of the more artisan inshore fisheries.
- Displacement of activity and raised impacts on habitats on currently un-fished grounds has been raised as an area of concern by a number of stakeholders.
- In the offshore grounds potential shifts in activity from beam trawling to seine netting may have benefits in terms of carbon reduction and catch quality and selectivity. If steaming time to grounds is significantly increased (as in the case of the inshore fleet and developing Round 1 and 2 offshore energy sites and their associated extensions) increased fuel consumption and therefore carbon footprint may result.
- Some habitats may be negatively impacted by fishing activity, such as dredging and certain forms of beam trawling.
- Negative pressures exerted by this activity differ by methodology and can include:
    - abrasion and disturbance to the seabed
    - impacts on biodiversity and by-catch including over exploitation of stocks[79]
    - shifts within sectors, that is from trawling to potting have potential to substantially increase pressures on shellfish stocks and particularly the inshore fishing fleet and affect coastal communities
    - over-exploitation of commercial fish stocks and threats to vulnerable or rare species damage or destruction to habitats and the historic environment
    - marine pollution through loss of fishing gear and ghost fishing.

4.9 Aquaculture

Relevance to East plan area

The Marine Policy Statement defines aquaculture as "the process of farming or culturing aquatic organisms." This leaves some subjectivity in terms of which activities are included in shellfish aquaculture.

- **Current:** Based on the data from 2007, the East Inshore plan area is the most productive area nationally for aquaculture[80]. It was responsible for just under 65 per cent of total shellfish production via aquaculture in England, with 17 businesses in operation in the area in 2007.
- **Future**: Aquaculture is a growing industry and is predicted to grow further in response to the growing demand for protein and locally sourced food. The East plan areas could be important to the development of aquaculture in the English marine area given the large estuaries and sheltered sites and the development of energy infrastructure that could be co-located with aquaculture. However, the development potential within the plan areas needs to be clarified by addressing

[79] Defra (2011) UK Marine Policy Statement, Page 42, Section 3.8.8.
[80] See reference 8

gaps in data and knowledge regarding the most suitable future sites. There is therefore a need for a study that maps the potential future spatial opportunity for aquaculture sites based on the full range of characteristics that the activity requires. These include good water quality, access for maintenance, shelter from storms and low environmental and technical constraints.

Figure 4.22: Water bodies with some shellfish aquaculture production

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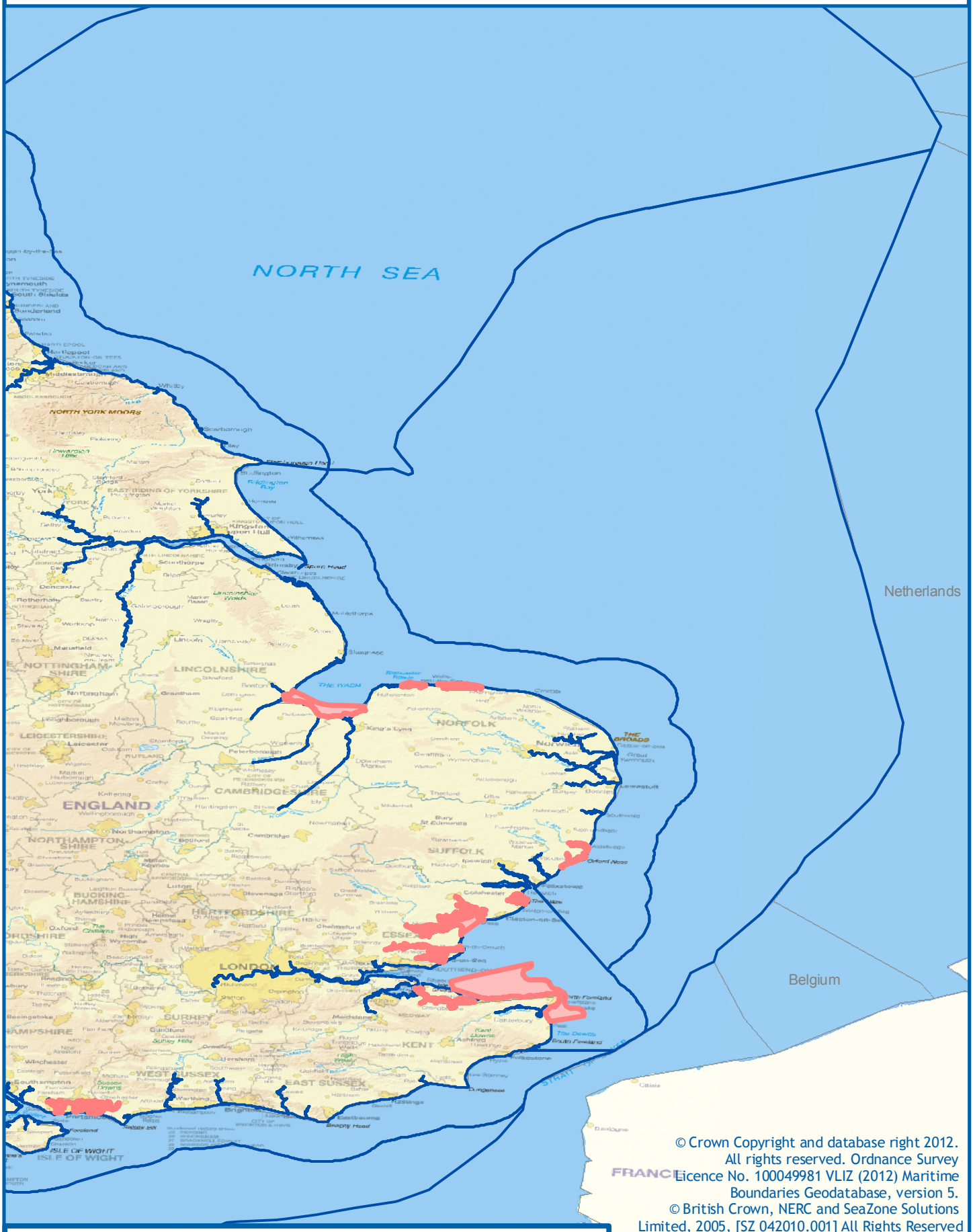

MMO Marine Plan Areas

Water bodies with some shellfish aquaculture production

Issues for delivery of aquaculture

- Trends in the industry are closely tied in with changes in wild fisheries, the availability of investment, and site availability[81].
- More intensive types of aquaculture can use space and resources more efficiently if they are carefully planned and managed[82]. The limiting factors on this development include site availability and environmental carrying capacity.
- It is difficult to secure investment finance for projects as little data on performance and profitability leads to low investor confidence and a high risk rating. There is a perceived lack of tenure security for these projects as the site manager is not the seabed owner.
- There are technological challenges relating to disease treatment, animal welfare (for finfish), product safety for consumers, technology transfer within the industry, research funding and expertise to carry out research.
- Environmental quality issues may be a limiting factor to project development where poor water quality in inshore areas occurs.
- There is no strategic plan highlighting the important role and potential for aquaculture in England, although this is due to be addressed by the draft aquaculture strategy.
- There are concerns from the industry that the consenting regime is too complex and is discouraging to proposals (particularly small schemes).

Issues for other sectors

There are considered to be broad opportunities for aquaculture to co-locate with other marine activities[83]. For example, it is possible to co-locate shellfish aquaculture and the fixed structures within wind farm developments. There may be difficulties however, linked to ownership and access. As the maintenance regimes required for offshore wind infrastructure become better understood, this will also influence the extent of co-location possible. Research on the potential for co-location between marine activities, including aquaculture, is ongoing via an MMO-funded project [84].

- Sites where shellfish aquaculture is most likely to develop may also be sites that are popular for other inshore activities, producing spatial conflicts. For example, a sheltered bay may have shipping activity or be a popular area for recreational activities such as sailing.
- Future finfish aquaculture sites could be positioned adjacent to shellfish aquaculture to provide increased nutrients that act as feed to the latter[14].This could reduce the organic enrichment to the broader marine environment from finfish aquaculture.
- The control of pollution within shellfish waters is important to allow the continuing existence and future expansion of inshore aquaculture facilities. Pollution affecting aquaculture is most likely to originate from surface or waste water discharges from land sources, so improvements in discharge quality would have benefits to aquaculture.

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[81] UK Marine Policy Statement, HM Government, 3.9.3, 2011
[82] UK Marine Policy Statement, HM Government, 3.9.3, 2011
[83] UK Marine Policy Statement, HM Government, 3.9.6, 2011
[84] (MMO1010) 'Evaluation of the potential for co-location of activities and interests in Marine Plan areas' due to be delivered in March 2012

- If aquaculture continues to expand, it is possible that it will take some market share from wild capture fisheries.

Issues for sustainability

Aquaculture can make a positive contribution to sustainable development via the following characteristics.

- Finfish convert protein from feedstuff at a more efficient rate than land-based livestock and shellfish do not need to be fed[85] [86]
- The production of shellfish and algae produces relatively small amounts of greenhouse gas emissions
- Marine produced products do not compete for limited space for food production on land
- A low input of freshwater is required in the production and preparation of aquaculture products
- Aquaculture can reduce the pressure on wild stocks from capture fishing.
- Aquaculture provides healthy consumer products and contributes positively to national food security
- Aquaculture provides locally important, often rural, employment.

Finfish aquaculture has the following potentially negative environmental effects.

- Organic enrichment from waste products and associated de-oxygenation of the surrounding water and sediments, reducing benthic invertebrate diversity.
- Inorganic enrichment that may cause eutrophication and changes in the plankton community.
- Concerns have been raised over the protein sources in finfish feeds and the sustainability of this supply as it generally contains fishmeal from wild caught marine fish species. The use of alternative protein sources in feeds, such as vegetable proteins or by-products from fish or meat processing could improve the sustainability of the supply. Opportunities could arise for deriving feed from fish landed as part of the discard reduction programme.
- Escaped fish can genetically alter local populations by inter-breeding.
- Diseases and parasites can be passed to native fish, with negative impacts on their populations.
- Should products be used to treat parasites and diseases, then contamination to the marine environment from such products may occur.
- Facilities may have a seascape impact as they tend to be located close to the shore.

Advances are being made to limit the potential for negative environmental effects from finfish aquaculture. These include, certification to sustainable standards of the fisheries to source fishmeal for feed and more efficient feeding regimes; closed sided floating tanks where effluent can be controlled; certification to sustainable standards of the fisheries to source fishmeal for feed; sterile female stocks to minimise the risk

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[85] www.aquamaxip.eu/content/view/108/177/

[86] Hall, S.J., A. Delaporte, M. J. Phillips, M. Beveridge and M. O'Keefe. 2011. Blue Frontiers: Managing the Environmental Costs of Aquaculture. The WorldFish Center, Penang, Malaysia. p71

of interbreeding with wild fish; vaccination against diseases which could be passed between farmed and wild fish and the use of well boats for veterinary medicine treatment with discharge of the water on land.

Shellfish aquaculture is considered to have a relatively low environmental impact. However, a localised impact may be habitat loss or alteration associated with aquaculture structures such as cages for oysters.

Any form of aquaculture involving non-native species has the potential to alter local ecosystems and biodiversity if individuals escape and establish populations that compete with native species.

4.10 Surface water management and waste water treatment and disposal

This section does not consider targets for the environment and water quality in relation to this sector. This will be done in the environmental, social and economic issues chapter under the water section.

Inshore, coastal and estuarine waters are particularly at risk of marine pollution from effluent discharge and outfalls. The implementation of national policy to address both the discharge directly through the Urban Waste Water Treatment Directive and indirectly through the Bathing Waters Directive and Shellfish Waters Directive has and continues to reduce marine pollution from these sources.

Relevance to East plan areas

There are 159 discharge sites in the East plan area. The majority of discharge points are to the north (Humber Estuary) and south (The Broads and Felixstowe) of the plan area, where there is increased industrial activity and thus associated discharge sites, with fewer around The Wash and North Norfolk.

Marine planning will need to have regard to existing surface water and waste water infrastructure and any future plans for new infrastructure. Marine plans should also have regard to the associated directives and plans that govern this sector and ensure the East Inshore plan does not contravene the directives and plans attempting to achieve, for example, good environment status for water bodies under Water Framework Directive (WFD) through the delivery of river basin management plans.

Figure 4.23: Consented discharges to controlled waters

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MMO Marine Plan Areas

Waste water discharge areas (freshwater estuary)

Waste water discharge areas (controlled sea)

Waste water discharge areas (saline estuary)

Combined sewer overflows

Issues for the delivery of surface water management and waste water treatment and disposal

- Sewerage infrastructure and drainage is essential in supporting economic and social development, and for reducing the risk of flooding in rural and urban areas.
- Marine plan authorities should consider the physical aspect of discharging to sea in the form of the location and physical impact of major sea outfalls in the development of marine plans. The impact of coastal and estuarine change, and the risk of flooding in such areas, should be taken into account to avoid inappropriate development in vulnerable areas and be in line with the considerations relating to the ecological and chemical water quality and resources, seascapes and historic environment.

Issues for other sectors

- Interactions between this sector and sectors such as fisheries will be dealt with on an individual basis through the application process. There are a number of issues other sectors need to be aware of and could be addressed through the plan such as marine protected areas and tourism and recreation.
- The impact of development and associated waste infrastructure must not be at the expense of the marine environment.
- Tourism and recreation rely heavily on clean and healthy coastlines to attract visitors so ensuring surface and waste water is properly managed so as not to impact upon the quality of coastlines is important. There are many processes in place to manage the water quality of outfalls including an appropriate assessment and relevant investigations required under licences from the Environment Agency and MMO.

Issues for sustainability

- The discharge of waste water and increased run-off may have a negative interaction with the natural environment so the location of these outfalls needs to be carefully considered. The physical appearance of an outfall also needs to be considered and this would be considered through assessment of any specific application.
- The location of outfalls for surface water and waste water must be considered in relation to the ecology and water quality of the area, particularly in relation to meeting Water Framework Directive targets.
- Allocation of sufficient space to facilitate future growth of current sewerage services is essential to meet the needs of development in key locations and this may result in increased pressure.

4.11 Tourism and recreation

Relevance to East plan areas

The East plan area contains over 2,000 kilometres of coastline which makes it an attractive area for both tourism and recreational activities.

- **Current**: Leisure boating is the most popular and economically viable part of the marine water sports industry with many RYA training areas, marinas and racing areas in the East Inshore plan area. These areas are clustered around the

Broads in Norfolk, Suffolk coastlines and estuaries and to a lesser extent the estuaries in the Wash and Humber. Records are not kept on numbers of members at individual clubs, their activities, or moorings and anchorages.

- **Current**: There are 16 beaches with blue flag status, which can be attributed to high water quality and good management[87].
- **Current**: Visitors across the East plan area support the tourism and recreation economy. 250,000 people viewed wildlife during visits to east Yorkshire in 2010, with 45,000 of these visitors coming specifically for the wildlife, generating over £1 million per annum for the local economy[88].
- Wildlife watching is a popular activity within the East plan area, with visitors keen to learn more about the natural environment and its attributes such as marine mammals.
- The public's awareness of the environment and conservation issues positions wildlife watching as a potential growth sector[89].
- **Future**: It is difficult to predict future trends and demands for tourism and recreation. The current economic situation may lead to an increase in domestic tourism due to the variety of opportunities available, which in turn may lead to an increase of visitors to local coastal and seaside areas.

