Marine Protected Area Network Report







Report compiled by Dr. Christopher Rice,
on behalf of the North Sea Marine Cluster

June 2010

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Abbreviation	Definition
BIS	*Department for Business Innovation and Skills*
CCW	*Countryside Council for Wales*
CE	*Crown Estate*
CEFAS	*Centre for Environment, Fisheries and Aquaculture Science*
CFP	*Common Fisheries Policy*
CNCC	*Council for Nature Conservation and the Countryside*
DCLG	*Department of Communities and Local Government*
DECC	*Department of Energy and Climate Change*
DEFRA	*Department for the Environment, Food and Rural Affairs*
DFT	*Department for Transport*
EA	*Environment Agency*
EEDA	*East of England Development Agency*
EIA	*Environmental Impact Assessment*
GDP	*Gross Domestic Product*
HD	*The Habitats Directive, 1992*
IA	*Impact Assessment*
IFCA	*Inshore Fisheries and Conservation Authorities*
IPC	*Infrastructure Planning Committee*
JNCC	*Joint Nature Conservation Committee*
KTN	*Knowledge Transfer Networks*
MCA	*Maritime and Coastguard Agency*
MCA Act	*The Marine and Coastal Access Act, 2009*
MCZ	*Marine Conservation Zone*
MFA	*Marine and Fisheries Agency*
MMO	*Marine Management Organisation*
MPA	*Marine Protected Area*
NE	*Natural England*
NERC	*Natural Environment Research Council*
NGO	*Non-Governmental Organisation*
NSMC	*North Sea Marine Cluster*
R&D	*Research and Development*
SAC	*Special Area of Conservation*
SEPA	*Scottish Environmental Protection Agency*
SFC	*Sea Fisheries Council*
SNH	*Scottish National Heritage*
SPA	*Special Protection Area*
TSB	*Technology Strategy Board*
UEA	*University of East Anglia*
WBD	*The Wild Birds Directive, 2009*
WFD	*The Water Framework Directive, 2000*

In addition to the published and Internet sources, valuable information has also been provided by the following knowledgeable individuals:

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Judith Stoutt
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MMO

Keith Weston
MPA Advisor, Natural England

1. Executive Summary

The marine environment around the UK contains many different species and habitats which are receiving greater protection due to the establishment of a new network of Marine Protected Areas (MPAs), created by UK legislation such as the Marine and Coastal Access Act, 2009 and international legislation from the European Union and beyond.

The North Sea Marine Cluster (NSMC) is, at present, a collaboration between the University of East Anglia and the Gardline Group. The cluster focuses on activities within the North Sea, one of the world's most important commercial and environmental areas, supporting many marine activities, which form part of the UK's valuable 'marine economy'.

The proposed MPA network will restrict some marine activities but will also open up new opportunities for the sustainable management of important marine resources. The aim of the research in this report was to understand the development of the MPA network and to highlight key organisations involved in the monitoring and management of the MPA network.

This report has reviewed relevant literature and consulted representatives of different organisations to gather opinions on the present and future needs of the MPA network. This research has determined that the development of MPAs is still at an early stage, with sites being allocated alongside engagement with marine stakeholders. The establishment of the new Marine Management Organisation (MMO) has provided a focus for the development of marine plans and an overall management of the MPA network. The MMO and DEFRA will be responsible for overseeing the monitoring of MPAs in England, most likely through national bodies such as Natural England. In Scotland, marine management will be conducted by Marine Scotland which is likely to liaise with Scottish National Heritage for MPA monitoring.

2. Project Aims

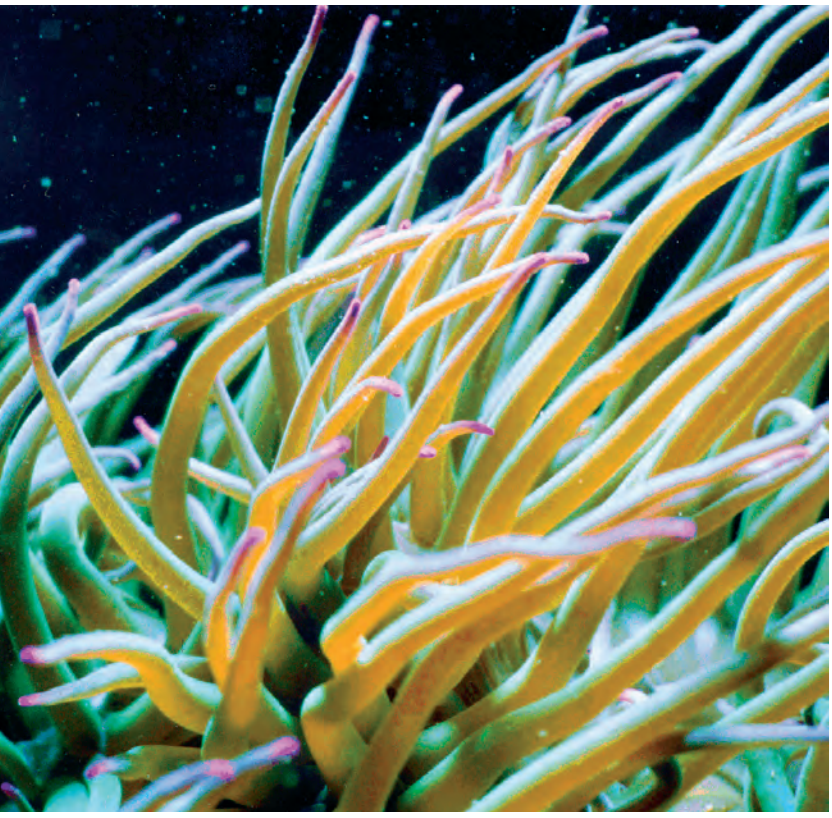
This project was focused on understanding the conservation and socio-economic aspects of the proposed MPA network within the UK and was undertaken within the context of the following aims:

- To understand the different types of MPA proposed within the UK.
- To identify key organisations involved in the MPA network and to determine how they interact to deliver the UK Government's vision of clean, safe, healthy productive and biologically diverse oceans and seas.
- To assess the need for additional information, training or assistance in the monitoring and maintenance of the MPA network.

3. MPAs: International Case Studies

To understand how a MPA network could be made to work in the UK, it is beneficial to look briefly at examples of existing MPAs from around the world. There are different types of MPA network, varying in size and function.

The following examples try to cover a range of MPA network sizes and types. Historically, most types of MPA network have focused on protecting reefs and corals in tropical waters however more recently MPAs have become a global priority and so increasingly networks will be developed in cold waters containing many migratory species. These types of MPA network are associated with new challenges to ensure protection of species and habitats. Although the North Sea represents a unique environment for the formation of an MPA network, it is possible to identify a 'best practice' scenario for MPA maintenance, monitoring and enforcement by studying these international cases.



Case Study 1:

A simple MPA Network established in West Hawaii

The archipelago of Hawaii contains unique marine species such as such as the Potter's angelfish *(Centropyge potteri)*, Bandit angelfish *(Holacanthus arcuatus)* and Tinker's Butterflyfish *(Chaetodon tinkeri)*. The western coast of the island of Hawaii contains coral reefs which form the habitat for many tropical fish species. In 1999 a network of Marine Protected Areas was established in response to public opposition for the taking of reef fish by aquarium fishers. In total 22 MPAs were setup, 9 of which prevented prohibited aquarium fish harvesting, totalling 35.2 % of the West Hawaii coastline.

The effect of the MPA network was reviewed in 2007, to see the effect of biodiversity within the MPAs and the socio-economic status of the aquarium fishers. Generally, the socio-economic status of the aquarium fishers had increased, correlating with increased yields of fish from outside of the MPA network and a premium price received for some fish species. Within the MPA network, replenishment of coral fish species had occurred, highlighted by an increase in yellow tang by 72%, which in turn led to more fish in waters outside of the MPA network.

Reflections:

The West Hawaii MPA network was established to encourage reef fish numbers to increase and so sustainable aquarium fishing could be managed. The MPA network was cheap to setup, was focused on one type of marine activity (fish replenishment) and was enforced locally through The Division of Conservation and Resources Enforcement (DOCARE). No strong protestations were registered by the aquarium fishers as representatives were consulted before the MPA network was established and aquarium fishing activities could continue outside of the MPA network. The simple MPA network was a success in producing sustainable fisheries which provided higher yields for exploitation by marine stakeholders, including aquarium fishers.

Case Study 2:

A temperate, deep-sea national MPA network in Australia

The marine environment around Australia contains diverse and unique marine life as well as underwater canyons and mountains comprising geomorphological features of interest. To protect the marine environment, 14 MPAs have been setup in addition to the Great Barrier Reef, which is protected separately by the Australian Marine Park Authority. The MPAs (Marine Reserves) in Australian waters make up a National Representative System of Marine Protected Areas (NRSMPA), managed by the Department of the Environment, Water, Heritage and the Arts. Although the NRSMPA process began in 1999, since 2003 each State Government is able to modify and develop the local strategy for MPA management until the final MPA network is completed in 2012. The network is enforced through a mixture of increasing awareness to the importance of MPAs and local reporting of ships. All commercial ships wishing to fish in MPAs that permit such activities need to register their ships, although some activities are not tolerated in any MPA (e.g. trawling and scallop dredging). For the initial 3 months of the MPA network coming into force a phased enforcement policy will be used, starting with warnings for first time offenders before stricter punishments are brought to bear against reckless or repeat offences. The scope of the MPA network is large, aimed at improving sustainable fishing, maintaining biodiversity, protecting rare and threatened species, conserving cultural heritage and promoting sustainable tourism. Each MPA must have an associated plan formed in consultation with stakeholders. These marine plans should encompass all marine activities including fishing, mining, waste disposal, vessel usage etc.

Reflections

The Australian MPA network is very large and is designed to protect the diverse marine life, whilst encouraging crucial marine-related tourism activities, such as diving and watersports. Arguably, the most important MPA is the Great Barrier Reef which has been managed separately by the Marine Park Authority. The MPA network is pseudo-analogous to the proposed UK network in that there is an overall national strategy with some local management of MPAs performed by the state governments in Australia and by local authorities in the UK, especially in the case of fisheries management. The Australian MPA network will be fully established in 2012 and successful outcomes will include the maintenance of the diverse marine life, sustainable exploitation of marine resources and increased eco-tourism.