Please note: The availability of data on tourism and recreation is limited. However, the MMO is commissioning work to draw together existing data on recreation to identify data gaps, and where appropriate commission further research to fill them.

[87] Blue Flag beach status awarded for May to September 2011.
[88] The Economic Potential of Nature Tourism in Eastern Yorkshire, 2010.
[89] Tourism benefit and Impact analysis of Norfolk Coast Area or Outstanding Natural Beauty, 2006.

Figure 4.24: Tourism and recreation

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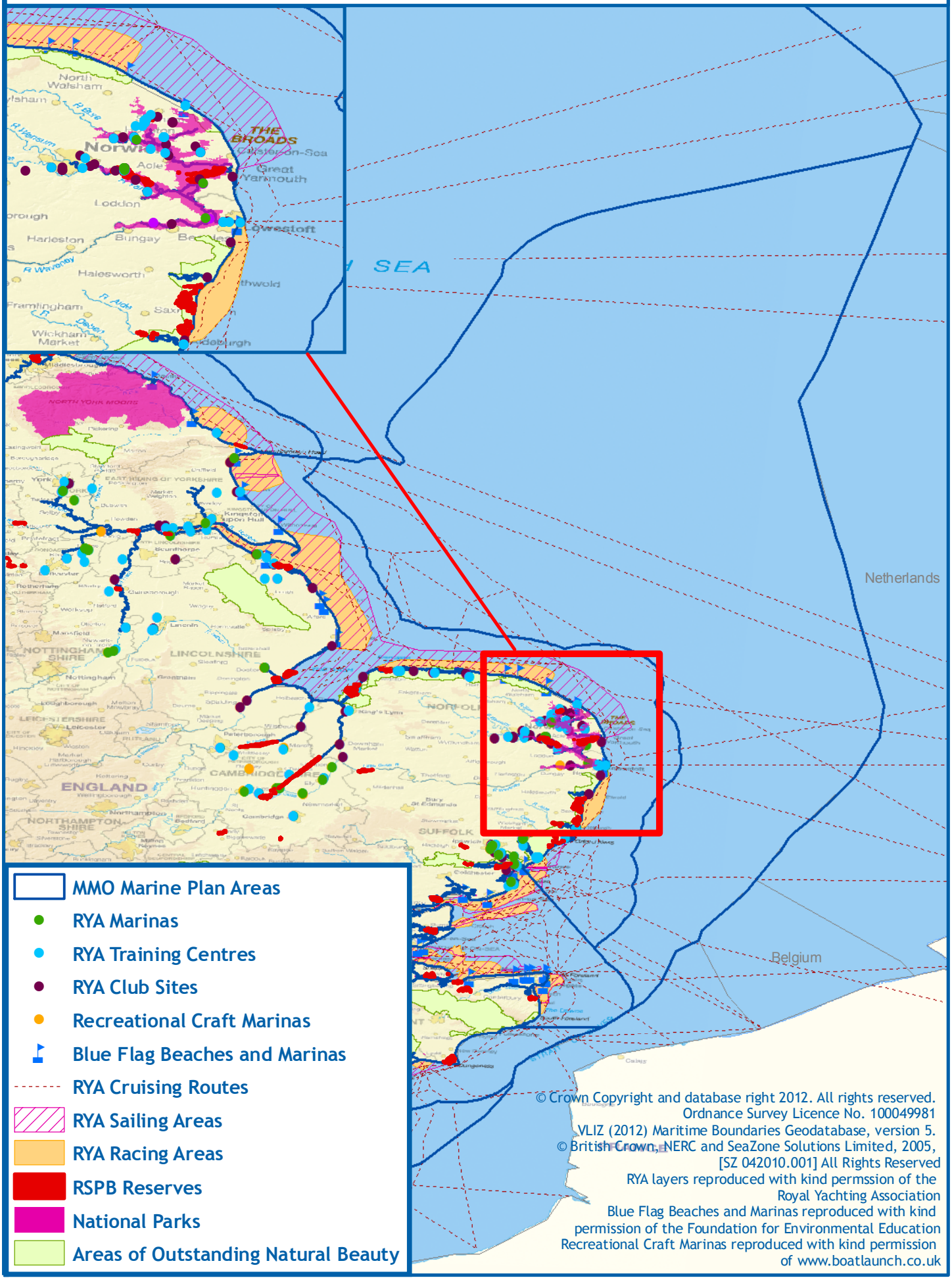

Figure 4.25: Tourism and recreation-activity locations

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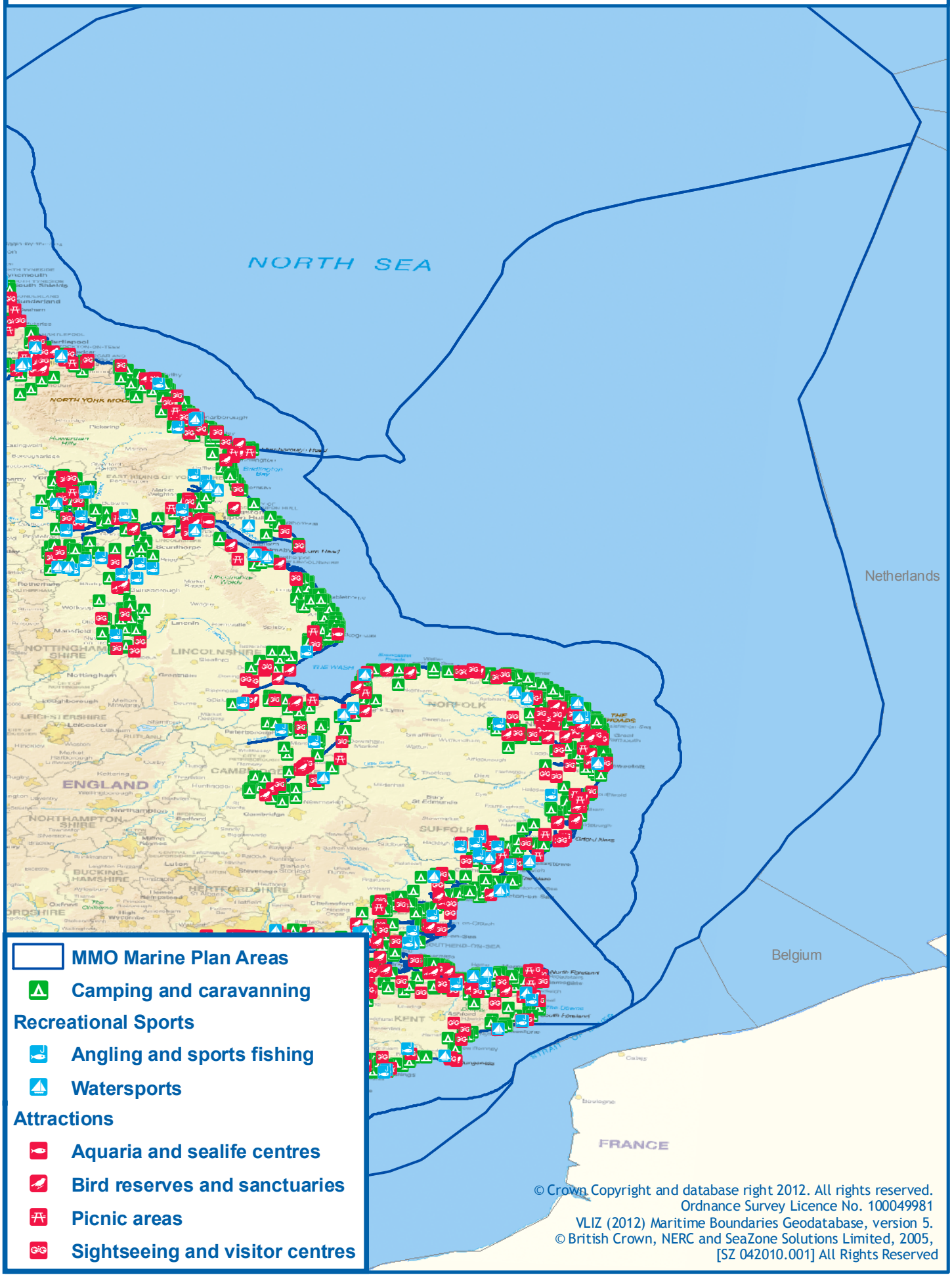

Issues for delivery of tourism and recreation

- Local development frameworks in the East cover the growth and enhancement of the tourism and recreation industries, placing criteria on delivery of new development so that it does not negatively impact on the environment, including conservation designations, water quality and seascapes. Marine planning, in general, will seek to support this approach in the development of the marine plan.
- Tourism and recreational activities will predominantly occur along the coast and in the East Inshore plan area. Few activities occur in the offshore area therefore this sector is spatially constrained to the coastline and inshore area.
- This sector is also impacted by the activities that occur on land and thus the need for terrestrial and marine planning to coordinate will be important for this sector.
- There are many interactions between activities within the tourism and recreation sector as well as with other sectors. In delivering marine planning, a thorough understanding of the range of tourism and recreation activities available in the East Plan area is necessary. The MMO has commissioned a recreation study to gather information on this and identify gaps in data[90].
- Tourism and recreation in coastal areas is frequently supported by an attractive and healthy beach which is often the focal point for many coastal communities. Increased coastal erosion and flooding along the East coast could impact on the tourism and recreation opportunities and associated economic benefits for local communities. Analysis of the six Shoreline Management Plans in the East plan area has been undertaken to ensure marine planning understands the management policies implemented to reduce the impact of erosion and flooding and support the coastal communities. This will need to be ongoing throughout the planning process.

Issues for other sectors

- Designations, identified specifically for environmental or conservation characteristics (see Section 4.1 for different types) or cultural heritage , are important for tourism and recreation. Visitors are attracted to these areas for a variety of reasons including conservation and wildlife watching, for recreation activities such as diving or walking and to appreciate the uniqueness of the site at the coast, including the Humber and Wash estuaries as well as the Norfolk and Suffolk coasts. These have been identified for specific appropriate management within local authority planning policies.
- Ports and harbours may play a role in the diversification of tourism and recreational activities, such as wildlife excursions, fishing trips or visiting offshore wind turbines. The latter occurring at Scroby Sands in Norfolk.
- They are also important for ferries, yachting and cruising.
- Decisions about fisheries may have implications for the tourism industry as fishing boats and associated activity form a key part of the tourism offer in areas such as Aldeburgh in Suffolk and Cromer in Norfolk. Although it is difficult to quantify this, links between fishing, ports, harbours and marinas and tourism and recreation should be considered carefully. The MMO is exploring research opportunities to further illustrate the economic linkages between commercial fishing and tourism.

[90] Compilation of spatial data on marine recreation activities, due for completion in March 2012.

- The visual impact of offshore wind turbines and associated land-fall cabling/sub-stations may have an impact on the seascape of an area, and could impact on the tourism offer. In some areas wind farms are attracting tourists interested to learn more and see them in their surroundings. The associated land based transmission infrastructure requires careful consideration and all regulatory authorities working closely together to ensure the minimisation of visual impacts and detriment to public amenity.
- Beaches in the east of England attract many visitors and have inherent coastal defence benefits. Many beaches have suffered from coastal erosion with beach replenishment schemes introduced to the Lincolnshire and North Norfolk Coast and East Anglia[91] to address erosion and maintain the tourism offer. The marine aggregate industry provides the majority of material for these schemes and this relationship needs to be recognised.
- Cumulative effects and potential 'squeeze' of other sectors on the navigational needs of tourism and recreation interests should be considered. A reduction in available space for commercial shipping may have a knock-on effect on recreational boating. This can force recreational craft into the same space as commercial shipping thus creating a potential navigation hazard.
- It is difficult to predict the future pattern of the economy so tourism and recreational resorts need to focus on developing a strong, multi-user, multi-industry offer to attract visitors, such as efforts in North Norfolk to diversify the accommodation and attraction offer while retaining existing tourism infrastructure.
- Impacts from many sector activities such as waste water, litter, noise and light pollution can have adverse effects on the tourism and recreation sector.

Issues for sustainability

Tourism and recreation can provide environmental benefits by helping to enhance understanding and appreciation of the marine environment through activities such as eco-tourism and nature watching. Increased visitors numbers and improved access can also offer socio-economic benefits to coastal communities.

In many communities, tourism and recreation is a key employer with many other businesses, such as construction, retail, arts and crafts, directly benefiting from this sector[92]. The need to protect, maintain and develop and diversify current tourism and recreation opportunities is very important for the local communities that rely on this sector and its contributions to the local economy.

However, tourism and recreational activities can also have a negative impact on the marine environment through the:

- removal of marine flora or fauna
- physical or visual disturbance to wildlife
- increased levels of waste water discharge litter or noise pollution
- pressures from increased visitor numbers in environmentally sensitive areas[93]
- introduction of non-native species into an area on recreational boats and crafts.

[91] www.bmapa.org/downloads/BMAPA_download.pdf
[92] www.norfolkcoastaonb.org.uk/mediaps/pdfuploads/pd000295.pdf
[93] Defra (2010) UK Marine Policy Statement, Page 46, Section 3.11.4

These impacts highlight the importance of protecting the environment to ensure the tourism offer is maintained and thus the economy continues to benefit from this sector. While it is important to continue offering visitors strong tourism and recreation opportunities (which support the economy through revenue and employment), these activities need to be carried out in a sympathetic manner to preserve the natural environment for future generations.

The potential effects of tourism and recreation activities on the marine environment will need to be considered in marine planning. Similarly, where they occur, the socio-economic benefits of tourism and recreation should therefore be recognised when developing marine planning policy.

4.12 Futures analysis – examples and potential approach

In order to undertake planning it is necessary to assess the **potential future changes** in relevant sectors, based on projecting current trends forward and assessing new demands for marine space, taking account of objectives, policies and technical considerations. The degree to which future development or change can be described or quantified varies greatly between sectors. There is also a need to focus analysis on those activities that will undergo a substantial amount of change resulting in a significant change or demand in spatial footprint which will potentially affect other users of space and/or the environment.

The report, therefore, considers three examples of relevant activities – wind energy, aggregate extraction and oil and gas production – whose delivery and/or impacts on others is particularly amenable to being addressed by marine planning, and which can be described in a meaningful way based on the evidence available. **Providing predictions of future change or growth for only some activities either here or in revised analysis in no way indicates that are other activities are less important, it is simply a reflection of available knowledge and the issues where marine planning can add value.**

The examples are provided to seek comment on the approach and methods used and their applicability to other activities. The brief analysis describes the steps involved and underlying information and assumptions. Two of the examples have been revised following comment but we **anticipate continuing to explore the approach, assumptions, method and data for futures analysis and its application to marine plans.** Therefore, whilst the following indicative summary of the analysis undertaken, these should not be taken as agreed conclusions:

- **Wind energy**: the East plan areas represent a large proportion of opportunity for fixed foundation wind turbines in English waters and are currently supporting numerous wind projects in planning and development. Government policies, targets and enabling documents form the basis for projected estimates. If renewable energy targets are increased, the East plan areas are likely to have to contribute significantly more in terms of space to accommodate new projects. The analysis to date implies this is possible but assessment of other activities spatial requirements and their ability to operate around wind farms needs to be completed.

- **Aggregate extraction**: the industry has been resilient to economic pressures and there are further opportunities for the industry to grow. Assuming sustained economic growth over the lifetime of the marine plan and allowing for the initial analysis herein of resource constraints, hard constraints and habitat sensitivity, suggests there is likely to be sufficient space for the activity to occur. However, this area will need to be modified to take account of other constraints (a range of activities) not currently factored in which may significantly reduce the space available or locations of future aggregate extraction.
- **Oil and gas production**: Gas production is the sole extraction activity in the East plan areas. Production of oil and gas on the UK Continental Shelf (UKCS) as a whole is in decline. Assuming that trend for the plan areas mirrors that of the UKCS, a range of potential spatial footprints for future production has been derived, accounting for sensitive habitats (although this has a limited effect) and hard constraints. This suggests that even under a high projected estimate, the total area occupied by infrastructure in 20 years' time the will be less than today, **although** this is dependent on many factors such as decommissioning of existing infrastructure. We are aware that industry are considering alternative projections, such as reviewing the demand assumptions.

The MMO welcomes input or assistance from stakeholders, such as industry representatives, to assess and refine possible future development scenarios and how a marine plan may use these.

Chapter 5: Interactions – between multiple activities and between activities and environment

Introduction

Understanding and addressing the interaction between a range of activities, and between that range of activities taken together and sustainability considerations, is integral to marine planning.

It is essential to not only collate relevant information and present this on a sector by sector basis, as in Chapter 4, or a topic by topic basis, as in Chapter 6, but also to develop and apply analyses to multiple activities. The following chapter explores this from two perspectives. The first considers interactions between multiple activities focussed on current distribution to highlight examples of successful co-location and where spatial conflicts may be occurring both now and in the future. The second considers activity-environment interactions, assessing the potential effect of multiple activities focussed on the pressures they generate, the sensitivity of seabed habitats to those pressures and the potential resulting effect. Detailed information on a number of limitations surrounding this analysis can be viewed in the full report in Chapter 5.2.

This work is very much in progress and its use here is to highlight the approach, illustrate potential key issues arising, and stimulate discussion rather than the outputs being taken to be finalised.

5.1 Assessing pressures and environmental sensitivity – an integrated view

While the potential effects on different elements of the environment is assessed in detail in Chapter 6, the interaction between activities, both individually and collectively, and the environment is explored further in Chapter 5. To understand the interaction between activities and the marine environment, and the potential impacts that may result, it is necessary to consider, among other things, the pressures that those activities generate and the sensitivity of receiving features to those pressures.

This is a key topic for marine planning to assess and address, given expectations set out in various government documents. However, both the approach in general and the analytical methods specifically are still evolving in the way that they are applied to marine management. Chapter 5 looks at two key environmental pressures-physical change (to another seabed type) and shallow abrasion whilst addressing the various limitations to this type of analysis and highlighting some remaining questions.

The examples are designed to prompt comment on the appropriateness of the method, the data that lies behind the analysis, and the utility of the approach, including if and how it might be extended and applied in planning for the East plan areas. The analysis and examples are based on current activity but, clearly, can be applied to projections and scenarios for potential future patterns of activity. The outputs are shown at a plan area scale to provide insight into the spatial distribution of pressure, where overlaps of common pressures occur and to assess where pressures occur over sensitive habitats.

Taking physical change as an example, the following steps and outputs are illustrated (see 5.2 of Main Report for full set of maps and caveats):

1) The sensitivity of different habitats is presented using a combined survey and modelled habitat map. Those in the East plan area range from medium to high sensitivity
2) The distribution of current activities, and a generic understanding of which activities generate what pressures, enables mapping of potential physical change that may arise from all the activities assessed.
3) The outputs of 1) and 2) can be combined to derive a spatial assessment of areas of habitat vulnerable to the pressure under consideration.
4) Predicted or hypothetical new areas/locations of activity that may generate the pressure can be added to assess the relative contribution and change that they generate. An output using Round 3 areas of search is provided for illustrative purposes.

Figure 5.2: Habitats and species sensitive to physical change (to another seabed type)

marine management organisation

Please note: this map should only be viewed in conjunction with the explanatory text in chapter 5.2 describing the methods used and their limitations

January 2012

This map has been produced using the ETRS89 Coordinate Reference System

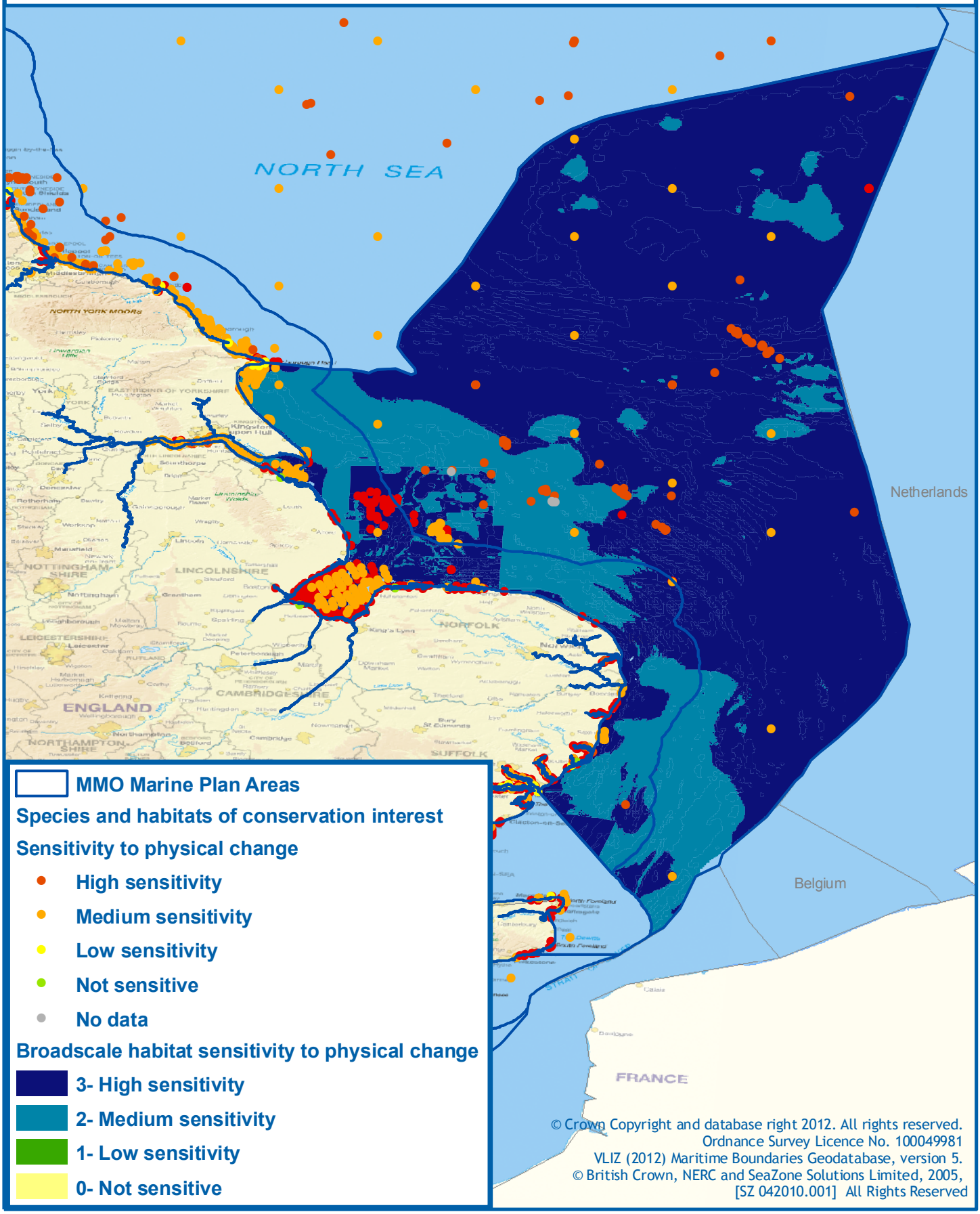

Figure 5.3: Potential sources of cumulative physical change (to another seabed type) pressure

marine management organisation

Please note: this map should only be viewed in conjunction with the explanatory text in chapter 5.2 describing the methods used and their limitations

January 2012
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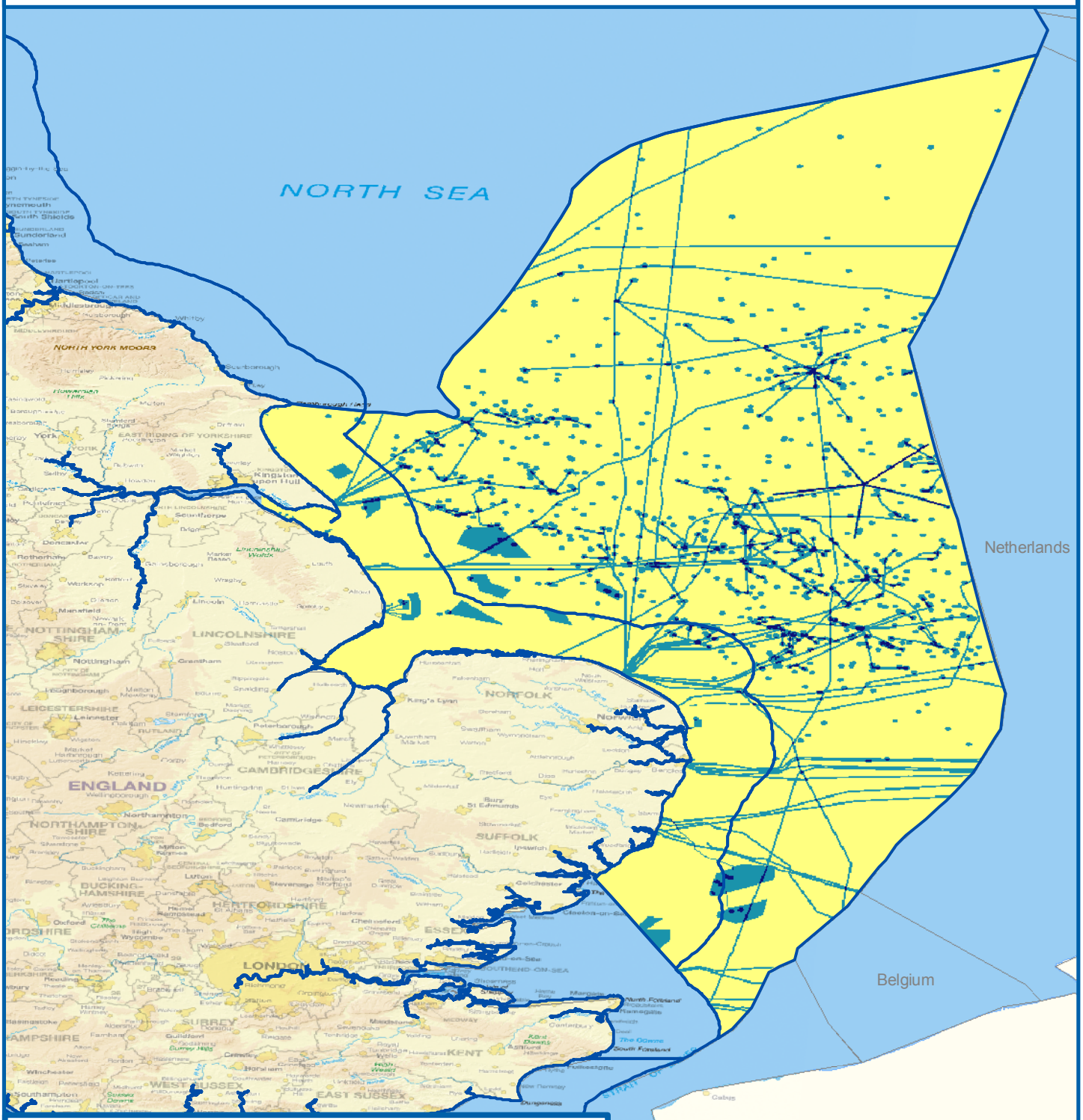

Figure 5.4: Areas of habitat 'vulnerable' to potential sources of Physical Change (to another seabed type) pressure

marine management organisation

Please note: this map should only be viewed in conjunction with the explanatory text in chapter 5.2 describing the methods used and their limitations

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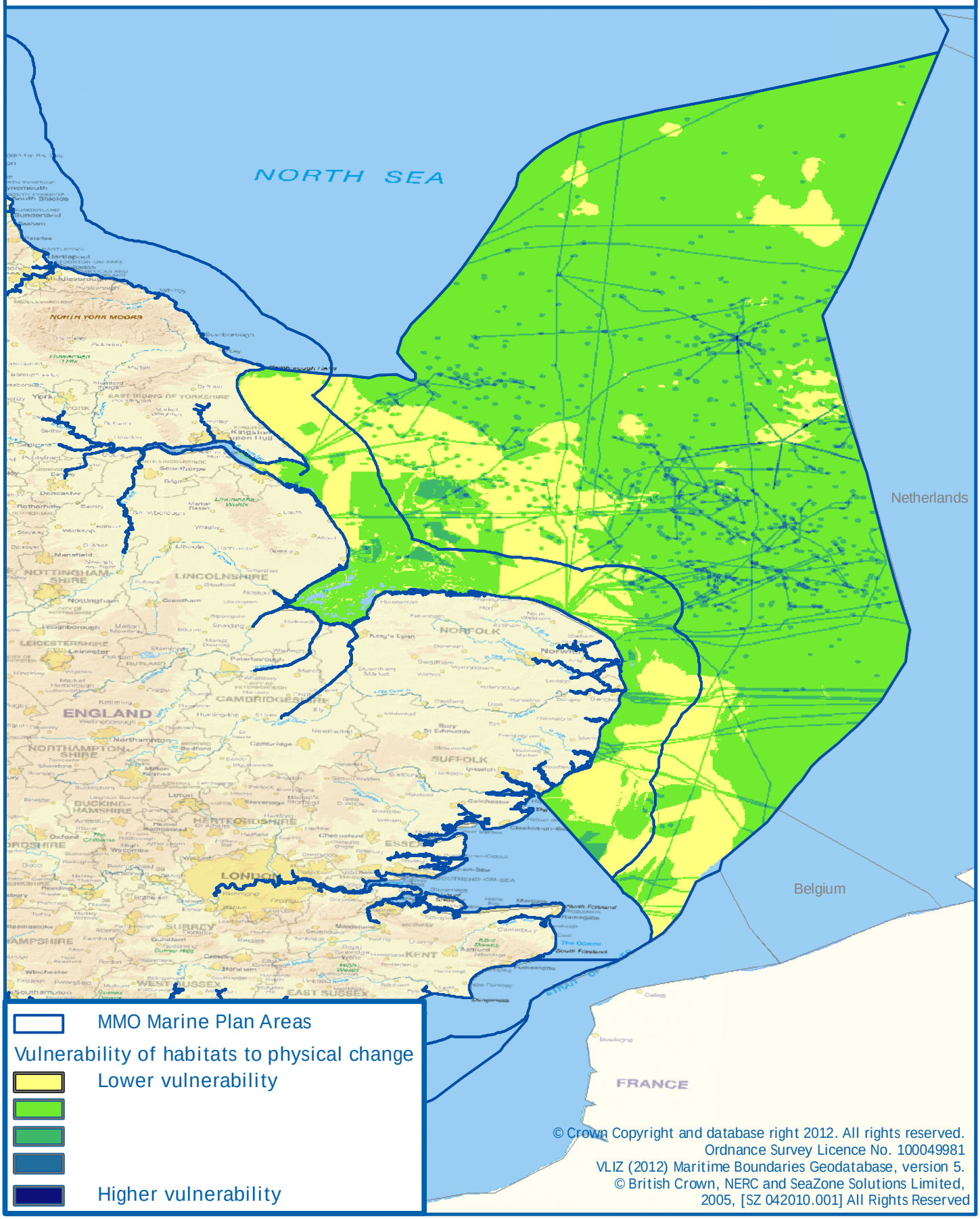