Case Study 3:

A politically-charged MPA network around the Chagos Islands

At the beginning of April 2010 the UK Government announced the formation of the world's largest marine reserve (545,000 km^2) around the Chagos archipelago. The coral reefs around the islands, such as the Great Chagos Bank, support thriving marine life and produce among the cleanest waters in the world. The marine sites have been classified as of "global importance", supporting ecological activities such as turtle egg-laying. The huge lagoon present on the largest island of Diego Garcia already has a protected status as a wetland of importance under the Ramsar convention. The formation of the Chagos Islands MPA network is strategically important to the UK as part of its commitment to increasing marine biodiversity and its MPA network strategy. Many of the MPAs represent 'no-take' zones which are protected against all type of fishing activity. The development of the Chagos Islands MPA network is complicated by a politically-charged atmosphere surrounding the inhabitants of the islands. The native Chagossians, removed from the islands in the 1960s during the construction of a U.S Airbase, generated their income solely through commercial fishing activities. Such activities would be outlawed in most of the MPAs. The decision on whether the Chagossians can return to the islands rests with the European Court of Human Rights. Management of the MPA network is performed by the British Government as part of the British Indian Ocean Territories (BIOT) although some territories have been conceded to Mauritius, which claims sovereignty to the islands. Enforcement of the MPA network occurs locally through a BIOT patrol vessel.

Reflections

This MPA network has been setup however it is still unclear how many MPAs will permit fishing activities to occur. If the native Chagossians are allowed to return then it is expected that at least sustainable fishing would be allowed to generate income to support the local communities. The Chagos Islands' coral reefs are deeper than most and are therefore more resilient to temperature changes and human activities. It is hoped that maintaining the coral reefs will act to seed recovery and potentially replenish other, degraded reefs. The marine environment around the Chagos Islands should be able to support sustainable fishing activities and even additional activities such as eco-tourism and leisure tourism to generate revenue for the governments of the UK and / or Mauritius and support the income of many of the islands' inhabitants. In terms of monitoring, it is unlikely that a single BIOT vessel is able to adequately enforce the MPA network and further investment is likely to be required to ensure the MPA regulations are adhered to.

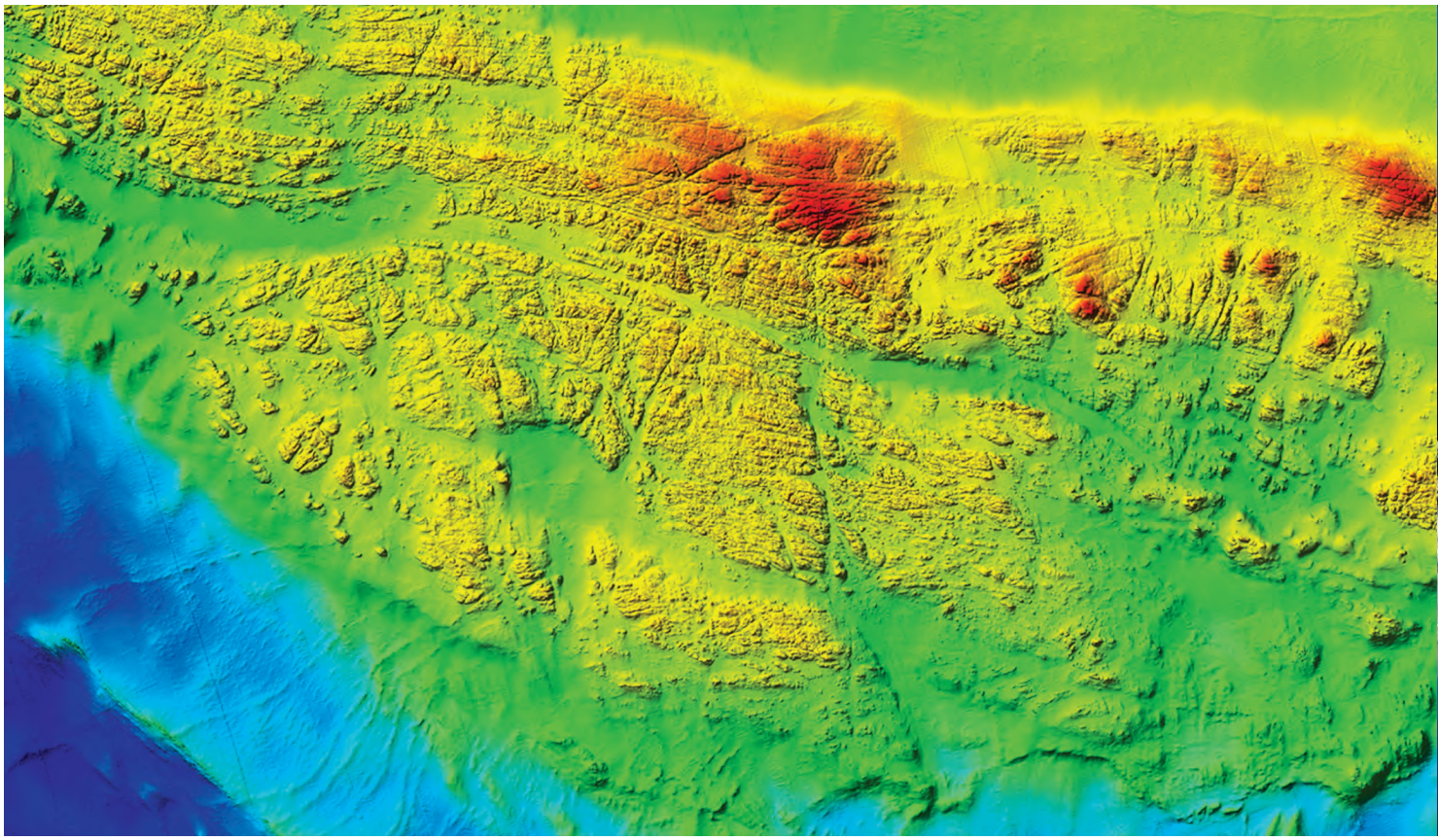
Case Study 4:

A strict MPA network around South Africa

South Africa has setup a MPA network which covers 15 % of the marine environment. The coverage is set to increase to 20 % by 2012. The network comprises sites of varying degrees of protection with the aim of supporting: eco-tourism, marine science, leisure activities (e.g. diving) and sustainable recreational fishing. The Department for Environmental Affairs and Tourism is responsible for the constructions of three categories of protection: controlled, restricted and sanctuary. Controlled zones will permit limited fishing activities; restricted zones allow controlled tourism development but not commercial fishing operations; sanctuary zones are completely protected to allow restoration of biodiversity. The marine zones will be enforced through the purchase of four new environmental patrol vessels (at a cost of approximately £40 million), 200 new Honorary Fishing Patrol Officers and more Environmental Courts.

Reflections

This MPA network has rigid zones offering differing degrees of protection. This is aimed at allowing a range of activities within different zones which can be monitored. The South African approach has also invested heavily in enforcement of the MPAs and has a specific judicial system for infractions of Environmental regulations. This large, defined and well enforced MPA network is aimed to aid marine conservation and sustainable development in the future. It will be interesting to see whether the large investment in the South African MPA will be translated into an increased sustainable marine environment.



4. The UK MPA network

4.1. Relevant Marine Legislation & Policy

The following is a very brief summary of some of the relevant UK and International marine legislation which puts the formation of marine protected areas into context and impacts upon the future formation of new government marine legislation.

Any new marine legislation will need to function within the context of the Government's vision for 2012:

"[...] to see an extended network of marine protected areas [MPAs] conserving the richness of our marine environment" [1]

Such a network of MPAs aims to cover 14% - 20% of UK seas and protect habitats and species of both national and international importance.

OSPAR Conventions

The 1972 Oslo and 1974 Paris conventions (OSPAR) recommended a network of MPAs in 2003 to guide international cooperation in marine protection within the northeast Atlantic. The OSPAR Commission is made up of representatives from 16 'contracting parties' including the European Commission. Although the spirit of the Commission's recommendations forms the basis of the MPA network vision, many of the themes have been subsumed by the subsequent legislative framework.

The Marine and Coastal Access Act 2009

The Marine and Coastal Access (MCA) Act 2009 was the principal piece of legislation to facilitate the creation of a network of MPAs within England and Wales to strengthen and improve marine conservation.

As part of the MCA Act, the Marine Management Organisation (MMO) was created, as of 1st April 2010, to act as a public body with a broad remit, subsuming the existing Marine Fisheries Authority. The role of the MMO encompasses marine planning, marine nature conservation, marine legislation enforcement, working with other marine enforcement bodies, responding to marine emergencies and co-ordinating the UK response to EU marine issues.

The Marine Policy Statement

Within two years of the MCA Act receiving Royal Assent, a Marine Policy Statement (MPS) must be made, outlining UK policies for management of the marine environment. The statement will set out the current use of marine resources, predicted trends and environmental changes and describe how marine planning will adapt to these changes where necessary. In practice the MPS provides the framework for all decisions in the marine area, steering policy-makers whilst planning for the future. A draft MPS has been subject to public consultation.

Marine plans will also be developed that will interpret and present the national policies within the MPS. It is hoped that developing marine plans within the context of the MPS will lead to a strong link being developed between national policy and local application. Marine plans will act as a crucial source of information, which marine industries can use when considering where and how they might carry out activities. In addition, marine plans will guide licensing and enforcement decisions made by public authorities.

Marine Protected Areas (MPAs)

The MCA Act 2009 broadly characterises MPAs into three key areas:

- Special Areas of Conservation (SACs)
- Special Protection Areas (SPAs)
- Marine Conservation Zones (MCZs)

SACs are allocated under the European Habitats Directive and are designed to afford protection to habitats of European importance (e.g. reefs and sandbanks). There were 608 SACs in the UK in August 2007 and of these 81 areas (including the North Norfolk Coast and The Wash) could be considered as having a marine component. Candidate SACs (cSACs) are chosen by DEFRA, on advice from Natural England, the JNCC and the devolved administrations and are presented to the European Commission for their approval. Current cSACs submitted (awaiting EU approval) are:

cSAC	Type of SAC	Location
Braemar Pockmarks	Submarine structures	North Sea
Scanner Pockmark	Submarine structure	North Sea
Haig Fras	Reef communities	Off western Cornwall
Stanton Banks	Reef communities	Off western Scotland
Darwin Mounds	Reef communities	Off western Scotland

Table 1: Candidate SACs

In addition to these are a further 10 PSACs which will shortly be submitted to Europe for approval. These are Haisborough Hammond and Winterton, Inner Dowsing, Race Bank and North Ridge, Margate and Long Sands, Lyme Bay and Torbay, Prawle Point to Plymouth Sound and Eddystone, Lizard Point, Lands End and Cape Bank and Shell Flat.