Figure 5.5: Areas of habitat 'vulnerable' to potential sources of Physical Change (to another seabed type) pressure including potential pressures caused by round 3 wind farms areas of search

marine management organisation

Please note: this map should only be viewed in conjunction with the explanatory text in chapter 5.2 describing the methods used and their limitations

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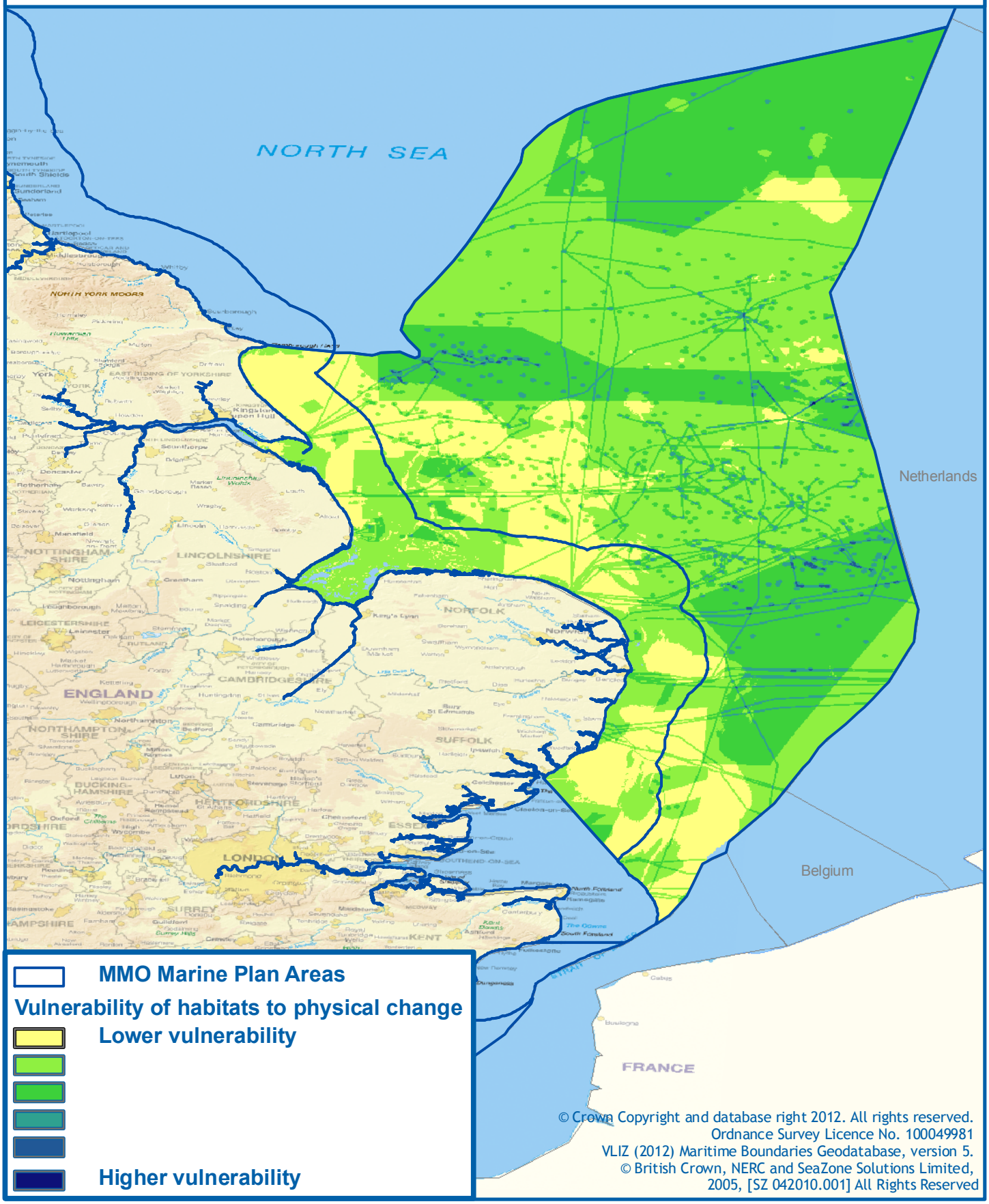
This map has been produced using the ETRS89 Coordinate Reference System



5.2 Application of pressure/sensitivity assessment to derive and visualise potential future scenarios

Another application of sensitivity assessment that could inform marine planning is to consider and present pressures from the perspective of one activity that is to indicate the full pressure footprint of an activity by combining the different pressures it generates. Again, the results would be particularly applicable to assessing the potential effects of future increase in the activity and where to site the activity to reduce pressures over sensitive habitats. If the approach is deemed appropriate and useful, any outputs should be regarded as a 'soft constraint' that require an agreed assessment of the degree of restriction posed rather than a hard constraint (that is those which are clearly incompatible). Examples are provided for wind energy and for aggregate extraction (in the Futures analysis at the end of Chapter 4).

5.3 Assessing the interactions between multiple activities

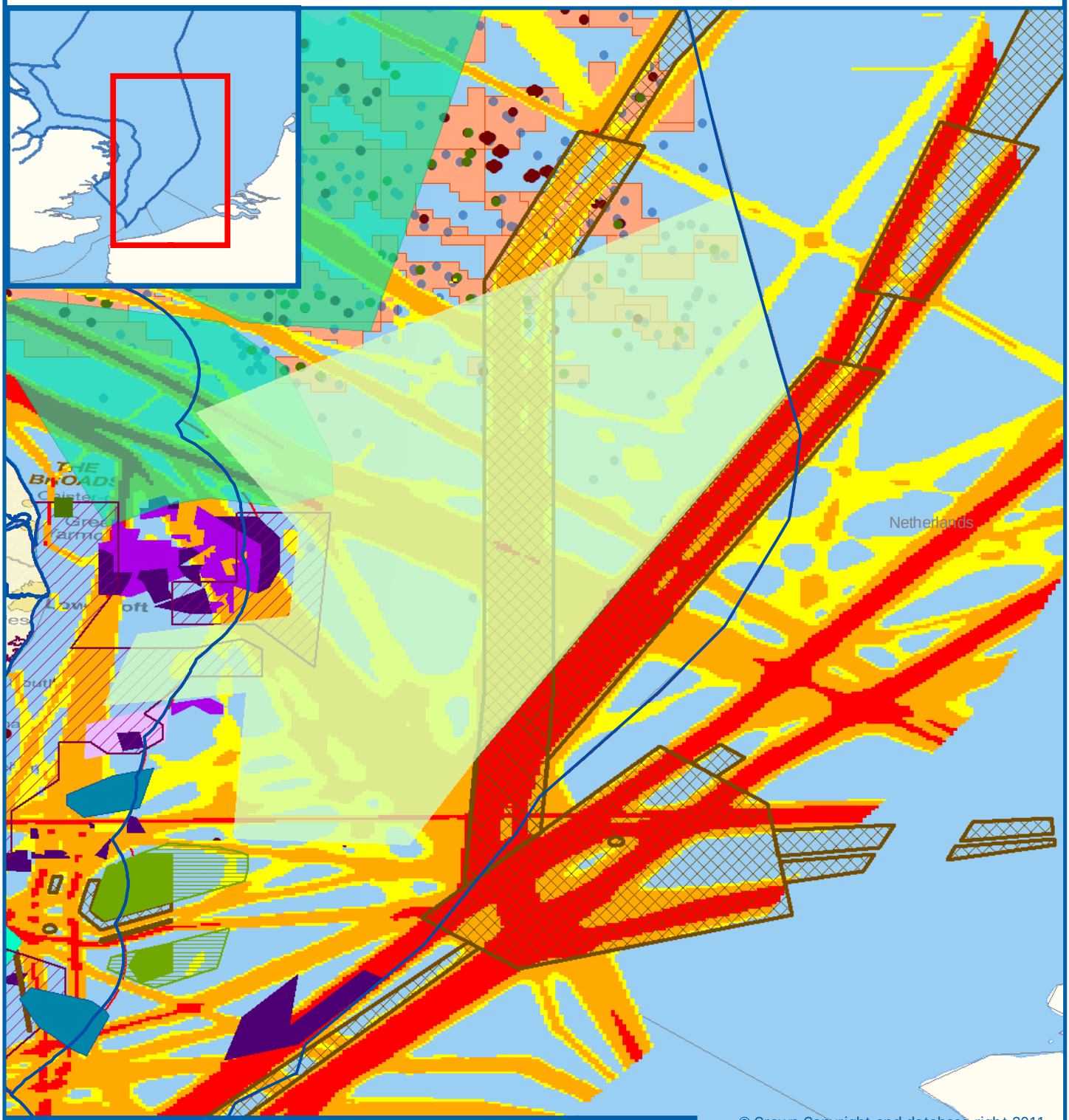
The East plan areas support the activities of a wide range of sectors. Chapter 5 presents mapped examples showing areas that are particularly busy, where co-location is currently taking place and where activities may develop in the near future. They highlight varying demands for space across the plan areas and where future demands may raise concerns that require consideration through marine planning.

An example can be seen off East Anglia where a Round 3 wind farm zone (area of search) is located in an area of significant shipping activity including a designated International Maritime Organization (IMO) route. The western edge of the zone overlaps with a special protection area (SPA) and a special area of conservation (SAC). There is also significant oil and gas extraction activity through the northern edge of the zone. See Chapter 5 of the full Evidence and Emerging Issues Report for more details and more examples.

Figure 5.12: Interactions across current activities and leased areas off the East Anglian coast

November 2011
This map has been produced using the ETRS89 Coordinate Reference System

marine management organisation



- MMO Marine Plan Areas
- Round 1 Wind Farms Lease
- Round 2 Wind Farms Lease
- Round 1-2 Wind Farm Ext
- Round 3 Wind Farms Zone
- MCZ Recommended Sites
- Inshore SPA
- Latest Offshore SAC Sites
- Inshore SAC
- Aggregates Applications
- Aggregates Licences
- Aggregates Prospecting or Options
- IMO Routing (polygon)
- Shipping > 1000 ships per year
- Shipping 200- 1000 ships per year
- Shipping 100- 200 ships year
- Subsurface infrastructure
- Surface infrastructure
- Wells
- Current oil and gas licence areas

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Chapter 6: Environmental, social and economic issues

The Sustainability Appraisal (SA) has been structured around eight sustainability topics. Each topic essentially represents a broad sustainability receptor – that is an element of the baseline that has the potential to be significantly impacted as a result of the plan. Each topic is outlined and discussed in relation to the first six questions to be addressed as part of SA.

6.1 Air and climate

Introduction

The significant impacts of air pollution relate primarily to **health effects** on people. It is estimated that the health impact of man-made particulate air pollution costs between £8.6 billion and £18.6 billion a year[94]. However, legislation and policy measures introduced over the last 30 years have successfully minimised the worst health effects of air pollutants.

The most recent of these being the Ambient Air Quality Directive (2008/50/EC) which sets legally binding limits for concentrations of major air pollutants that impact public health such as particulate matter (PM_{10} and $PM_{2.5}$) and nitrogen dioxide (NO_2)and which was transposed into English law through the Air Quality Standards Regulations 2010[95]. Declining rates of respiratory diseases and improved life chances are testimony to these policy interventions, although there is still the opportunity for continued gains[96].

Climate change is a reality that threatens major economic, social and environmental dislocation within a few decades. It is exacerbated by human activity, primarily greenhouse gas emissions from the burning of fossil fuels. Under the **Climate Change Act 2008**, the government is committed to a 34 per cent reduction in emissions by 2020 and 80 per cent reductions by 2050. The marine areas must plan for and adapt social and economic activities to be more resilient to impacts of climate change that will inevitably arise. There is also a need to consider wide ranging indirect and secondary effects – for example the effect of increased air temperature on sea temperature and knock-on effects from this. See figure 6.1 in the main report.

The SA considers air and climate as a single topic because many of the activities that can and will be influenced by the plan may result in impacts to both simultaneously. Furthermore the UK government is increasingly seeking to **develop air quality and climate change policy in parallel**.

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[94] Defra (2010) Valuing the Overall Impacts of Air Pollution

[95] Directive 2004/35/CE of the European Parliament and of the Council on environmental liability with regard to the prevention and remedying of environmental damage http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:143:0056:0075:EN:PDF, accessed June 2011

[96] British Lung Foundation, http://www.lunguk.org/media-and-campaigning/media-centre/lung-stats-and-facts/factsaboutrespiratorydisease, (Accessed June 2011)

Optimisation of climate change policy to take into consideration of air pollution issues is predicted to yield economic benefits of approximately £24 billion by 2050 (largely as a result of improving health as well as reduced carbon dioxide emissions as part of the transition to low carbon transport and energy generation)[97].

Baseline

Air quality

The greater North Sea is one of the world's busiest maritime areas with high shipping densities particularly in inshore waters. Shipping activity, notably around the Humber Estuary, the Wash and Felixstowe contribute to detectable levels of emissions of PM_{10}, nitrogen oxides (NO_x), carbon monoxide (CO), sulphur dioxide (SO_2) in the marine area. In some places, levels of SO_2 and NO_x are relatively higher in the marine area than in adjacent onshore areas[98]. Over the plan period shipping activity is expected to increase as freight transport is increasingly shifted from road and rail. Ship-based transport is expected to continue to increase and is expected to remain the principle means for UK goods transportation. Agreed amendments to the International Convention for the Prevention of Pollution from Ships (MARPOL) commit to reduce SO_2 and NO_x with stringent controls being placed on marine engines from January 2016 which will help improve air quality at ports where ships dock.

Other major activities to be addressed through the marine plan areas include the exploitation of oil and gas reserves, the extraction of sand and gravel, and fishing. Offshore oil and gas installations are a source of emissions, particularly in terms of SO_2 and NO_x. NO_x from offshore installations have remained relatively stable since 1999, but emissions of SO_2 have reduced significantly, as have emissions of methane and non-methane volatile organic compounds (VOCs). Shipping activities associated with oil and gas exploration and production dominate fixed installation related emissions.

Air quality is not routinely monitored at offshore sites. However it is conducted by coastal local authorities. In some coastal local authorities air quality management areas (AQMAs) have been established to manage exceedances of EU limits[99]. 16 AQMAs exist in local authority areas adjacent to the east inshore plan area.

Climate change

The UK is the only country in the world to commit to long-term legally binding greenhouse gas emission targets – at least 80 per cent by 2050 with an interim target of 34 per cent by 2020. Through the EU Renewable Energy Directive, the UK has a legal commitment to produce 15 per cent of its energy from renewable sources by 2020.

[97] DECC UK Offshore Energy Strategic Environmental Assessment, OESEA2 Appendix 3 Environmental baseline

[98] UK Offshore Energy Strategic Environmental Assessment, OESEA2 Appendix 3 Environmental baseline (DECC 2011)

[99] The air Quality Strategy for England, Scotland, Wales and Northern Ireland (Defra 2007) www.official-documents.gov.uk/document/cm71/7169/7169_i.pdf

In relation to climate change, and **climate change mitigation** in particular, there is a need to give consideration to the current rate of rollout for offshore wind turbines and marine renewables, as this is something that is likely to be influenced by the plan, and which should be a focus of the SA.

Current offshore installed wind energy capacity is around 1.6 GigaWatts (GW)[100] and total offshore installed capacity is projected to be around 18 GW by 2020[101]. The proposed capacity of the Round 3 sites is 32 GW with the potential to supply over 25 per cent of the UK's net electricity demand[102].

Offshore wind, of which the vast majority will be developed in East Offshore area, is projected to provide a significant proportion of UK electricity, contributing to over 10 per cent of total UK electricity supply by 2020[103]. Wave and tidal technologies are emerging industries with some demonstrator sites operational. No sites are located in the East Offshore area.

Emissions from ships are estimated to be approximately 3 per cent of total global carbon dioxide emissions and are projected to rise to approximately 15 to 30 per cent by 2050 due to expected increase in global trade[104]. UK shipping emissions are estimated between 0.8 and 5 per cent of global emissions[105]. Compared to other forms of freight transport including road, rail and air, shipping releases fewer $kgCO_2e$ per tonne per km travelled[106]. This means that, per kilometre travelled by tonne of freight, fewer greenhouse gases are emitted by shipping other than other forms of freight transport. The committee on climate Change recommends that international shipping emissions are included in the UK's 2050 target.

It is also important to identify the role of the oceans in absorbing carbon dioxide. On average the oceans remove approximately 25 per cent of atmospheric emissions from human activities. However, there is evidence that in some areas in the North East Atlantic the efficiency of carbon dioxide uptake is decreasing.

Up to 39 per cent of the atmospheric carbon captured by living organisms is taken up at sea, captured by the ocean's vegetated habitats including salt marshes, seagrass and seaweed. Although these habitats only cover a very small proportion of the sea bed they perform an important role in mitigating climate change[107].

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[100] RenewableUK, Working for a Green Britain: Employment and Skills in the UK Wind & Marine Industries, February 2011
[101] The UK Renewable Energy Strategy, July 2009
[102] RenewableUK, Annual Review 2010
[103] The UK Renewable Energy Strategy (2009) Calculated based on 13GW of offshore and 14GW of onshore wind installed and wind providing two thirds of the 30 per cent of total electricity demand in 2020. The Renewable Energy Strategy indicates that up to 20GW of offshore wind could be installed by 2020
[104] DECC, UK Offshore Energy Strategic Environmental Assessment, OESEA2 Appendices 1, 2, 4 , and 5, February 2011
[105] Gilbert, P, Bows, A, Starkey, R (2010) Shipping and climate change: Scope for unilateral action
[106] Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting (2011) (Maritime Shipping General Cargo Average=0.015 $kgCO_2e$ per tonne.km) (Rail=0.037$kgCO_2e$ per tonne.km) (All HGV UK Average= 0.154 $kgCO_2e$ per tonne.km) (Air, Long-haul international=0.727 $kgCO_2e$ per tonne.km)
[107] UNEP, FAO, IC/UNESCO (2009) Blue Carbon, The Role of Health Oceans in Binding Carbon, A Rapid Response Assessment

During the lifespan of the marine plans the UK is expected to undergo a significant shift in its reliance on renewable and low carbon energy generation. The UK will still remain reliant to a large degree on fossil fuel powered electricity generation. However, the Clean Air Act and Large Combustion Plant Directives (LCPD) will force a number of existing coal power stations to close by 2015 with the need to replace these with other generation.

Issues and opportunities

- To ensure the maximum sustainable deployment of offshore wind and marine renewable technologies.
- To safeguard access to potentially suitable geological storage areas for carbon dioxide.
- To minimise air pollution associated with oil and gas exploitation and related industrial activities.
- To consider how marine planning can contribute to reducing further growth in emissions from the transport sector (shipping, aviation, road, and rail) as a result of the marine plan/s, and associated activities.
- Identify, promote and plan for more low carbon industry, such as production of low carbon goods or services and to provide new jobs and businesses.

6.2 Communities and health (incorporating equalities assessment)

Introduction

The SA considers how the marine plans may impact on communities living along the coastline and in inland areas corresponding to the East marine plan areas. The SA includes an integrated equalities impact assessment (EqIA). This is to enable the Marine Management Organisation (MMO), as a public authority, to fulfil its duty to give due regard to the need to promote equality, tackle discrimination and promote good relations between different groups in society. It also includes consideration of the potential health impacts of the marine plans for people living in affected communities.

The Localism Act and the Health and Social Care Bill are both significant pieces of new legislation that will give rise to important changes affecting local communities, while the Welfare Reform Act, another major piece of new legislation, is already beginning to be implemented. The Localism Act is intended to devolve greater powers to councils and neighbourhoods and give local communities more control over housing and planning decisions. The Health and Social Care Bill proposes changes to the way in which NHS services are provided, commissioned and overseen, changes to improve democratic accountability, and to strengthen public health services. These new pieces of legislation, once enacted, are likely to alter the policy context for the marine plan's implementation.

Social deprivation in cities, towns and rural communities relate to a range of dimensions, including the quality of the physical environment and housing infrastructure, employment opportunities, income and wealth of individuals and households, mental and physical health and the range and quality of services, shops and leisure activities available to people. Where a significant numbers of people experience disadvantage in their access to and possessing of these various forms of

assets or services within a local area, the effects can be detrimental for people's health and wellbeing, may be associated with increased crime levels and safety concerns, and can be damaging to community cohesion, to social mobility and to the life chance of individuals.

Health is defined by the World Health Organisation as "a **state of complete physical, mental and social well-being and not merely the absence of disease or infirmity**"[108]. This definition encourages recognition of how global, national and local conditions contribute to determining an individual's health, in combination with an individual's own lifestyle and hereditary factors.

The Equality Act 2010 covers nine protected characteristics – age, disability, gender reassignment, pregnancy and maternity, race, religion or belief, sex, sexual orientation, marriage and civil partnership (applicable only to the need to eliminate unlawful discrimination) – which cannot be used, either directly or indirectly, as a basis for unequal treatment.

Within our diverse society, characteristics such as race, disability, and sex are associated with differences in people's opportunities, their health status and likelihood of experiencing deprivation. **Social inequality and deprivation are strongly linked**, with inequalities in educational attainment or income levels associated with higher rates of social problems affecting people lower down the social gradient, such as problems of depression, obesity, children's educational attainment and experience of violence.

The Eastern coastline includes both sizeable cities and towns which have been associated with particular traditional industries and many of which have experienced decline, giving rise to, deprivation, prompting regeneration investment to address these problems. The coastline also includes a mix of other resort town, coastal and rural villages with diversity in terms of the social status, economic situation and health status of individuals. It is important to understand how the marine plans may affect local people, within the context of a complex mix of global, national and local influences.

Baseline

Health

Throughout much of England, percentages of residents with long-term limiting illness or self-assessed "health not good" are higher in coastal areas compared to inland. However, these figures are likely to reflect other patterns in demographics such as age structure, as a number of coastal settlements have large populations of elderly people. Similarly, a number of coastal settlements exhibit high levels of deprivation. Self-reported not good health, used as an indicator of health deprivation, shows concentrations of poor health particularly marked in Hull, Mablethorpe, Felixstowe and surrounding communities, but also along much of the remainder of the coastal fringe adjoining the plan areas.

[108] World Health Organisation, www.who.int/suggestions/faq/en/index.html, accessed 28 September 2011

Life expectancies for both men and women are shorter than the national average in Kingston-upon-Hull, North East Lincolnshire and North Lincolnshire. See figure 6.7 in the main report.

Health is closely related with deprivation. The following section is complementary to the evidence provided regarding wider determinants of health and health deprivation.

Deprivation

The **coastline adjacent to the east inshore plan area experiences above average levels of deprivation,** with particular towns, experiencing significant levels of deprivation within the worst 10 per cent in England. Deprivation disparity in the East of England is one of the highest in England. Yorkshire and the Humber and the West Midlands also have notable deprivation disparity (see Figure 6.8).

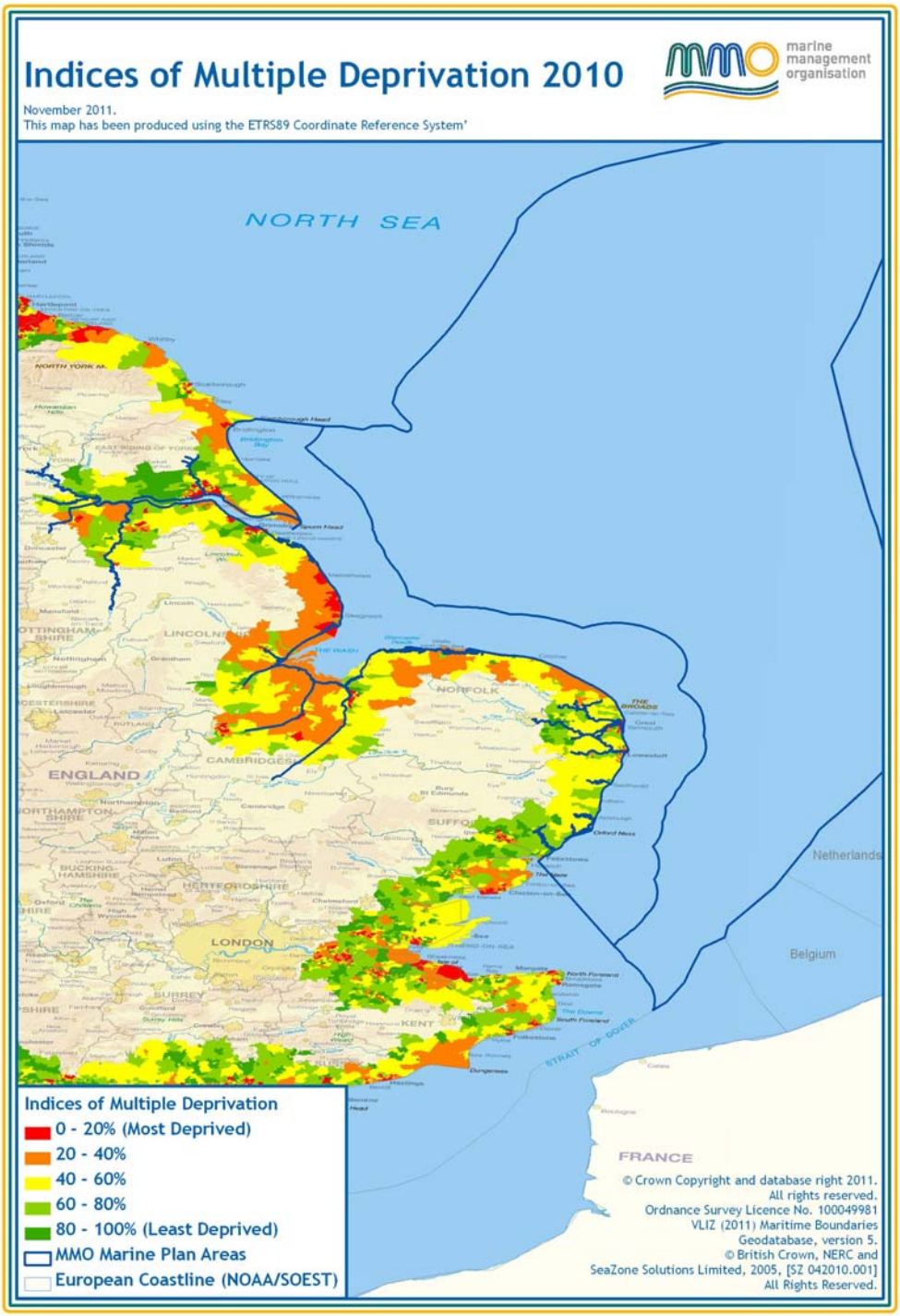

Figure 6.8: 2010 Indices of Multiple Deprivation map

The recent recession and ongoing financial crisis has resulted in marked increases in unemployment across England. While many regions have experienced increases in unemployment levels, Kingston-upon-Hull, in particular has experienced the highest increase in number of people unemployed and remains significantly above regional and national averages, strongly associated with continued falls in manufacturing jobs and other business sectors[109]. See figure 6.10 in the main report.

Jobs at all levels are needed across many of the deprived areas correspond to the marine plan geography. A widespread problem of lack of well-paid and high skill opportunities currently contributes to a brain drain from the region, an outcome as well as factor in perpetuating deprivation.

Regeneration areas

The East Inshore marine plan area adjoining the coastal strip includes a number of areas where investment has been directed towards achieving regeneration in order to address deprivation and health inequalities.

The South Humber Gateway boasts excellent transport infrastructure, including the busiest ports complex in the UK and is identified as having 1,000 hectares of development land presenting a strategic development site fronting a deep-water estuary, with potential for significant employment creation in Yorkshire and Humber[110].

Grimsby and Cleethorpes are both identified as areas in need of regeneration. In Grimsby this includes efforts to develop fish docks and waterfront areas. While in Cleethorpes there is an emphasis on enhancing its attractiveness as a seaside resort[111].

Enterprise zone funding at Great Yarmouth and Lowestoft is focused on enhancing the area's market share of activity and income from the energy sector, including from planned investment in offshore wind and other renewables, gas exploration, extraction and storage, decommissioning and civil nuclear power[112]. Significant associated job creation potential is identified.

Coastal and rural communities

The East plan areas both support high levels of fishing activity, both commercial and for recreation. The UK fishing sector remains important locally in terms of employment despite its declining significance as a contributor to the UK economy. It also has importance in the inter-relationship between tourism and fishing, towards maintaining sustainable coastal communities.

Many coastal communities comprise sizeable or growing numbers of older people with significant care needs. See figure 6.15 in main report. This places an increased demand on health and social care services. Rural communities are in certain areas experiencing declines in population or ageing of their populations. In the Fens and other areas, many settlements include people in lower skill occupations. Though they generally have lower average levels of deprivation, they tend to face significant travel costs and problems of higher heating costs.

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[109] Hull and Humber Ports City Region, Economic Assessment – March 2010, Humber Economic Partnership

[110] www.northlincs.gov.uk/NorthLincs/Business/Invest/SouthHumberGateway.htm, accessed September 2011

[111] New Horizons, A regeneration strategy for North East Lincolnshire 2006-2022, North East Lincolnshire Council

[112] www.waveney.gov.uk/site/scripts/documents_info.php?documentID=707&categoryID=100002

Diversity and inequality

Existing inequalities occur between people in relation to identity characteristics, such as age or disability, as well as in relation to differences in income or educational status. Equality legislation protects against illegal discrimination on grounds of a number of protected characteristics. This section sets out existing trends in terms of the diversity of the population and existing inequalities relevant to the East plan areas.

Deprivation and social inequality are strongly linked, so that people who have lower level qualifications and lower status/worse paid jobs, experience higher rates of social deprivation, in terms of crime, health problems, poor quality local environment, as well as rates of poverty. Social inequalities often also relate strongly to disadvantage experienced in relation to characteristics such as disability, age or race, characteristics protected by equalities legislation.

Ageing is a significant trend affecting the coastal communities while Lincolnshire and North Norfolk are areas which struggle to retain young people or attract them to the area.