SPAs are allocated by the Wild Birds Directive, 2009 for seabirds of European importance (e.g. puffins and gannets). There are presently c.. 250 SPA' in the UK of which 73 areas, including Morecambe Bay, that could be considered to have a marine component. In addition are a further 2 SPAs, Outer Thames Estuary and Liverpool Bay/Bae Lerpwl, have been recommended to Defra for approval. SPAs are identified initially through Natural England and the devolved administrations and then presented to the EC for final approval.

Marine Conservation Zones are a new group of MPA legislated under the MCA Act and are allocated nationally. An important consideration for MCZs, which distinguish them from SACs

and SPAs, is that MCZs take account of socio-economic factors, which allows a balance to be struck between protecting the marine environment and supporting local communities, some of which are reliant on marine activities and may suffer as a consequence of marine conservation. The first designated MCZ was Lundy Island off the coast of Devon selected by the Joint Nature Conservation Committee (JNCC) and Natural England. Lundy Island previously enjoyed protection as a Marine Nature Reserve and was re-classified as a MCZ under the MCA Act in 2010.

Further candidate MCZs need to be presented to the Government by autumn 2011. The Government, in consultation with interested parties will then decide the final designations in 2012.

MCZs selected are to be delivered through the following regional projects:

Project Name	Region	Project manager
Net Gain	The North Sea	Joanna Redhead
Finding Sanctuary	The southwest	Tom Hooper
Irish Sea Conservation Zone	The Irish Sea	Rowan Byrne
Balanced Seas	The Eastern Channel	Sue Wells

Table 2: MCZ Projects

MCZs will act as an 'umbrella term', encompassing existing Ramsar sites, marine heritage sites and sites of special scientific interest (SSSIs) whilst expanding to include sites identified by MCZ projects in consultation with local stakeholders.

The Common Fisheries Policy

The Common Fisheries Policy (CFP) is the EC instrument for the management of fisheries and aquaculture. It allows for fishing in other EC members' waters, based on historic fishing rights. The CFP was last reformed in 2002 when, among the changes, the conservation aspects were strengthened. One aspect of the CFP is the 'total allowable catches' and associated landing quotas employed as tools with the aim of preventing overfishing of threatened commercial stocks. One of the principal criticisms of the CFP is that the quota system leads to many fish being caught and returned dead. Nations such as Norway have remained out of the EU, citing the existing CFP as legislation which would harm their interests. Proposals for further reform of the CFP appeared in the EC's Green Paper published in 2009. The Commission published earlier this year the results of the consultation and will be producing an impact assessment, which it plans to complete in the autumn of 2010. The CFP reform Green paper raised several key aims including:

- Ending existing 'fleet overcapacity'.
- Refocusing the main CFP objective towards maintenance of healthy, sustainable, exploitable fish stocks.
- Decentralising fishery governance from the Council of Fisheries Ministers to regionalised implementation. The EC is insistent that this does not mean devolvement to the national level but is proposing that each region of the EU will be responsible for its own fisheries management.
- Involving the fishing sector more towards results-based management.
- Developing a simpler, cost-effective policy with a greater proximity to decision-making.

Reform of the CFP is due to be completed by 1st January 2013, leading to a fundamental change to the CFP encompassing the above aims.

In a response to the CFP Reform Green Paper, the UK Government broadly welcomed the debate and said it believed CFP reform should encompass ecological sustainability and generation of wealth through exploitation of a common marine resource. The Government endorses the view that there should be a shift towards a maximum sustainable yield (MSY) approach and that future regulations should be more flexible to encourage fishermen to move towards sustainable fishing

practices. Finally, all sea users should be encouraged to share data regarding fish stocks and how they are affected by fishing practices, stock interaction and climate change.

The following are areas of the Common Fisheries Policy that will be covered in England by the MMO or IFCAs:

- Licensing of fishing vessels
- Managing fleet capacity
- Managing fisheries quotas and other access controls including the closure of some zones to protect marine stocks from overfishing.
- Managing European grants schemes (primarily from the European Fisheries Fund)
- Collecting, co-ordinating and providing information
- Enforcing rules
- The IFCAs will have additional powers to create bye-laws relating to the management of the fish stock/ fishing activities where deemed appropriate.

Fisheries 2027

Fisheries 2027 is a long term UK vision, published in 2007, with the aim of clarifying long term objectives and the balance to be struck between economic, social and environmental priorities. It recognised that there had been serious shortcomings in the way that fisheries had been managed in the past and that further improvements were required. Importantly, it laid out the need for regulatory bodies and stakeholders to work together and set out for each their roles and responsibilities. Fisheries 2027 has become the touchstone for the UK Government's fisheries policy, though it will be interesting to see whether this continues under the new coalition government.

Part of this strategy involves the management of fisheries within an ecosystem-based approach and as part of the marine planning system. This includes operating within clearly defined acceptable limits of environmental impact – to be defined by the UK Government - and the industry employing environmentally acceptable methods. Fisheries 2027 recognises that environmentally sustainable aquaculture has a role to play and that fisheries as a whole will contribute to local coastal communities. Fisheries 2027 aims to work in harmony with a reformed CFP to keep the discarding of dead fish to the minimum. One key aspect of Fisheries 2027 is the aim of devolving fisheries management in ways that will enable local and regional managers to react rapidly to changing circumstances. Above all, the Fisheries 2027 vision has to be seen as a package of measures; nothing in the document should be taken in isolation.

European Union Directives

The Wild Birds Directive, 2009 stems from The Birds Directive, 1979, the EU's oldest piece of nature legislation. The directive recognises that habitat loss and degradation are the most serious threats to the conservation of wild birds. It therefore places great emphasis on the protection of habitats through the establishment of a network of SPAs. In addition, The Birds Directive, 1979, banned activities that directly threaten birds, such as the deliberate killing or capture of birds, the destruction of their nests and taking of their eggs.

The Habitats Directive, 1992 aims to protect over 1,000 animal and plant species and over 200 habitats of European importance. The directive was amended in 2004 and 2007 to include habitats of new member nations including The Black Sea and the Steppic Regions after Bulgaria and Romania were admitted in 2007. Together with the Wild Birds Directive, the Habitats Directive encompasses Natura 2000 sites across Europe.

Natura 2000 encompasses Europe-wide SACs and SPAs. The Natura 2000 network comprises over 18,000 sites covering an area the size of France and is now being extended to new member states. Natura 2000 sites are nominated by member nations in each bio-geographical region (the UK lies in the 'Atlantic' region along with western France, northern Spain, Belgium, The Netherlands, north-western Germany and western Denmark). The EC then decides the network of sites in consultation with experts from member states, NGOs

4.2. Relevant Organisations

and the European Environmental Agency (EEA). The Natura 2000 network is distinct from strict nature reserves where all human activities are excluded. The majority of the land is likely to continue to be privately owned and the emphasis will be on ensuring that future management is sustainable, both ecologically and economically. Natura 2000 encompasses the marine environment for the protection of sea bird habitats and the management of aquaculture to prevent the leaching of substances such as antibiotics and anti-fouling agent into the marine environment. Whilst traditionally the UK's Natura 2000 network has had a terrestrial focus, over recent years the focus has shifted to increasingly incorporate marine habitats and species.

The Marine Strategy Framework Directive (MSFD), adopted in June 2008, aims to provide a:

> "[...] good environmental status of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend."

The MSFD underpins the main environmental aspect of EU maritime policy with an aim of utilising the marine resources with consideration for the long term impact of commercial activities on the marine environment, similar to the policy of Fisheries 2027. The ambitious MSFD depends on EU member states producing a report detailing the environmental status of the national marine waters and outlining clear future environmental targets and monitoring programmes. As an EU member, the UK was required to transpose the directive to UK law on 15th July 2010 and will be required to complete a full and detailed survey of marine waters by 2015. Implementation of the Directive will include a series of cost-effective measures to clean the environment, complete with a cost-benefit analysis. Further consultations between relevant UK organisations and the EU will occur between 2010 and 2016.

Below some of the relevant organisations are listed which have responsibility for marine management. Where the role of these organisations changes after the implementation of the MCA Act, 2009, these are noted. The roles and responsibilities of these organisations in relation to the formation of MPAs are outlined. Many of these organisations were consulted during stakeholder meetings, the outcomes of which are described in Section 6.

The Marine Management Organisation (MMO) is a public body to manage marine sustainability within England. The MMO was legislated for under the MCA Act, 2009 and came into force on 1st April 2010. The remit of the MMO is broad, subsuming the responsibilities of the Marine and Fisheries Agency (MFA). The MMO has a role in "Marine Social Planning", a new term replacing the equivalent parlance – "marine mapping". In addition the MMO will be the principal licensing authority (ports, dredging etc.) including licensing fishing activity under the CFP, which was previously managed by the Secretary of State for the Environment and Rural Affairs.

Other MMO marine conservation roles include:

- Implement marine legislation
- Working with other marine management bodies
- Responding to marine emergencies
- Co-ordinating the UK response on EU marine issues

The MMO will work with other partners including regulatory, delivery, enforcement and scientific organisations to fulfil its responsibilities, including in clarifying policies and priorities for the future, and directing decision-makers and users towards more efficient and sustainable use and protection of marine resources.

The Secretary of State for the Environment and Rural Affairs appointed the MMO board and a chairman on a part-time basis for 3-4 years, however the MMO remains an independent public body, working within existing legislation in the UK and EU.

The MMO Board members are:

- Chris Parry
  (Chair of the Board)
- Rodney Anderson
  (Former Director of Marine and Fisheries, DEFRA)
- Prof. Richard Birmingham
  (University of Newcastle)
- Robert James
  (Geldards LLP)
- Dr. Derek Langslow
  (Chairman of East of England Tourism)
- Jeremy Loyd
  (Former Managing Director of Capital Radio)
- Nigel Reader CBE
  (Former Director of Finance of the EA)
- Jane Ryder
  (CEO of the Scottish Charity Regulator)
- Jayne Scott
  (Non-executive director of Ofgem and the Council for Healthcare Regulatory Excellence)

The MMO will commission marine research and science as part of the marine monitoring and assessment of the impact of MPAs. The monitoring and assessment will require resources and manpower, primarily using existing MFA staff however new staff will be recruited as required. In addition, the MMO Board will require access to independent scientific advice on an ad hoc basis including expertise potentially provided by the NSMC.

The Inshore Fisheries and Conservation Authorities (IFCAs) were legislated for under the MCA Act, 2009 to replace the existing Sea Fisheries Committees (SFCs) from April 2011. IFCAs have a wider remit than SFCs and include a greater marine conservation element. IFCAs have responsibility for promoting sustainable development in fisheries activities. IFCAs will have jurisdiction for coastal waters out to 6 nautical miles, including estuaries where IFCAs will be responsible for sea fisheries management.