Gender pay differences, segregation within the labour market and the different patterns of working between men and women are important dimensions to consider with respect to equal opportunities for men and women. Gender pay differences identify the percentage difference in median hourly earnings of men and women.

For full-time employees, the gender pay difference in the East Midlands was 14.1 per cent, which is the second highest after the South East. In the East the gender pay difference was 12.2 per cent, above the overall UK rate of 10.2 per cent. The full time gender pay gap is less marked at 8.7 per cent in Yorkshire and Humber[113].

The pay gap between part time and full-time median hourly earnings is very marked in the East of England (-8.0), whereas in Yorkshire and Humber (-4.5) it is more in line with the national average (-4.0), while in the East Midlands, there is a positive pay gap of 0.8.

Migrant workers from central and eastern European countries that joined the EU in 2004 (A8 countries) as well as from Bulgaria and Romania that joined the EU in 2007 (A2 countries) comprise a significant proportion of the cultural diversity of the East coast population. Restrictions on A8 nationals' rights to work ended in May 2011, whereas A2 nationals will continue to face restrictions on their rights to work until January 2012. Economic migrants face particular vulnerabilities in terms of housing, employment conditions as well as economic and social inclusion. Large numbers of migrants in local communities have also posed challenges for policing and education services, as well as for community cohesion[114].

[113] ONS 2010: Statistical Bulletin: Annual Survey of Hours and Earnings 2010
[114] The UK's new Europeans: Progress and challenges five years after accession 2009 www.equalityhumanrights.com/uploaded_files/new_europeans.pdf Accessed 13/10/2011

Issues and opportunities

- Social impacts relate to individuals, households and communities. While area-based deprivation data can provide a useful sense of potential issues, not all people living in the areas will experience the same opportunities or disadvantages.
- A very wide range of other policies and initiatives influence community, health and equality. This makes it difficult to identify and judge the significance of marine plan policy on the existing situation.
- A variety of regeneration initiatives are taking place or are planned within the area, some of which are directly related to expected investment in inshore and offshore waters. The appraisal will need to consider how the Plans will contribute to and reinforce these.
- Opportunities exist to enhance the confidence of industry to invest in deprived areas. Lack of clarity in terms of investment conditions has the potential to drive investment to other parts of the world.
- A further consideration will be how effectively this investment is likely to bring about changes that impact on existing unfavourable conditions which shape social and health inequalities.
- Poor health and deprivation are significant factors that the Plan needs to address, both through employment creation. Marine planning may also indirectly influence improvements to the living environment, although land-based policies are likely to be more significant in driving such improvements.
- Existing economic deprivation, including income inequalities, increasing unemployment, low educational attainment and skills levels may hamper efforts to share the potential economic benefits in order to tackle existing social and health inequalities.
- Coastal communities adjacent to the East Inshore plan area include towns which are amongst the 10 per cent most deprived communities in England. See Figure 6.8 in the main report. The Typology identifies that the area includes many towns and cities that have lost their primary markets and are facing challenges to identify and secure new ones. Amongst these, fishing has declined as a significant contributor to employment and economy, though it retains social and heritage value.
- Many coastal communities comprise sizeable or growing numbers of older people with significant care needs. This places an increased demand on health and social care services. Increasing likelihood of more frequent and more severe extreme weather events and coastal flood risk due to climate change may mean health, social care and emergency services lack the resilience to cope with demands when a major flood or other extreme weather event occurs.
- Tourism and recreation have a significant influence within the plan areas and can be important in contributing to social wellbeing and health, which the plan may be able to enhance.
- While the region has a relatively small BME (Black, Minority and Ethnic) population, A2 and A8 migrant populations as well as Gypsy and Traveller populations experience particular vulnerabilities which will require consideration, particularly with respect to employment creation. Local authority land use decision making with respect to marine plan-related activities may affect opportunities for identifying new sites for Gypsies and Travellers along the coastal strip.

- Existing gender and part time working salary inequalities are very wide in the East Midlands and East of England.
- Marine plans provide an opportunity to direct investment towards areas of deprivation, potentially improving the quality of the living environment and opportunities, so tackling causes of social and health inequality and poor community cohesion.
- Opportunities to create new employment, including jobs at a variety of levels, and to drive an increased emphasis on education, skills and training so that disadvantaged groups living in the area are able to share in the benefits of investment.
- Potential to provide opportunities which enable young people to remain in or be drawn to the region.
- Potential opportunities to strengthen tourism and leisure provision, with benefits for healthy living and community cohesion.
- Potential opportunities to mitigate climate change impacts for coastal communities and enhance resilience of towns with significant ageing populations.
- Potential opportunities to strengthen community involvement in how investment is allocated in cities, towns and other coastal communities near land hubs associated with marine activities.

6.3 Cultural Heritage

Introduction and baseline summary

The Marine Policy Statement (MPS) (Defra, 2011) states that "The historic environment includes the aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged. Those elements of the historic environment – buildings, monuments, sites or landscapes – that have been positively identified as holding a degree of significance[115] meriting consideration are called "heritage assets".

As an island nation, the history of the lands now comprising the UK is inextricably linked with the sea, comprising a range of maritime (such as seafaring) remains, features associated with coastal settlement, as well as remains of former terrestrial landscapes and their inhabitants, submerged following historic sea-level rise.

The East marine plan areas have particular heritage interest given their inclusion of continental shelf regions which were once exposed above water between the British Isles and mainland Europe during glacial periods and for being the scene of considerable wartime activity both at sea and in the air.

The marine heritage resource is relatively unknown by comparison with the terrestrial record, but is equally threatened by natural and human influences. Development in coastal areas, offshore energy projects, pipelines, dredging and fishing may all have an impact on the marine and coastal heritage resource.

[115] Significance is the value of a heritage asset to this and future generations because of its heritage interests.

Cultural heritage is not restricted to physical features but also applies to socio-cultural associations with particular areas that contribute to a sense of place. This can be important for coastal communities which have strong historical connections with, for example, industrial heritage, such as fishing, shipbuilding and trade.

A large number of policy documents have been produced from the international through to the local level that have the overarching objective of protecting, conserving and enhancing the archaeological and cultural heritage resources throughout the UK.

The coastal zone contains a large number of statutory heritage features including listed structures, scheduled ancient monuments and registered historic parks and gardens. These may include, for example lighthouses, quaysides, piers or ancient remains. While not all strictly below the mean high water mark, these features may be indirectly affected by activities at sea. Further information about these features will be obtained during the next stage of the SA process as necessary.

Five notable historic areas in the East marine plan areas are:

- Yorkshire Coast
- Sea Henge, Holme-next-to-Sea, Norfolk
- Dogger Bank
- Leman and Ower Banks (submerged landscape)
- Brown Ridge.

Wrecks

The strategic importance of the sea, a long history of fishing for food, the importance of maritime trade routes and the treacherous nature of many inshore waters, has lead to a large number of shipwrecks in UK waters although information about the number, type and location of them is limited. There are around 7,352 wreck sites listed in the National Monument Record (NMR) which are located in the plan areas although some of these are located in terrestrial fluvial environments (such as river terraces).

There are four historic protected wrecks (protected by either the Protection of Wrecks Act 1973 or the Protection of Military Remains Act 1986) within the East of England marine plan areas:

- Dunwich Bank in Southwold, Suffolk
- Bonhomme Richard in Filey Bay, Yorkshire
- HMS Exmoor off Lowestoft
- HMS Vortigern off Cromer.

Issues and opportunities

- Knowledge of offshore archaeology is limited by the practical and economic problems involved in searching large areas of the sea floor, Published archaeological research guide further studies, such as The North Sea Prehistory Research and Management Framework (2009).

- Dredging (including aggregate extraction) and benthic fishing methods may disturb the sea bed and damage sites.
- Developments in the offshore zone have the potential to uncover, disturb or destroy archaeological remains lying on or under the sea bed and any impacts should be taken into account in decision making as informed by SEA and EIA procedures. Of particular concern are major infrastructure developments such as the construction of oil and gas installations, commercial ports and offshore wind farms. Indirect impacts are not always fully appreciated, they can include changes to local current patterns, sediment movements and scour from cables and structures.
- The cumulative effects of marine activities upon heritage assets are of particular concern.
- Whilst artificial coastal defence works can help to retain the stability of fast-eroding sections of coastline, they can have adverse impacts downdrift and offshore as sediment movement becomes disrupted. Increased rates of scour may expose or erode deposits of potential archaeological value. The resulting situation is one which requires continual surveying of sites at an appropriate suitable frequency to support the monitoring of sites and where appropriate the recovery of important artefacts. In many cases erosion is geologically controlled, such as at Holderness (see 6.3 in the main report).
- The visual impacts of development on landscape/seascape[116] have the potential to affect the setting of historical features. Changes may be significant from a heritage perspective, but also affect the potential for income from tourist-related activities. These may arise from both offshore developments and their coastal-based infrastructure.
- Commercial salvage and attrition as a result of recreational diving are localised threats to the archaeological resource, with total salvage from wrecks on the UK continental shelf unclear with under reporting likely[117].
- An erosion of 'way of life' associated with declining fishing communities in which historic connections and family ties with the fishing industry may be diminishing. The same may be true of other industries where pressures to reduce manpower or reform working practices would have an adverse impact on cultural associations. See also sections 6.2 and 6.5 of this document.
- Archaeological sites in offshore areas and north of the Dogger Bank are less well known than the more intensively studied southern North Sea. Material of Palaeolithic or early Mesolithic provenance may exist.
- Co-location of activities and developments with sites areas of archaeological interest requires attention, in order to optimise spatial planning and thereby support access and long-term conservation.
- Marine plans provide an opportunity to improve the protection of heritage resources in the coastal and offshore areas.

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[116] Wessex Archaeology (2007). Historical Environment Guidance for the Offshore Renewable Energy Sector. Published by COWRIE Ltd, UK, 52pp.
[117] Wessex Archaeology (2008). Wessex Archaeology website (accessed March 2008) http://news.wessexarch.co.uk/2008/03/09/evidence-of-ice-age-hunters-found-below-northsea/

- Opportunities to gain a greater insight into the marine archaeological resource may arise through adoption of measures that place new information in the public realm.
- Potential advantages to heritage tourism where existing and newly discovered coastal sites are protected, or enhanced through appropriate management.

6.4 Marine ecology

Introduction

This section provides a brief overview of the main ecological elements of the coast and sea within the East marine plan areas. It also outlines elements important for biodiversity or nature conservation beyond those encompassed within Marine Protected Areas and other designated sites that are set out in Chapter 4.1 of the main report.

The Marine Policy Statement (MPS)[118] is wide reaching and provides a policy steer for marine decision makers in relation to most marine activities. More widely and in relation to all marine activities, high level environmental considerations are provided by reaffirming the conservation responsibilities of the UK Government which are to be taken account of in the preparation of marine plans. This includes the commitment to establishing a UK network of marine protected areas (MPAs) incorporating the new marine conservation zone (MCZ) designation under the Marine and Coastal Access Act 2009 and existing and future marine sites including special areas of conservation (SACs) and special protection areas (SPAs), but also covers conservation responsibilities in all UK waters.

The composition of the seabed fauna of the UK reflects the intersection of four biogeographical zones or provinces, with the North Sea being covered by the Boreal Province. Each province has a distinguishable series of faunal communities inhabiting specific sediment types, and often these communities extend over wide areas (such as the fine sands of the central North Sea). In addition, there are a number of highly localised habitats and communities, including reefs of long lived horse mussels and cold water corals, some of which are the subject of biodiversity conservation action at an OSPAR, EU or UK-level. More detail on the constituent parts of the species and habitats present in the marine plan areas can be found in the full version of this document.

Issues and opportunities

The trajectory of individual receptors covered by the Biodiversity, Habitats, Flora and Fauna topic has been outlined elsewhere[119]. A number of key environmental issues which affect these receptors, and which are also of particular relevance to the East marine plan areas are:

- **Climate change**: rising global air and sea temperatures and associated sea-level rise has implications for all receptors considered in the marine ecology chapter,

[118] Defra (2011) UK Marine Policy Statement. TSO, London
[119] Defra (2010). Charting Progress 2: An assessment of the state of UK seas. Published by the Department for Environment Food and Rural Affairs on behalf of the UK Marine Monitoring and Assessment Strategy community, London,

for instance the loss of intertidal habitat (such as used by waterbirds and waders) through coastal squeeze (see Section 6.6). More direct changes include a change in the plankton growing season and the distribution of certain fish species (such as the coldwater monkfish *Lophius piscatorius* has progressively moved northwards) which may also be prey species for other animals such as seals. Ocean acidification, through the uptake of CO_2 from the atmosphere, is predicted to have future negative impacts on calcifying organisms, including numerous plankton taxa, molluscs, echinoderms and molluscs, which will resonate at higher trophic levels (see figure 6.1 in the main report).

- **Habitat loss and disturbance**: fishing impacts include the depletion of commercial fish stocks, impacts on benthic habitats and by-catch[120] of, non-target fish species, seabirds, marine reptiles and cetaceans. Habitat damage resulting from the harvesting of shellfish (such as scallop dredging) can also cause changes to marine ecosystems, for instance leading to mortality of benthic organisms and the reduction in food availability for waterbirds or marine mammals. On a smaller scale, direct impacts on benthic habitats arise from aggregate extraction, wind farm installation and other offshore subsea installation.
- **Marine litter**: ingestion of or entanglement in marine litter by fish, mammals, reptiles and birds can result in mortality.
- **Marine noise**: anthropogenic activities in the East Inshore and East Offshore areas which generate marine noise include shipping, oil and gas exploration and production (which may include the acquisition of seismic data) and wind farm installation (presently largely reliant on pile driving). Marine mammals are of principal concern, though fish and cephalopods may also be subject to disturbance by noise.
- **Pollution**: estuarine fish species are still subject to pressure from inputs of pollutants and coastal developments, though a number of initiatives (including those associated with the Water Framework Directive) are helping to improve the physical and chemical quality of rivers and estuaries.
- **Non-native species**: the spread of non-native species may be accentuated by climate change. Their appearance in a number of habitats around the UK, including intertidal and shallow sub-tidal environments, is being addressed through a number of national and international initiatives aiming to recommend and introduce safeguards to limit the transport of invasive species, including the GloBallast Partnership Programme and the Invasive Non-native Species Strategy for Great Britain.

Opportunities

In terms of opportunities, the marine plans will help to ensure that targets associated with, for instance, the implementation of the Marine Strategy Framework Directive (MSFD) in the UK are met, and ensure relevant high level marine objectives for the wider marine environment are also considered.

The Marine Management Organisation (MMO) should maximise the opportunities for integrating policy outcomes when drafting the marine plans (such as developments building-in beneficial features for marine ecology as part of good design).

[120] OECD definition http://stats.oecd.org/glossary/detail.asp?ID=252

6.5 Economy

Introduction

Broad issues that should be the focus of the SA for the plan areas from an economic sustainability perspective are understood from the UK Plan for Growth (2011)[121] and the Local Growth White Paper (2010)[122]. The key message from central government is that there is a need to support investment that will have a long-term impact on growth, working with markets rather than seeking to create artificial and unsustainable growth.

In some cases this means **focusing investment** at **areas with long-term growth challenges** so that these areas can undergo transition to an economy that responds to a local demand. In other cases this can mean focusing on **places that are currently successful**, maximising further growth by removing barriers (such as infrastructure constraints). Correspondingly, the Government is clear that economic policy should be judged on the degree to which it delivers growth that is:

- broad-based industrially and geographically, ensuring everyone has access, including future generations, to the opportunities that growth brings
- focused on businesses that compete with the best internationally.