IFCAs will have powers to make byelaws within their jurisdiction however consultation must be undertaken and approval gained from the MMO for all putative byelaws. IFCAs will operate within 10 national IFC districts that continue inland, following local authority borders. IFCAs will be funded through local authorities' grants of approximately £6 million, but will receive an extra share of "new burden funding" to cover new responsibilities. This £5 million additional funding will be paid directly by the Department for Communities and Local Government (DCLG) through a non ring-fenced "Area Based Grant" to local authorities who will decide how best to spend the money in their region.

The proposed IFCA regions are shown in Figure 1below.

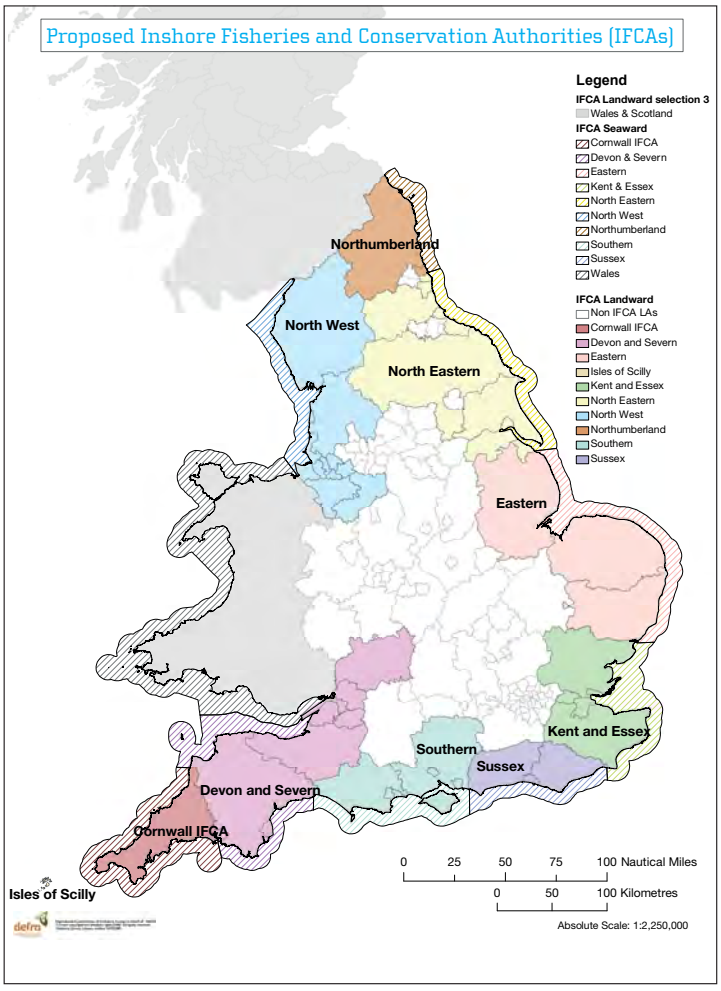


Figure 1. Proposed IFCA boundaries.[2]

The Environment Agency is principally concerned with the protection and enhancement of the environment for England & Wales. The EA has responsibility for management of coastal waters, flood risk management, coastal erosion and freshwater fisheries management (up to 6 nautical miles). The MMO and the EA were required to sign a "Memorandum of Understanding" to define their respective roles in marine management after 1st April 2010. It is expected that the responsibilities of the EA regarding fisheries management will be subsumed by IFCAs.

The Maritime and Coastguard Agency (MCA) is an executive agency for the Department for Transport and is responsible for ensuring ships meet UK and International safety regulations. In addition, the MCA coordinate search and rescue services, coastal risk management and implementation of the UK Government's maritime safety policy.

Natural England was created in 2006 to look after England's natural environment, including freshwater and marine environments. NE can award grants and recommend Areas of Outstanding Natural Beauty (AONB) and SSSIs, which form MPAs. NE is an independent public body that advises DEFRA on marine conservation in English coastal waters (0-12 nautical miles) after which point responsibility for providing advice passes to the JNCC.

The Joint Nature Conservation Committee (JNCC) is a non-departmental public body and is the statutory adviser to the Government on UK and international conservation. The JNCC is responsible for advising, establishing common UK standards for nature conservation and commissioning relevant research. The JNCC identifies SACs and SPAs beyond the 12 nautical miles Territorial Limit. Waters within the Territorial Limit fall within the scope of the national bodies (e.g. Natural England).

Centre for Environment, Fisheries and Aquaculture Science (Cefas) has extensive knowledge of fisheries and is an executive agency of DEFRA, performing bespoke Government research for funds. Approximately 25 % of Cefas projects are now funded externally.

Key Cefas areas:

- Climate change impacts and adaptation
- Marine spatial planning and environmental licensing
- Sustainable fisheries management
- Marine biodiversity and habitats
- Fish and shellfish health and hygiene
- Emergency response

Existing Cefas projects:

- Coastal zone management and monitoring
- Ecosystem quality
- Fish health and aquaculture
- Marine and freshwater fisheries
- Data management
- International collaborations
- Institutional strengthening and policy advice
- Public health and risk assessment
- Climate change

As an executive agency of DEFRA, Cefas is employed by the MMO to provide scientific and technical advice and support (including IT systems). The relationship between the MMO and Cefas can be expected to be the subject of review, in line with any broader review of the role of agencies.

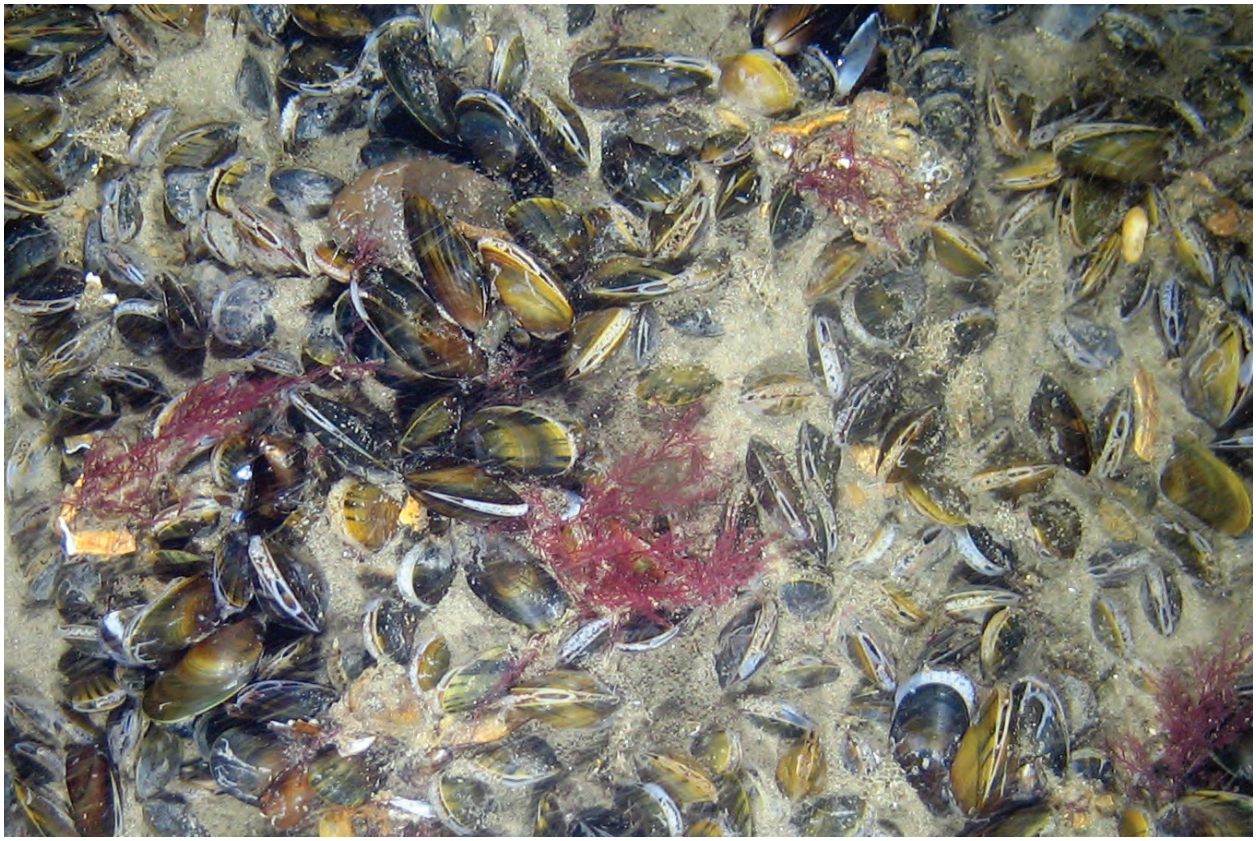
The Crown Estate owns the sea bed out to 12 nautical miles and licenses renewable energy generation out to 200 nautical miles within the 'Renewable Energy Zone'. In addition, where it owns the sea bed, the consent of the Crown Estate is required for the laying of cable and pipelines and aggregate dredging in addition to other consents. Although the Crown Estate owns 55% of the foreshore and approximately half of the beds of estuaries and tidal rivers in the United Kingdom, it does not govern marine fisheries.

4.3. The Scottish Administration

From 1st April 2009 Marine Scotland, an organisation responsible for the management of Scottish marine waters, was formed. Marine Scotland is the body with overall responsibility for regulating marine activities, similar to the MMO in England. Marine Scotland combines the roles of the previous Scottish Government Marine Directorate, Fisheries Research Services and the Scottish Fisheries Protection Agency.

Unlike the MMO, Marine Scotland is a Directorate within the national Government and is responsible for all aspects of the Scottish Marine Area including marine science, planning policy, licensing, renewables development, marine management and policing marine activities. Only areas involving ports and harbours are not within the remit of Marine Scotland, but are controlled by the Department for Transport. Marine Scotland works closely with Scottish National Heritage and JNCC. Unlike England, Scotland contains only a single marine conservation zone, encompassing all Scottish waters. The individual MCZs have not been allocated but sites have started to be identified and stakeholder consultation is ongoing. Marine Scotland is bound by the MCA Act 2009 to form a MPA network by 2012 and also cooperate with international agreements, such as the MSFD.

During the formation of MCZs, Marine Scotland is able, but not obliged to consider the socio-economic impact of the MCZ. If two separate sites are of equal conservational importance then socio-economic criteria are considered to determine protection levels however the economic impact is secondary compared with the conservation aspect of MCZs. Monitoring for the MPA network has not been finalised yet, but it is believed that SNH and the JNCC will take a leading role.



5. Stakeholder consultation summary

Relevant organisations, including those described in Section 4, were contacted to gather opinions regarding preparations for the MCZ designation process.

Consultation was performed with a representative from each organisation and a series of general questions were asked with respect to marine protection. The answers provided were of a non-confidential nature and are used with permission to generate the analysis in Section 6. The focus of the consultations was on marine management in England although aspects of devolved management were considered through consultation with Marine Scotland (Section 4c). In addition, as the NSMC is primarily based in East Anglia, local marine management was considered in greater detail for the Eastern Region through consultation with the Eastern Sea Fisheries Joint Committee and Norfolk County Council.

The responses gathered through consultation with representatives from relevant organisations can be loosely categorised into four main areas: **Marine planning, Marine science, Marine conservation** (including designation on and monitoring of MCZs) **and Offshore Renewable energy**. In addition, an academic perspective of MCZs was supplied by Professor Alastair Grant, a prominent environmental scientist at the University of East Anglia and a former Director of the Centre for Ecology, Evolution and Conservation.

Each of the marine areas may be served by several marine organisations. To highlight how these organisations interact, a simple network map is shown in Figure 3. The definitions of the abbreviations used can be found in the “List of Abbreviations” at the beginning of this document.

6. Outcomes of stakeholder consultations

Marine Planning

The MMO is the responsible organisation for marine issues on behalf of the UK Government in consultation with DEFRA, the Environment Agency, Natural England, the JNCC, local authorities and the Crown Estate; with the latter considering itself to be a leader in marine planning.

The MMO is responsible for the overall marine planning and management of the network of MPAs, working closely with Natural England and the JNCC. DEFRA will be producing a Marine Policy Statement by 2011, outlining plans for use of the marine environment. Natural England, with the support of DEFRA, has funded MCZ local projects, which plan for the creation of candidate MCZs by 2011. During local conservation planning, Biodiversity Action Plans are formulated in consultation with local authorities. Grants are provided to local authorities by the Department for Communities and Local Government (DCLG). Some of these grants are ring-fenced for particular projects however the remaining money is allocated by the Local Government Cabinet (introduced by the Local Government Act, 2000). In the case of Norfolk County Council, some responsibilities for planning for local harbours and inshore activities are performed but the local authority does not have any direct responsibility for regulating offshore activities. During any local marine planning, advice is sought from national organisations, such as the Environment Agency and Natural England. The local Government Office (GO-East), representing central Government, has formed the East of England Coastal Initiative (EECI), bringing together EEDA, the East of England Regional Assembly (EERA), the Environment Agency, Natural England, Norfolk County Council, CoastNet and Sustainability East as part of coastal planning in the Eastern Region.

Since the change in Government in May 2010, some regional bodies, such as RDAs, will change and other organisations may be involved in Marine Planning.

Fisheries planning falls within the remit of the MMO but contributions will be made by Sea Fisheries Committees (and later, the IFCAs). After 2011 IFCAs will be partially-funded through local authority committees. In addition to the £6 million Area Based Grant currently made available to SFCs by DEFRA, an additional £5 million 'new burden' grant will be provided to local governments by the Department for Communities and Local Government to fund IFCAs. The 'new burden' grant will not be ring-fenced and it is up to the local authority how best to allocate the funds. SFCs have a small input into offshore activities such as wind farms and dredging, advising the responsible bodies at the project level. In addition SFCs are consulted during marine planning if activities are considered to compromise the protection of local fish stocks.

Licensing

Licensing of fisheries falls principally within the remit of the MMO with advice sought from SFCs. Vessel licensing previously fell under the purview of the Maritime and Coastguard Agency (an executive agency of the Department for Transport) and now falls within the scope of the MMO. MMO consultation with the MCA is still expected especially with licensing issues which may impact upon marine safety.

Licensing for renewable energy technology is also performed by the MMO and the Infrastructure Planning Committee (IPC). The MMO is responsible for projects generating under 100 kilowatts of electricity with larger projects falling within the remit of the IPC. The MMO has overall responsibility for monitoring to ensure that all consent conditions are met by the renewable energy license holders. The IPC is likely to be the subject to future reform and therefore the process of issuing Renewable Energy licenses may change over the next few years. The Department of Energy and Climate Change (DECC) is responsible for permitting renewable energy projects as well as oil and gas exploration. The Crown Estate owns the seabed and therefore leases areas for offshore renewable energy technology such as wind turbines.

Marine Science

The Department for Business, Innovation and Skills provides funding to research councils (e.g. NERC) which in turn fund environmental research by Universities and other Research Institutes. Funding from UK Government to Technology Strategy Boards can be used to fund Knowledge Transfer Networks in return for technical expertise. KTNs represent an alternative source of funding for Universities and Research Institutes. In terms of marine science, DEFRA has setup the

Marine Science Co-ordination Committee consisting of members from the key marine science funding Government departments, the Devolved Administrations, three non-executive members and public marine science providers in the UK. Further to this, the UK marine science strategy was launched on 3rd February 2010 which sets the general direction for future marine science across the UK for the period 2010 to 2025.

Specifically, the Strategy sets out three high level priority areas for future marine science:

- Understanding how the marine ecosystem functions.
- Responding to climate change and its interaction with the marine environment.
- Sustaining and increasing ecosystem benefits.

As an executive agency of DEFRA, Cefas performs Government research within the marine sector specifically involving fisheries and marine habitats. Some of this research is performed in collaboration with research institutes such as the Centre for Ecology, Evolution and Conservation (CEEC) and national Universities. As previously described in this report, Natural England and the JNCC are involved in marine research and further research is expected to be commissioned by the MMO.

Marine Conservation

The MCA Act 2009 required a network of MPAs to be setup to support marine conservation. The principal aim of the MPA network is to create a sustainable marine resource to benefit all stakeholders. The SACs and SPAs receive Europe-wide protection as Natura 2000 sites under the 'Wild Birds' and 'Habitats' Directives. National MCZs will be designated by 2012 and are influenced by local authorities, the JNCC, the EA, and Natural England or the appropriate conservation agency, CCW, SNH etc. Protection of MCZs is not guaranteed against international influence although The UK Government is holding talks with EU partners to receive assurances that national conservation zones will be respected. MCZ protection will need to be guaranteed within existing EU legislation (such as the CFP) and control measures will need to be addressed. The MCZ projects charged with the responsibility of designating candidate MCZs are funded by DEFRA through Natural England. Conservation of MCZs which are co-incidental with commercial fisheries will be protected through bye-laws established by IFCAs.

The MMO is responsible for the establishment and administration of the MPA network and liaises with other relevant organisations including Natural England, JNCC, Environment Agency, SFCs and DEFRA. Concerns have been voiced to these organisations by those in the fisheries and aggregate dredging sectors who fear their livelihoods may be compromised. The MMO believe that a balance must be reached between marine conservation and the impact on the interest of all users of the marine environment. The European marine sites do not take into account socio-economic factors however national MCZs are obliged to take these factors into account. MCZs are divided by region into projects (Figure 2). The local MCZ project for the North Sea is Net Gain, which is the largest with boundaries in the North Sea stretching from the Scottish border south to Felixstowe and out to 200 nautical miles. There is no guideline as to the number of MCZs formed within each project or the area that should be covered. Guidelines instead focus on a percentage of specific habitats or species that must be protected. Most species are 'static' and protection is not designed to cover migratory marine species. Different MCZs will have different protection stringencies depending upon the objectives of the MCZ, the sensitivity of marine life and the local marine activities being performed. MCZ projects work with all marine stakeholders including SFCs, environmental pressure groups and sea users to ensure a fair balance between conservation and economic stability is reached. Natural England assumes the role of stakeholder and project partner. In addition, Natural England is responsible for monitoring the MCZs. Once established, the MCZs will be reviewed by DEFRA every six years to ensure they are fit for purpose.

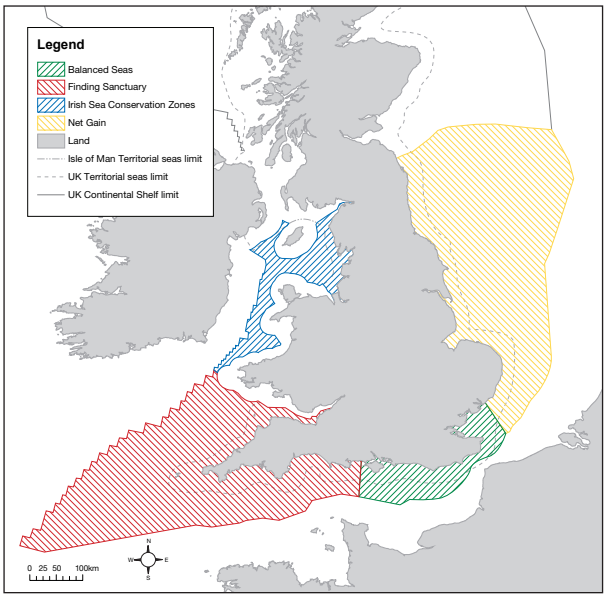
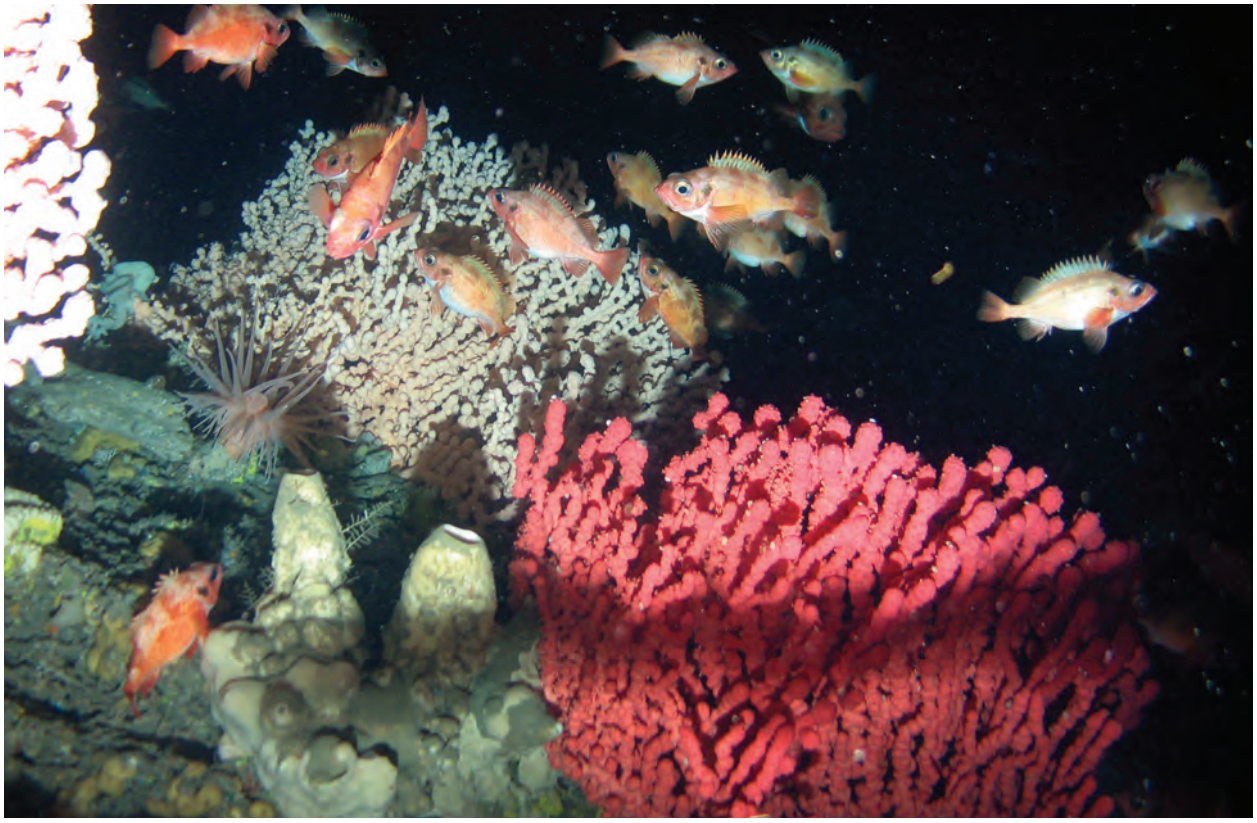