The Marine Policy Statement[123] is also a key context document, given that it identifies the **varying potential for marine activities to result in economic benefits**. Other context documents are also useful in this sense. For example, the importance of port expansion to national and local economies is understood from the recently published National Policy Statement for Ports (NPSP)[124]. The NPSP identifies that, at regional and local level, ports can generate agglomeration effects by bringing together businesses, with varying degrees of mutual interaction, and producing economic benefits over and above those reflected in the value of transactions among those businesses.

It is important to state at the outset that the SA will focus on exploring the merits of the marine plans (and plan alternatives) in terms of economic issues for the coastal area at local and regional scales. The marine plans will also have effects that are felt more widely (such as benefits in terms of the competitiveness of the national economy), but these effects will be more difficult to attribute and hence understand.

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[121] HM Treasury (2001) The UK Plan for Growth available at www.hm-treasury.gov.uk/ukecon_growth_index.htm (Accessed 10/11)
[122] Department for Business, Innovation and Skills (2010) Local Growth: Realising Every Place's Potential available at www.bis.gov.uk/policies/economic-development/local-growth-white-paper (Accessed 10/11)
[123] HM Government (2011) UK Marine Policy Statement available at www.defra.gov.uk/publications/files/pb3654-marine-policy-statement-110316.pdf (Accessed 10/11)
[124] Department for Transport (2011) National Policy Statement for Ports available at http://assets.dft.gov.uk/publications/national-policy-statement-for-ports/111018-ports-nps-for-das.pdf (Accessed 11/11)

A recent study undertaken by Roger Tym & Partners / OCSI[125] advocates exploring the benefits of marine activities for local economies in terms of the potential for the activity to increase local labour utilisation and labour productivity. In terms of **labour utilisation**, the report finds that, for example:

Geographical proximity to an energy production site will not guarantee benefits. Rather, effects on local labour utilisation depend on the extent to which support industries (such as construction, maintenance and operations industries) are able to establish.
Ports and shipping activity tend to lead to benefits, as labour catchments tend to be relatively local, and there is demand for lower skilled labour, so creating jobs that are accessible for less well skilled workers who find themselves at increased risk of unemployment.

In terms of **labour productivity**, the report finds that, for example:

The renewables industry will be the beneficiary of very high levels of capital investment over coming years, and as a result it will attract skilled workers who will expect a high wage. As a result, this industry can support local increases in per capita output.
As with other primary/extractive industries, the fishing industry is less likely to drive forward local productivity (although it is important to note that there may be exceptions). Also, the presence of fisheries does tend to play a role in terms of supporting local distinctiveness, which in turn can boost productivity in the tourism industry.

Baseline

There are perhaps two aspects to the baseline that must be the focus of SA. Firstly, there is a need to consider the current economic performance of different areas along the coastline (and, where possible, understand any likely future trends that can be expected under a business as usual scenario). Secondly, there is a need to understand current and planned economic initiatives.

Economic performance of coastal areas

It has been possible to draw on work recently undertaken to by Roger Tym & Partners / OCSI[126]. The report uses a range of economic indicators to categorise all coastal areas nationally according to a typology. See table 6.2 in the main report.

Existing and planned economic initiatives

The East plan area coastline falls primarily within the local enterprise partnership (LEP) areas for The Humber, Greater Lincolnshire and New Anglia.

[125] Roger Tym and Partners / OSCI (2001) Maximising the socio-economic benefits of marine planning for English coastal communities available at www.marinemanagement.org.uk/marineplanning/documents/se_national.pdf (Accessed 10/11)
[126] Roger Tym and Partners / OSCI (2001) Maximising the socio-economic benefits of marine planning for English coastal communities available at www.marinemanagement.org.uk/marineplanning/documents/se_national.pdf (Accessed 10/11)

Through the **Humber LEP,** the four unitary Humber authorities are working with Associated British Ports and other private sector partners to establish the estuary as a major energy corridor, building on its existing role in non-renewables such as the import of coal and provision of support for North Sea gas terminals. Furthermore, in August 2011 the Government announced that the Humber Estuary Renewable Energy Super Cluster would be one of the 22 national enterprise zones.

The Greater Lincolnshire LEP is focusing attention within the coastal area on continued support for the agri-food sectors. This priority also extends to the King's Lynn and West Norfolk areas. To the north of Lincolnshire, Grimsby and Immingham (the fourth largest port in Northern Europe) does much to underpin the agri-food sector for the north of Greater Lincolnshire.

Within the **New Anglia LEP** the goal is to capitalise on strengths including the energy coastline tag, shipping, ports and logistics. The major international container port at Felixstowe (just outside the plan area) is a considerable feature.

Furthermore, in August 2011 the Government announced the Great Yarmouth and Lowestoft Enterprise Zone, which will seek to capitalise on the growth potential within the two towns that is offered by the energy sector. The focus will be on new jobs in the ports, logistics and engineering sectors as well as the services which support those.

A range of **other economic initiatives** are planned or underway, beyond those that are a particular focus of the LEPs. For example, several areas along the coastline have well developed long-term plans for recreation and tourism, and there are focused regeneration initiatives underway or planned for a number of towns. A survey by Roger Tym and Partners / OSCI[127] found that a number of areas along the coastline identify fishing as an important activity to be protected and supported, despite the fact that it is relatively peripheral as an economic priority.

Issues and opportunities

- Perhaps the key issue identified through scoping is the need to **encourage private sector investment and enterprise**, particularly in those localities currently underperforming and/or reliant on government jobs and investment. This should help to ensure that growth is sustainable in the longer-term.
- At the same time, there is a need to recognise that not all places and all sectors will wish to focus on becoming more competitive. Keeping things as they are in some instances can help to secure a **diverse economic base** and support local distinctiveness. There is a need to support long established industries as well as those that are emerging and developing.
- In terms of addressing economic barriers associated with localities, there is a particular need to support investment in **infrastructure**, including, where possible, transport infrastructure that helps to address the problem of geographic peripherality.

[127] Roger Tym & Partners / OCSI (2011). The East Marine Plan area: maximising the socio-economic benefits of marine planning available at www.marinemanagement.org.uk/marineplanning/documents/se_east.pdf (Accessed 10/11)

- There is a need to support the Humber area and the Great Yarmouth and Lowestoft area as they seek to develop a competitive advantage in relation to **energy and green technologies**.
- There is a need to create private sector certainty through planning for the offshore and onshore infrastructure needed to enable development of an offshore renewable energy **transmission network**, as well as Carbon Capture and Storage (CCS) transport and storage.
- Given that some new activities will be specialised or capital intensive activities that demand highly specialised labour or capital equipment from regional, national and even international markets, there is a need to support industries that can **minimise leakage**, including through supporting local skills development. A goal is to **increase average wages among the local population**, which will lead to an increase in the value of goods and services created per head.
- In the shorter-term, there is also a need to support activities that will lead to employment with high local effects on **labour utilisation**, that is where labour catchments are relatively local, and there is demand for lower skilled labour, so creating jobs that are accessible for less well skilled workers who find themselves at increased risk of unemployment. **Full-time jobs** should be supported so that there is a move away from seasonal or part time work particularly in areas that focus on the tourist economy.
- There is a need to support industries that can capitalise on the **stewardship of the natural and historic environment**, given the importance to tourism and investment more generally along this coastline.

6.6 Geology, geomorphology and coastal processes

Introduction and baseline summary

The present distribution of geological strata in the UK Continental Shelf (UKCS) and at the coast, including that of the East plan areas is determined by past geological and geomorphological processes. The present location of sediments and certain topographic features is a function of the underlying geology (such as at the coast, the spatial variation in erosional resistance) and millennia of aeolian, fluvial and glacial activity both in the marine and terrestrial environment. Sediment derived from coastal erosion and riverine inputs may be redistributed offshore and redeposited, contributing to shelf substrates, or be coastally redistributed where it may help to maintain beach systems in wave dominated environments or contribute to estuarine infilling, tidal flat and salt marsh in tidally dominated energy environments. The distribution of sediments is generally well characterised across the UKCS and the deep geological structure of the UKCS, and the North Sea in particular, is quite well known, particularly in areas of mature oil and gas production – the Southern North Sea is a mature gas province.

The hydrocarbon reservoirs of the UKCS have been a substantial source of oil and gas resources since their discovery in the 1960s. In some areas sediments provide suitable grades of aggregate which are extracted and used in construction, and more recently marine renewables present a new spatial use of the seabed. All of these activities have potential impacts for geology and substrates, whether it is physical disturbance and associated habitat loss, or contamination. Seabed sediments, like terrestrial soils, are also potential stores of cultural material.

Certain topographic features are important for the quality of habitat they provide, and these are bound by hard geology or sediment type and process (such as North Norfolk sandbanks), though others may be formed by marine organisms themselves (such as a biogenic reef). A range of notable topographic features are found in the East plan areas, and a number of candidate SACs are currently being considered. There are also a number of SACs with marine components which have qualifying features that can be described as geological or geomorphological, such as **sandbanks which are slightly covered by seawater all the time, reefs and submerged or partially submerged sea caves.** It should also be noted that the Marine and Coastal Access Act (MCAA) 2009 provides for the conservation of specific "features of geological and geomorphological interest" through the designation of marine conservation zones (MCZs).

The Joint Nature Conservation Committee (JNCC)[128] list 11 principal coastal physiographic features that are located in the East Inshore area. These update and reclassify a number of previous works and include estuaries, bays and lagoons. The importance of such features in coastal processes and as supporting habitats is recognised in statutory designations, for instance as Annex I habitats of the Habitats Directive.

Sediment flows, erosion rates and coastal landforms are greatly influenced by the tidal and wave environment which meets the coast. Current sea-level and historic sea-level change has influenced the character of much of the UK coastline[129] [130]. Integrated coastal zone management (ICZM) has been highlighted by the Inter-governmental Panel on Climate Change[131], as a means to deal with the threat of sea-level rise, and the principles are being adopted in the UK, for instance through shoreline management plans (and also river basin management plans).

In addition to the above, planning policy (such as Planning Policy Statement (PPS) 20 and PPS 25) and related guidance outlines how developers and authorities should manage development at the coast. This includes considering, among other things, impacts that may arise from a development (such as to whether it may enhance flood risk elsewhere), whether the development is itself flood resilient, whether it may be more appropriately located elsewhere, and whether it is sustainable in the long-term (for example, in the face of rising sea-levels)[132].

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[128] McBreen F, Askew N, Cameron A, Connor D, Ellwood H & Carter A (2011). UKSeaMap 2010: Predictive mapping of seabed habitats in UK waters. JNCC Report, No. 446.
[129] Shennan I & Horton B (2002). Holocene land- and sea-level changes in Great Britain. Journal of Quaternary Science 17: 511-526.
[130] Shennan I, Milne G & Bradley S (2009). Late Holocene relative land- and sea-level changes: Providing information for stakeholders. GSA Today 19: 52-53.
[131] Nicholls RJ, Wong PP, Burkett VR, Codignotto JO, Hay JE, McLean RF, Ragoonaden S & Woodroffe CD (2007). Coastal systems and low-lying areas. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Parry ML, Canziani OF, Palutikof JP, van der Linden PJ & Hanson CE (Eds.), Cambridge University Press, Cambridge, UK, 315-356.
[132] See paragraphs 148-162 of the draft National Planning Policy Framework, and corresponding detail in section 2.6.8 of the Marine Policy Statement.

Issues and opportunities

The environmental baseline is likely to evolve slowly in the absence of anthropogenic influences. At present there are no anthropogenic activities which are likely to cause significant regional scale changes to geology and sediments, though a number of key issues are outlined below:

- Trawling and dredging activities can generate localised scour and associated habitat damage and loss, and sediment plumes.
- Impacts at the coast have wider environmental and social implications, and are derived from both the natural denudation process, and anthropogenic impacts including coastal defence and other coastal infrastructure (such as cable and pipe landfall, new port infrastructure) and sea-level change.
- As coastal erosion and inundation in some areas may be uneconomic or undesirable to halt through engineering, the realignment of some coastal infrastructure and housing may be expected.
- The loss of some of the coastal archaeological resource that cannot be studied prior to inundation and erosion may also be expected.
- Many of the coastal and estuarine environments in the East Inshore area are defined as heavily modified due to the incidence of land reclamation, coastal and flooding defences, aggregate extraction, use for marine fisheries, and navigation and port activity. Heavily modified water bodies (HMWB) include those sites which have had their character or physical form greatly altered by anthropogenic activities, or which are designated as such under Article 4(3) of the Water Framework Directive. Work is underway in order to try and achieve "good ecological potential" (GEP) in such areas. In order to achieve GEP, mitigation measures set out for each water body by the Environment Agency need to be put in place.

The marine planning process also raises opportunities for the topic of geology, substrates and coastal processes, which include:

- Making the most of the requirement to consider other relevant plans including river basin management plans, shoreline management plans, flood risk management plans and other existing coastal policies and initiatives (such as coastal change management areas), in planning decisions and in drafting the marine plans.
- The consideration of the resilience of proposed developments given present projections with regards to sea-level change, and their potential impact on sediment dynamics.

6.7 Landscape and seascape

Introduction and baseline summary

Landscapes with views of the coast or sea, or more specifically seascapes, can be defined as "An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors" (from Article 1 of the European Landscape Convention), though were defined in the MPS[133] as

[133] Defra (2011) UK Marine Policy Statement. TSO, London, p21.

"landscapes with views of the coast or seas, and coasts and the adjacent marine environment with cultural, historical and archaeological links with each other".

Issues concerning landscape and seascape change are important but potentially subjective, based around the individual perceptions of residents, visitors or tourists.

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

Consistent with those issues to be considered when developing marine plans as outlined in the Marine Policy Statement, the plans and therefore the sustainability appraisal, will consider the potential visual, cultural, historical and archaeological impacts for both designated and non-designated areas. Additionally, the assessment will consider any wider social and economic impacts of a development or activity on coastal landscapes and seascapes.

The East Inshore plan area has been subject to a number of landscape character assessments (including historic landscape and pilot seascape assessment), as well as having been considered by a number of other initiatives of relevance to. These projects provide a baseline of information which may be used to generate a consideration of landscape/seascape character in the East Inshore area which is not isolated to designated landscapes. It should be noted, that though landscape designations occur exclusively within the East Inshore area, activities taking place further offshore may also be impacted by developments.

Landscape designations, and historic monuments and their settings, are dealt with in numerous terrestrial planning policy statements and guidance in England. It should be noted that there is a consultation underway to replace these with a consolidated National Planning Policy Framework. Most recently, the energy National Policy Statements (EN1 to 6) present a view consistent with the present PPS7 (and largely in keeping with the draft National Planning Policy Framework), that the highest protection status is afforded to statutory landscape designations (such as areas of outstanding natural beauty, national parks), within which proposed developments may be exceptionally granted consent where it is demonstrated to be in the public interest.

The European Landscape Convention (ELC) and associated initiatives are presently targeting a move away from focussing on aesthetically "outstanding" areas to adopt a general focus which looks at the quality and sustainability of all landscapes. This is reflected in the national character area network in England, more local landscape or historic character assessment, and organisation policy statements (such as Natural England's framework for implementation, and ELC action plan, the English Heritage Action Plan for Implementation). Moreover, the Marine Policy Statement states that, all coastal landscapes should be considered when developing marine plans, not just those which are protected through designations, which is broadly complementary to the tenets of the ELC.