Figure 2: MCZ project boundaries.[3]



MPA monitoring

During stakeholder consultation, it was evident that there were different perspectives from different organisations regarding MPA monitoring. The following section describes the process of future MPA monitoring from the perspective of the relevant organisations. It is interesting to note that there is some overlap and gaps in overall responsibilities which will need to be 'ironed out' before effective monitoring can be provided after 2012.

The MMO has stated that nothing has been finalised in terms of other MPA monitoring however it is likely that they will be coordinated by coastal offices. Monitoring is likely to occur as a partnership between Natural England, JNCC and regional groups. DEFRA will be in charge of organising the research and development activities within the MPA network. The MMO foresees that nature conservation bodies will be involved and monitoring will be a partnership between organisations. The Eastern Sea Fisheries Joint Committee understands that local MPA monitoring will be coordinated by Natural England, who will ensure that the habitats are in good condition. The JNCC understands that it will have a role in monitoring, either directly, or by providing advice and that all monitoring will be coordinated by DEFRA. Monitoring will be based on the Habitats Directive (Annex I and II) and will include migratory species' habitats for which the JNCC provides advice and data using Behavioural Ecology to classify different habitats as "breeding areas", "nursery areas", "juvenile areas", "feeding areas" etc. Each MPA may have a different protection status depending upon "species vulnerability". The JNCC concedes that there may be gaps in knowledge which may need to be filled by additional data before the protection criteria can be fully defined.

An academic perspective

The MPA network strategy is welcomed. It is accepted that many marine activities, especially commercial fishing, have exploited our marine resource and caused the numbers of marine animals

to sharply decline. The main benefit of the MPA network will be to reduce the collateral damage caused by marine activities such as trawling which not only diminish fish stocks but also damage benthic organisms. The MPAs may also be used as a refuge for larger fish species, to replenish their numbers. Marine organisms are at risk from many potential threats, some of which may be mitigated by the MPA network. Of these threats, marine activities such as commercial fishing and aggregate extraction are the most significant, and can have their impact attenuated through regulation. Pollution, such as leached, diffuse aromatic hydrocarbons, threatens local populations of marine life but are generally not considered a major problem for the marine environment except for isolated areas. Climate change is already threatening biodiversity and marine habitats on a large scale, but the protection afforded by MPAs would be minimal. MPAs should be focused on protecting the more vulnerable species and habitats. Some of these habitats include cold water corals, hard ground and areas of sheltered and relatively deep mud. These habitats are more vulnerable than sandbanks, which are more dynamic by nature and therefore accustomed to regular disturbance and more often contain species which rapidly adapt and are replenished. Leaving some areas completely free from marine activities would benefit species of marine wildlife which are slow to replenish (e.g. benthic invertebrates). The MPA network may have additional benefits to marine wildlife outside of the zones of protection although this depends heavily on the size of the MPA. There has been no formal investigation as to the effects of a UK MPA network on marine wildlife. The benefits of an MPA network will depend heavily on the type of problem affecting marine wildlife. If a marine species is having difficulties breeding or the breeding habitat is becoming damaged then an MPA may be able to form a secure breeding ground and replenish stocks rapidly. If the problem is that fish are being caught before they are sexually mature then the effect of a MPA would be limited to within the zone boundaries. Again, the benefits would depend on the ecological behaviour of fish populations and whether they will aggregate in the MPA 'safe zones'. A crucial aspect to the MPA network is an extensive monitoring process to confirm that the MPA network is working and to determine the rate of wildlife replenishment.

MPA monitoring should not, as far as is reasonably practicable, cause damage or disturbance to the habitats/species of interest and should not occur more than once a year. Suitable activities would include photographic analysis, ROV work and limited seabed sampling. Some species will take a long time (over a year) to replenish and so monitoring should be performed over the long term. Many of these species are fish and it is not clear whether the fish would move into MPAs (assuming the protected habitats supported the fish populations) to replenish the stocks.

The expansion of offshore renewable energy projects may impact negatively upon the sea-bed and habitats however the effects of such activities are currently mitigated against by the requirement of extensive surveying and planning prior to permission being granted. In addition, there may be some unexpected positive impacts of renewable energy on the marine ecosystem in the form of encouraging fish aggregation and protecting communities through artificial reefs.

Offshore Renewable Energy

The Renewables sector has been highlighted as being crucial to the long-term stability of the UK economy. Offshore wind farms offer the greatest potential in terms of investment and have a potential estimated worth of £75 billion and will provide in excess of 40 % of the UK's and 15 % of Europe's energy usage by 2020. In March 2010, The Department for Business, Innovation and Skills (BIS) published its UK Marine Industries Strategic Framework, highlighting the importance of the UK marine environment and is encouraging further investment in UK renewable energy by international parties.

The Environment Agency has a regulatory role in the delivery of renewable energy as well as being a statutory advisor to the UK Government on the environmental impacts of

all public policy. This means the Environment Agency is a principal player in ensuring that renewable energy reduces greenhouse gas emissions and does not cause unacceptable environmental impacts. At the time of writing regional bodies, such as the East of England Development Agency, have responsibilities for fostering investment and helping to increase the local economy. These bodies receive external funding (e.g. through the European Social Fund). EEDA provide funding for offshore renewable energy through its regional enterprise hub for offshore renewables, OrbisEnergy. The Department of Energy and Climate Change supply funding to the Carbon Trust – a not-for-profit company with interests in moving the UK towards a low carbon economy. In February 2010, the Carbon Trust received £22.5 million for its Marine Renewables Proving Fund. This fund supplies money for SMEs developing renewable energy projects in the marine environment.

The MMO is responsible for Renewable licensing for structures which generate 1-100 kW. If the structure generates in excess of 100 kW, responsibility previously passed to the Infrastructure Planning Committee (IPC), who decided whether to grant licenses. The MMO then acted as an advisor to the IPC during the license decision-making process. Prior to the 2010 General Election, the Conservative Party announced its intention to reform the IPC. The status of this proposed reform in unclear since the coalition has been announced and the Liberal Democrat's Chris Huhne is the new Secretary of

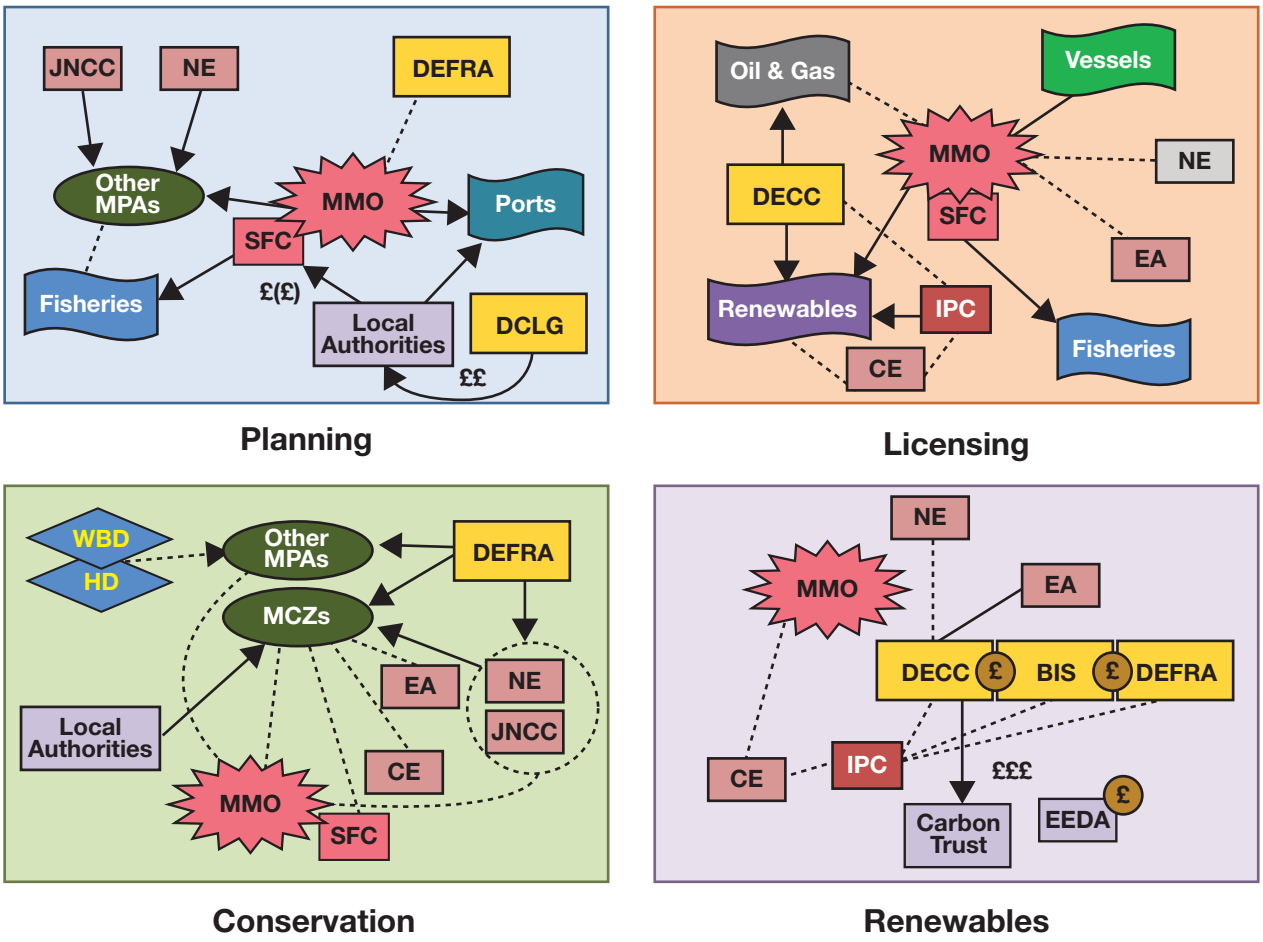


Figure 3: Network of relevant organisations by sector. Arrows indicate responsibility for an organisation, dashed lines indicate a non-direct involvement between organisations. Pound signs (£) indicate funding occurs between organisations.

7. Existing and potential commercial operations

State for Environment and Climate Change. As a result the MMO may take on some of the responsibilities of the IPC with regards to Renewable Energy licensing or reviewing Environmental Impact Assessments submitted by a renewable energy licensee. It is anticipated that there will be a body called the Major Infrastructure Planning Unit which will deal with these issues with the department falling back into governmental control under the auspices of the Planning Inspectorate of the Department for Communities and Local Government (CLG).

The Crown Estate owns approximately half the inshore waters and estuaries, owns the sea bed out to 12 nautical miles and leases areas for renewable energy generation out to 200 nautical miles within the Renewable Energy Zone (REZ). The Crown Estate announced that the Round 1 and 2 REZs are being extended. This follows the announcement of Alex Salmond, Scotland's First Minister, that "Scotland is the Saudi Arabia of marine power". In addition, The Crown Estate has announced the formation of "demonstration sites" for testing renewable energy projects. Renewable prototype testing is being performed by companies such as Narec (based in Blyth, Northumberland).

Historically, the UK has relied heavily on the "marine economy" and that reliance has never been higher than at present where over 90 % of our goods are transported from overseas[4].

It has been estimated that the total marine economy is worth £46 billion (4.2% UK GDP) and employs over 890,000 people, representing 2.9% of total UK employment[5]. The marine economy can be divided into many sectors however for the purposes of this report, only the following sectors have been included. For a more thorough breakdown of the marine economy by each of individual 18 sectors, see the detailed report published by The Crown Estate in 2008[5].

- Aggregates extraction
- Environment and conservation
- Fishing
- Oil and Gas extraction
- Renewable energy
- Research and Development

Aggregates extraction

In 2006, the aggregates industry was worth approximately £242 million and employed over 1,600 people, producing more than 20% of the material used for construction in England and Wales. In the UK, the South-east region lands the most sand and gravel (10 million tonnes; 75 % total aggregate landing)[5]. Aggregates are also used for beach replenishment, regular contract fill and coastal protection and are extracted by seabed dredging. The UK has the largest dredging industry in Europe and all dredging is performed under license from The Crown Estate, providing royalties of around £14 million per year. Licenses are obtained after an Environmental Impact Assessment has been performed and the UK Government has issued a Dredging Permission form. In addition, the MMO must obtain a Food and Environment Protection Act 1985 (FEPA) license before dredging can occur.

Aggregates potential

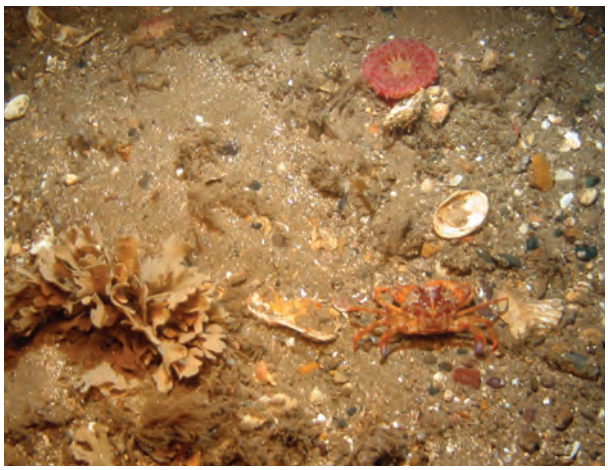
The demand for marine-dredged sand and gravel has remained stable from 1970 until the present day, with the exception of big construction projects such as The Channel Tunnel. The large construction projects underway in London in preparation for 2012 will undoubtedly see an increased demand for aggregates, however a commitment has been made to use more 'recycled aggregates' from demolished buildings, which may result in a less than expected demand for marine aggregates. The domestic demand for marine aggregates is expected to rise as climate change increases the coastal flooding risk and requires further coastal replenishment. Future exports of UK marine aggregates to the Continent are expected to steadily rise as European terrestrial-based aggregate supplies become exhausted.

Likely effects of the MPA network

Aggregate dredging has been highlighted as an activity with severe implications to the marine environment. It is likely that none of the new MPAs will permit dredging to occur within the restricted zones and increased environmental awareness may lead to growing calls for aggregate dredging to be restricted further. However, at present dredging only occurs in areas which do not contain significant marine life (based on environmental surveys) and so the activity is likely to continue outside of the MPA network. The largest impact to the industry is likely to be in finding new sites for dredging which may be limited if there are MPAs in the vicinity.

The Marine Environment and Conservation

This sector includes all activities which improve or protect the marine environment including wastewater treatment, activities of environmental agencies and the decommissioning of offshore structures which together employ over 16,000 staff and have a turnover of £981 million. The environmental aspect of renewable energy is not taken into account here, but is covered within the "Renewable energy" section.



The decommissioning of offshore oil and gas installations provides employment for 1,200 people and has a turnover of approximately £80 million. The industry has a potential of £15-£20 billion however at present very few decommissioning projects are underway.

The following UK environmental public bodies have a responsibility for some aspect of marine conservation (the definition of abbreviations can be found at the beginning of this report): JNCC, Natural England, CCW, SNH, SEPA, EA, National Trust and the new MMO. These organisations combined (excluding the MMO which is a new organisation currently in the process of recruiting staff) have a turnover of £165 million and employ over 2,700 staff.

Environmental potential

The commercial opportunities afforded by the Environment and Conservation sector are set to increase in future. The MCA Act 2009 has laid the framework for the development of MCZs to complement the existing MPAs, which will form part of the UK's commitment to the EU Marine Strategy Framework Directive. Each of these MPAs will need to be monitored, maintained and enforced to ensure the MPAs are fit for purpose. The main groups responsible for monitoring will be DEFRA, the MMO, Natural England and the JNCC and it is expected that regional groups with the necessary expertise will have an input. As climate change threatens biodiversity, it is likely that marine conservation will be a high priority and as such will receive a higher proportion of investment than is currently enjoyed.

The Fishing Sector

Fishing in the UK remains an important industry, generating a turnover of £3.74 billion and employing over 31,000 people in 2004. These figures include traditional sea fishing, fish farming and fish processing (including the 13,000 fishmongers

employed in 2005). The total fleet of the fishing industry is 6,722 vessels, landing 708,000 tonnes of sea-fish, worth an estimated £571 million. Fish farming is an important contributor to the marine economy, generating a fish retail value of £318 million in 2005. Farmed salmon in Scotland also has considerable associated food processing industry and generates large export revenues. In addition there is a growing shellfish industry, producing oysters, scallops and mussels with a turnover of £5.4 million. Over 18,000 people are employed in the fish processing industry which generates sales of £2.72 billion in canned, smoked, ready-prepared etc. fish products.

The fishing sector potential

The sea-fishing industry is slowly declining, due to threats from diminishing fish stocks and problems with CFP fish quotas (prior to the 2002 CFP reform). Farmed fish has also been in decline however is expected to rise in response to initiatives to farm "other fish species". It is hoped that both farmed fish and shellfish stocks will rise within the next 10 years creating 2,000 new jobs and producing a sale value of £100 million (Source: The British Marine Finfish Association). In addition, there may be unexpected beneficial side-effects of offshore renewable technology such as wind turbines acting as artificial reefs and fish aggregation devices (FADs). A report by BERR (now BIS) into the use of FADs concluded that there was a general trend for wind farms to act as gathering or spawning sites for fish communities, with salmon being highlighted as a particular species which could be encouraged for fish farming[6]. Such opportunities may increase as the offshore renewables sector grows in future.

Likely effects of the MPA network

Many of the putative MPAs are likely to contain fisheries and the impact on commercial fishing may be positive, although the extent of fish replenishment can only be determined after extensive monitoring. Previous MPA networks have shown that limiting fishing activities can lead to increased fish spawning, with more fish developing to sexual maturity (Section 3). This in turn may have a positive effect on future fish stocks, helped by reform of the CFP and the development of the Fisheries 2027 vision. It should be noted however that the North Sea represents a uniquely complex marine environment and the positive impacts of MPAs cannot be taken for granted.

One potential negative effect for the commercial fishing industry is the impact of "no-take" areas which would ban all fishing activities. Although such areas have the potential to benefit the industry in the long term by encouraging undisturbed breeding of fish, in the short term this could lead to fewer available sites for fishing. It will be interesting to see whether a balance can be struck between fisheries management within MPAs and environmental pressures for more strict conservation MPAs, which would reduce overall fishing activities.

Oil and Gas extraction

The oil and gas industries represent the most important financial sector in the marine industry, generating £28.7 billion (>1.8 % of UK GDP) and employing 290,000 people in 2005. The majority of the revenue is generated through sales of oil (£16.7 billion), gas (£8.9 billion) and revenue generated from pipelines and terminals (£1.5 billion). Oil and gas exports were primarily to countries within the EU (£6.8 billion) with about one-third of exports reaching non-EU markets (£3.2 billion) in 2004. In 2005, the UK became a net importer of oil, based on pre-processed 'primary oil' used exclusively by the oil industry (See Figure 4 below)

The oil and gas potential

Oil and gas production is generally declining after peak production in 1999 and 2000 as resources are being progressively exhausted. Despite this, oil and gas exploration in UK waters is still being performed, and as the price of oil increases, the revenue to oil companies is maintained, encouraging further investment. The demand for oil and gas may be reduced further as the UK Government has an aim of 20% of domestic energy usage to be met by renewable energy.