The ELC requires, “landscape to be integrated into regional and town planning policies and in cultural, environmental, agricultural, social and economic policies, as well as any other policies with possible direct or indirect impacts on landscape (Article 5 (d)), and Natural England has prepared guidance on how to integrate the principles of the ELC into plans, policies and strategies. The ELC also raises a number of specific measures (Article 6) including: awareness raising, promotion in the training of landscape specialists, and the identification/assessment of landscapes along with the setting of landscape quality objectives.

The MPS and Marine and Coastal Access Act provide a policy and legal framework for the implementation of a new national coastal trail in England which the public is free to use. The scheme for the implementation of this part of the Act in England has been drawn up by Natural England (2010), with work having begun on six stretches of coastline. Norfolk is the only one to reside adjacent to the East Inshore area, the trail stretching between Weybourne and Sea Palling, with completion expected in 2014.
This path augments part of an existing National Trail (Peddars Way/North Norfolk Coast Path) from where it ends at Cromer, south to Sea Palling. The coastal access audit conducted by Natural England in 2009-2010 indicated that the Yorkshire & Humber, East Midlands and East of England areas (i.e. those which have coastline in the East Inshore Plan area), already have satisfactory and legally secure paths along 67 per cent, 61 per cent and 67 per cent of their coastline respectively. Though perhaps not directly affecting landscape, the initiative may encourage a greater number of visitors to the coast and is likely to increase the number of people experiencing and interacting with seascapes.

There are presently four statutory and three non-statutory landscape designations in the East Inshore plan area. In addition to these designations, which are indicated in Figure 1, the setting of heritage assets[134], defined in the Marine Policy Statement (paragraph 2.6.6.1) as "buildings, monuments, sites or landscapes – that have been positively identified as holding a degree of significance meriting consideration", should also be a landscape or seascape consideration[135]. These may include, among others, scheduled monuments, listed buildings and parks and gardens of special historic interest. These features are considered separately under cultural heritage.

[134] The setting, or surroundings in which a heritage asset is experienced, is an underlying consideration of Planning Policy Statement 5: Planning for the Historic Environment, and is also considered in the draft National Planning Policy Framework (see paragraphs 180,181 and 188).
[135] See also, English Heritage (2010) guidance on the setting of heritage assets: Consultation draft, July 2010.

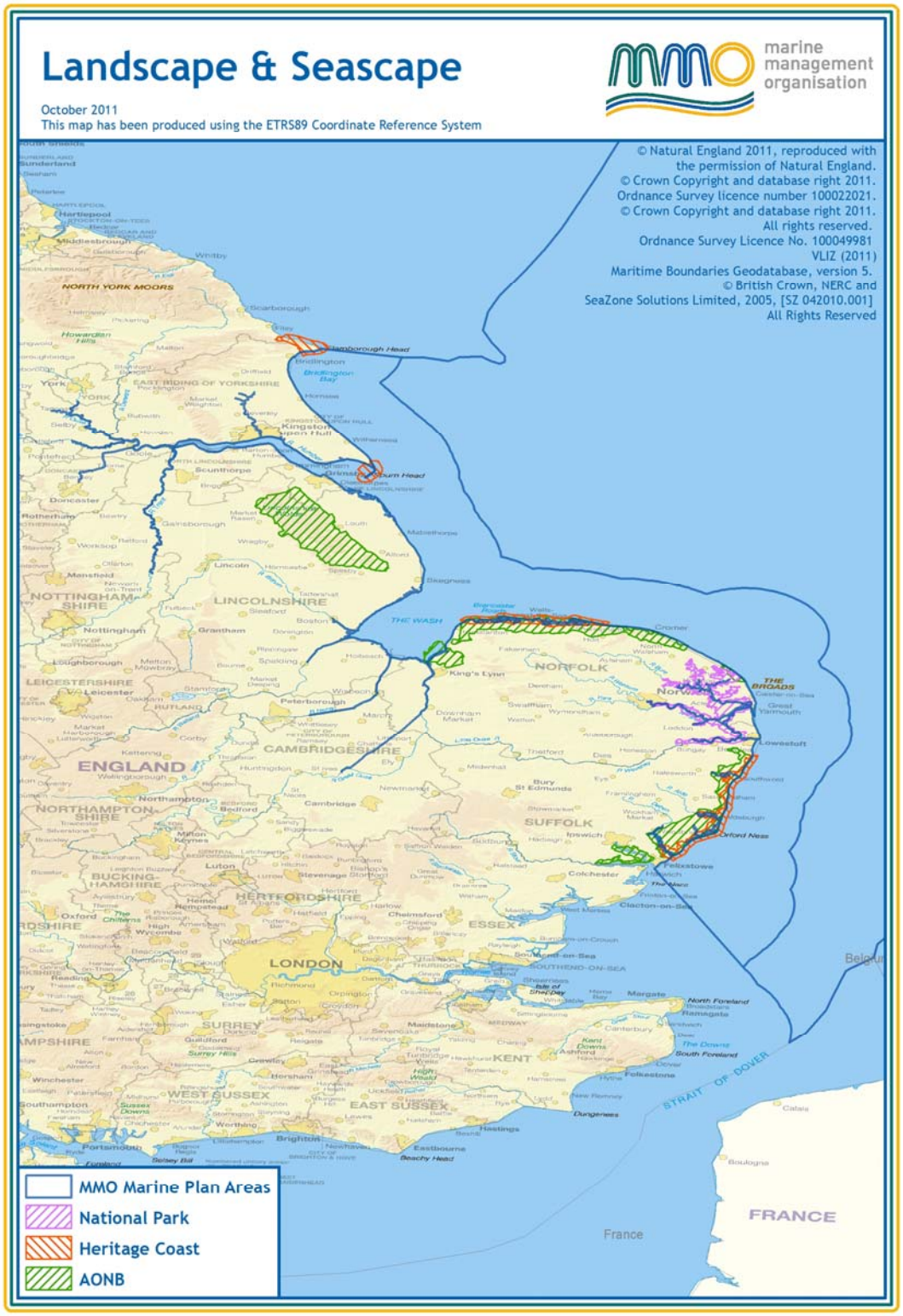

Figure 6.29: Statutory and non-statutory landscape designations intervisible with the coast

Issues and opportunities

Key issues with regards to seascape (both in the East Inshore and East Offshore plan areas) are centred on any future increase in offshore activity, particularly offshore renewables development, and its association with the terrestrial landscape. Specific issues include:

- The present and future leasing rounds of offshore wind are likely to see high numbers of larger turbines built in UK waters. Though the majority of the Round 3 wind zones are outside of territorial waters and therefore developments are unlikely to be greatly visible from the coast, views at sea and associated ancillary development (which may include additional port infrastructure and cable landfalls) for these wind farms and other marine renewables is likely in the coming years.
- The Southern North Sea is also a prospective area for carbon capture and storage and continuing gas field development, both of which will result in ongoing or incremental offshore and potentially also coastal development.
- The Government believes that there is a compelling need for substantial additional port capacity over the next 20–30 years (see Section 6.5), which would be associated with a similar increase in vessel traffic.

The marine plans also provide a number of opportunities with regards to landscape and seascape which include:

- The opportunity to consider landscape and seascape in offshore development consent both for individual developments and as part of cumulative assessments, and to implement landscape character assessment in the consideration of such impacts where appropriate[136].
- The ability to, where necessary, liaise with terrestrial planning authorities on seascape issues.

6.8 Water environment

Introduction and baseline summary

The East of England marine water environment is highly varied. A wide range of issues must be considered to understand the sensitivity of the marine water environment to new activities and the potential constraints that this environment may place upon new development, such as flood risk and sea level rise.

There is a large amount of policy at all levels of government aiming to improve the health of the marine water environment and to ensure that future risks appropriately managed.

Water masses and circulation

The water masses in the North Sea primarily comprise Atlantic water, Scottish coastal waters, North Sea water, Norwegian coastal water, central North Sea water, south North Sea water, Jutland coastal water and Channel water (see Figure 6.31).

[136] Defra (2011) UK Marine Policy Statement. TSO, London, p21.

The generalised pattern of water movement in the North Sea can be strongly influenced by short to medium term weather conditions, resulting in considerable variability.

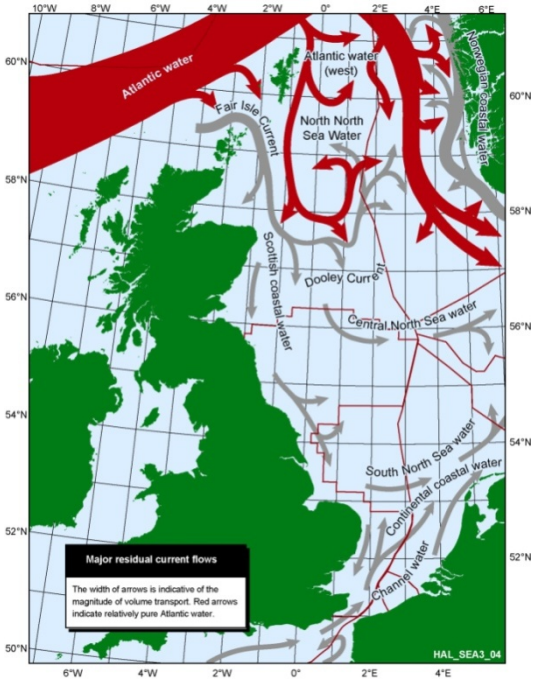

Figure 6.31: Major water masses and residual circulation in the North Sea Source: after Turrell, et al (1992)

Wave and tidal environment

The wave environment is strongly seasonal with mean wave heights peaking in January. Extreme waves may be encountered at other times of the year, most notably between October and March. Mean heights tend to be less than 1 metre at the coast. How these waves are expressed at the coast and how their energy is dissipated is spatially variable and depends on nearshore and coastal bathymetry and topography.

Mean spring tidal range generally varies between 5 and 6.5 metres on England's east coast. Where water travels down estuaries and narrow channels the range tends to increase. For instance, tidal range increases in the macro tidal estuarine environments of the East Inshore area, with the Humber and Wash Estuaries having ranges of 6 and 6.5 metres respectively.

Temperature and salinity

In the East plan areas, significant freshwater input from rivers makes the southern North Sea less saline than the northern North Sea, with the exception of in the far south where water of North Atlantic origin enters via the Dover Straits.

Within the plan areas, winter sea surface temperatures are prevented from dropping below approximately 5 degrees Celsius in the south by a wedge of warm water extending from the English Channel, although further north, temperatures are some of lowest in the UK. In August, temperatures increase progressively to the south reflecting the increased proximity to the European landmass. The waters at this time of year are also well-mixed with little stratification, whereas further north the bottom

temperatures are approximately 2 to 3 degrees Celsius lower than the surface temperatures. Since the 1980s, sea surface temperatures in UK coastal waters have been rising and most rapidly in the North Sea. Increases are predicted to continue.

Sea-level change and flood risk

Predicted sea-level rise will lead to a greater risk of coastal flooding and erosion, which may also be exacerbated by an increased frequency and severity of storms.

In view of the growing populations and increasing urbanisation of the coastal zone, increasing numbers of people are vulnerable to extreme risks in sea level. The second tranche of shoreline management plans have recently been consulted upon or finalised and there are six within the East marine plan areas that will be used to guide future decision-making about coastal defence management.

Marine pollution

Approximately 80 per cent of marine pollution originates from a variety of land-based activities which arrive within the marine environment through effluent discharges, river outflows and from shipping and port activities. Inshore, coastal and estuarine areas are, therefore, at particular risk of being exposed to pollution. However, the chemical and ecological quality of waters has improved in recent decades and in the long-term is likely to be further enhanced by the implementation of management plans, particularly the Anglian and Humber River Basin Management Plans which are produced to implement the Water Framework Directive requirements.

Charting Progress 2[137] identifies that concentrations of the most commonly monitored contaminants in seawater have fallen since Charting Progress and are generally below UK Environmental Quality Standard (EQS) limits. Charting Progress 2 reports that there are pollution issues in estuaries that have been or are heavily industrialised. Elevated concentrations of mercury have been identified in the Wash and elevated levels of poly aromatic hydrocarbons in the Humber Estuary. Slightly elevated cadmium, mercury and lead concentrations were also recorded in mussels in the Humber. Imposex (the imposition of male characteristics on female organisms) caused by exposure to tributyltin has been identified in samples of Dogwhelks from south of Flamborough Head.

Bathing waters are monitored by the Environment Agency to assess whether they comply with the standards of the Bathing Water Directive. For September 2011, all but three of the sampling points in the East Inshore plan area were classified as meeting the stricter UK guideline standards of the directive. The amount of coastal and marine debris which includes litter deposited by visitors and tourists, as well as that from sewerage outflows, shipping litter and lost fishing gear remains high in UK waters[138].

[137] Defra (2010). Charting Progress 2: An assessment of the state of UK seas. Published by the Department for Environment Food and Rural Affairs on behalf of the UK Marine Monitoring and Assessment Strategy community, London, Page 194.
[138] OSPAR (2009). Marine litter in the North-East Atlantic Region: Assessment and priorities for response. London, United Kingdom, Page 127.

The pH of the oceans surrounding the UK has fallen as a result of the uptake of anthropogenically-produced carbon dioxide and this fall is expected to continue. The acidification of ocean waters has potential implications for marine biota.

Sizewell nuclear power station lies within the East Inshore plan area and Bradwell nuclear power station lies to the south in Essex. The National Policy Statement for Nuclear Power Generation has identified that Sizewell and Bradwell are both locations suitable for new nuclear power stations before the end of 2025.

Radioactive discharges are strictly controlled and the aim of the OSPAR Radioactive Substances Strategy is to reduce such discharges so that concentrations are close to background levels for naturally occurring substances and close to zero from man-made radionuclides.

Issues and opportunities

- The potential effects of climate change on coastal flooding and erosion. A large portion of the east coast is vulnerable to flooding and erosion. The marine plans present an opportunity to contribute to a more holistic approach to planning in the marine/coastal zone to reduce the risk to property and infrastructure.
- The effects of climate change on sea temperatures and ecology. An increase in sea temperature reduces the ability of oceans to absorb carbon dioxide affecting certain species thereby causing them to migrate or adapt.
- The likely effects of ocean acidification on ecosystems and marine species.
- Marine pollution derived from riverine, coastal and marine sources, and atmospheric emissions and subsequent deposition (such as metals, acidifying and eutrophying components from sewage and agricultural run-off) and pollutant legacies such as munitions dumping and dredging disposal sites. While these issues are decreasing, there is a persistent legacy of some substances in industrial estuaries.
- Temporary effects in the water column from dredging and other activities which cause turbidity.
- Coastal and marine litter and debris (such as from beach visitors, shipping litter and fishing related debris) is an aesthetic, ecological and economic problem.
- The Marine and Coastal Access Act 2009 and the Marine Strategy Framework Directive provide new means by which important marine sites and ecosystem functions can be protected. The marine plans should carry this forward into regionally specific proposals.
- A key driver for change is the Water Framework Directive requirement (and forthcoming Marine Strategy Framework Directive) to attain good ecological status in coastal waters (0 to 1 nautical miles) and chemical status within territorial waters (0 to 12 nautical miles).