Likely effects of the MPA network

The MPA network is expected to be of concern to the oil and gas industry as it may restrict their activities in areas supporting marine life. Although it is unlikely that the UK Government would stop oil and gas exploration for the sake

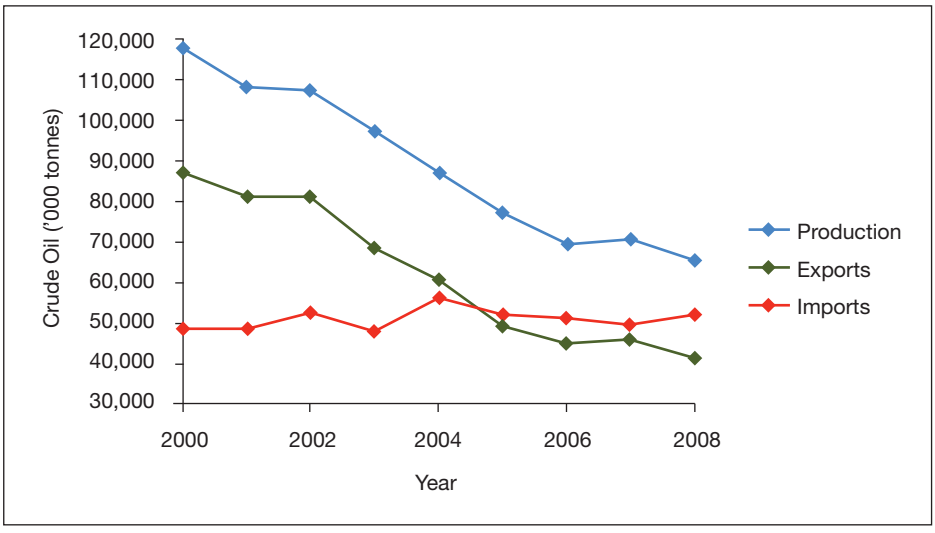


Figure 4: Production, export and import of primary crude oil 2000-2008. Data obtained from the Office of National Statistics and DECC.

of MPAs, new areas for exploratory drilling may be limited and concerns over marine conservation could potentially lead to greater pressure by environmental groups to limit oil and gas activities in a sector producing diminishing oil revenues. The UK Government may require the oil and gas industry to be more stringent in controlling potential environmentally-damaging activities, which could produce more opportunities for risk management and environmental surveying companies.

Marine Renewable Energy

Between 1996 and 2003, renewable energy increased at 14.5 % per year. During the next two years, renewable energy usage increased by 22 % per year. This trend is set to rise over at least the next ten years to meet the UK Government's aim 20% of energy usage to be met by renewable energy.

Wind energy is generating the most of the renewable energy investment, £75 billion. Energy generated by offshore wind power is currently transported back to shore through offshore sub-stations and cables, although it is expected that there will be greater innovation in future to transfer electricity through less wasteful means. It is hoped that by 2020 over 40% of energy usage will be met by renewable energy depending on the level of investment in some offshore renewable technology such as tidal and offshore solar energy which are in their infancy at the moment and require further research and development. Investment in offshore wind technology is primarily coming from foreign companies such as: Mitsubishi, General Electric, Siemens and Spain-based Gamesa. Much of this investment is coming in the form of research and development. In 2005-2006, Renewable Energy was the least

profitable of the marine economic sectors, generating only £32 million and employing fewer than 100 people. In recent years this sector has boomed and is widely expected to expand further over the next decade, supporting a plethora of ancillary industries as part of the new "Green Economy". Longer term it has been reported that by 2050, the UK offshore renewable energy sector could generate the same amount of energy per year as one billion barrels of oil, using 29 % of the UK's practical wind, wave and tidal resources[7]. According to DECC, all commercial interest is at present focused on the offshore wind sector although there are small-scale R&D projects being performed on other types of offshore renewable energy technology such as wave and tidal and solar energy. These alternative renewable energy sources may attract additional commercial investment in the future.

Likely effects of the MPA network

There is potential for conflict between the Renewables sector and environmental conservation through MPAs. The expansion of the renewable energy sector is supported to meet UK targets for 2020 however the environmental impact of projects such as wind turbines would need to be considered. It is possible that the 'reef effects' of wind turbines[6] could be used as an argument in future to support renewable energy projects coupled with MPAs.

Research and Development (R&D)

Marine R&D falls into three categories: the industry sector, University (Higher Education Institutions) and the Public Sector. In addition, some funding comes through EU programmes but represents only a small part of the overall investment. The marine-related sciences tend to be researched in the public sector, in sharp contrast to pharmaceuticals and petrochemicals which are funded to a greater extent by the companies themselves. Some of the marine sectors do not require extensive R&D, for example the leisure and tourism industry; others such as the emerging renewable energy sector are attracting large amounts of investment and are expected to continue to do so. In addition, the UK knowledge base and expertise in marine and renewable science represents an exportable asset which is set to increase in future. Funding of Research Councils by BIS is set to increase year on year until 2010-2011, although the majority marine science is funded through the Natural Environment Research Council (NERC), which receives the least funding of the science Research Councils[8]. In 2007, NERC approved "Oceans 2025"[9], a five year research programme coordinated across seven marine centres aimed at "bringing marine researchers together to increase people's knowledge of the marine environment". Additional science funding can be provided for specific project areas by Knowledge Transfer Networks, local Government and public bodies such as Cefas and the National Oceanography Centre.

Likely effects of the MPA network

Over the next few years, marine conservation will become an ever-more important issue and this is likely to be reflected in increased funding for environmental and marine research. The MPA network will require expert monitoring, and intervention strategies are likely to be sought to combat threats such as climate change. Increasingly, research may be funded by private companies (e.g. within the fisheries sector) to research problems if the MPAs fail to provide the desired level of protection.

8. NSMC existing capacity and capability

The NSMC presently combines the research excellence of The University of East Anglia and the marine expertise of the Gardline Group, the latter of which currently contains over 35 global science and technology companies.

University of East Anglia

The University of East Anglia contains the largest Environment Science Department in the UK, employing around 250 staff and performing internationally-recognised research in a wide range of fields, including marine science[10]. The multidisciplinary academic expertise of the Environmental Sciences Department encompasses fields such as Earth and Geophysical Sciences, Wave & Fluid Dynamics, Marine & Intertidal Ecology, Ecotoxicology, Marine Ecosystem Services, Marine and Atmospheric Chemistry, Computer modelling and specialist analytical facilities.

GARDLINE GROUP

The Gardline Group contains individual companies working within diverse fields, including marine science employing approximately 1200 staff and generating a turnover of over £140 million. Gardline Marine Science contains groups working in fields of geoscience, geosurveying and the marine environment. A particular strength of Gardline Marine Science is the fleet of 20 vessels varying in size from under 8 meters up to almost 100 metres in length[11]. These vessels fulfil a variety of roles in offshore, nearshore and coastal waters including marine surveying and wind farm support. Gardline Geosurvey provides hydrographic and geophysical surveys for marine cable routes, offshore pipelines and rig and platform sites. In addition, seabed mapping, seismic data processing and shallow gas hazard analysis facilities provide high-quality data for a range of clients including government agencies, offshore exploration companies and the telecommunications industry.

For more detailed information on the capacity of the NSMC visit the website: http://www.nsmc.eu.com/ or read the Capability Statement in the NSMC brochure. Copies of the brochure can be ordered by email (info@nsmc.eu.com).

9. Areas for NSMC expansion

The NSMC currently consists of a good breadth of expertise by combining R&D strengths of UEA with the marine and maritime expertise of the Gardline Group. This breadth, combined with experienced, cross-sector Board members provides a good basis for the NSMC to be seen as an authoritative advisory body to NGOs, Government Departments and other marine stakeholders. The renewable energy sector contains many emerging and established companies for potential partnership with the cluster.

10. Overall Conclusions

The North Sea marine economy contributes greatly towards the UK GDP and is expected to increase rapidly over the next few decades. The output of previous commercial North Sea operations such as sea fishing and oil and gas extraction are set to decline over the next few years and will be replaced by the rapidly-growing Renewables and Environmental Conservation sector as the UK builds the new 'Green Economy'.

This report has focused on the establishment of the MPA network, which over the next two years will provide many opportunities for groups with expertise in environmental science, marine surveying, geophysical science and strong computational capabilities.

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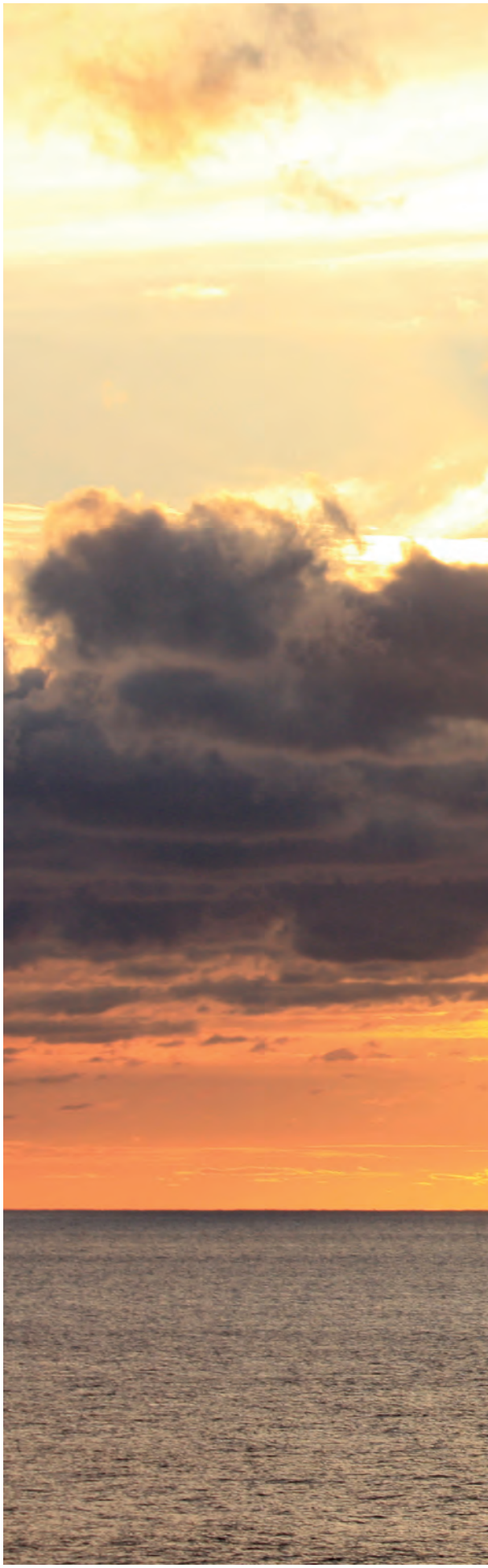

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