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Marine Planning for Wales
Strategic Scoping Exercise

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Marine Planning for Wales - Strategic Scoping Exercise

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This document presents the best currently available evidence on the state of the Welsh marine environment - the natural resources that it contains and the use that we currently make of them. It presents the current situation, identifies trends in the evidence and uses this information to consider the future. This evidence, coupled with the relevant policy context, that has also been collated, has been used to identify key issues for the Welsh marine planning process.

This Strategic Scoping Exercise will be used to inform the development of the Welsh National Marine Plan. The evidence base presented here will be maintained and updated as marine planning in Wales develops.

Further spatial marine evidence will be presented through the Welsh marine planning portal, available at:
http://lle.wales.gov.uk/apps/marineportal/#lat=52.5145&lon=-3.9111&z=8

For further information on marine planning in Wales, see:
http://gov.wales/topics/environmentcountryside/fisheries/marine/marine-planning/?lang=en

To facilitate access to the SSE, a supporting summary document has been produced that includes some of the maps and issues highlighted in this document. The document can be accessed at: http://gov.wales/topics/environmentcountryside/marineandfisheries/marineplanning/welshnationalmarineplan

Summary

Background and Scope

The purpose of marine planning under the Marine and Coastal Access Act 2009 (MCAA) is to help achieve sustainable development of the marine area. Sustainable development is the central organising principle of the Welsh Government and is enshrined in the Government of Wales Act 2006. UK Administrations published the UK Marine Policy Statement (MPS) in March 2011 as part of a new system of marine planning being introduced across UK seas. The MPS will ensure an appropriate and consistent approach to marine planning across UK waters with the purpose of achieving the sustainable development of our seas by guiding marine licensing and other decisions. In Wales, marine planning is being taken forward by the Welsh Government.

The marine planning systems will allow the Welsh Government to strategically, and holistically, plan for and guide the management of Wales's seas; integrating economic, social and environmental considerations, and engaging with communities to help shape the future. Marine planning will build on the framework provided by the MPS to reflect the specific needs and interests of Wales.

The MPS requires plan-making authorities to use the best available evidence in plan making. In order to ensure that Welsh Government is in a position to do so, it has commissioned this Strategic Scoping Exercise (SSE) to assess the spatial distribution of natural resources and human activities within Wales's marine area and to understand at a strategic level the key issues that marine planning should take account of.

This SSE has collated and summarised the evidence base available for the Welsh Government to develop and implement the Welsh National Marine Plan (WNMP). It has been structured to mirror the MPS and to reflect the likely scope of the WNMP. It includes evidence on status of the marine environment (e.g. biodiversity and geodiversity), over-arching issues (e.g. climate change; air and water quality; noise; historic environment; seascape) and specific human activities (e.g. aggregates; aquaculture; defence; navigation dredging and disposal; energy; fisheries; recreation and tourism; telecommunication cabling; transport (ports and shipping); surface water management and waste water treatment and disposal). Further evaluations are provided on the social and economic considerations of these topics for marine planning. The evidence in this SSE has been collected from a variety of public sources in the peer-reviewed and grey literature.

The SSE has been developed through a stepwise process of evidence identification, collation and analysis. The introductory Chapters provide the context for marine planning, the relationship with other planning regimes and a series of general considerations. The current SSE has been produced iteratively with earlier drafts distributed to and reviewed by policy and regulatory leads in the Welsh Government and Natural Resources Wales. This has facilitated refinement of the content, ensuring a clear Welsh focus and producing a quality assured product.

In developing the Welsh National Marine Plan the Welsh Government will need to balance environmental, economic, social and cultural considerations. Marine planning requires an understanding of if and how marine space and resources may be managed to optimise their use by multiple, often interdependent, interests. This will entail evaluations of the possible use of spaces for protection, development by multiple and single activities, recognising that the marine environment is already used / enjoyed by multiple stakeholders (for livelihood and pleasure). The SSE also presents some initial considerations for identifying areas of future technical opportunity.

Natural Resource Management

The Welsh Government is taking forward a new approach to the management of natural resources in order to drive sustainable economic growth and to improve the quality of life and increase the range of opportunities for everyone who lives and works in Wales. The aim is to enable a step change in the delivery of sustainable natural resource planning and use in Wales by taking a more proactive, evidence-based and joined-up approach.

Wales faces many challenges, including tackling relatively high rates of poverty, ensuring the provision of jobs and income, and tackling the threats of climate change and flooding. Wales has a wealth of natural resources which are key to meeting these challenges. Natural resources provide energy, prosperity, security, protection, health and well-being. Through a process of Integrated Natural Resource Management the Welsh Government aims to optimise those benefits for the long term, recognising that the resilience of natural resources will be essential to the wellbeing of future generations.

Integration with other planning regimes

According to the MPS the marine planning process should ensure appropriate harmonisation between marine policy guidance and existing terrestrial planning. Any marine plan should seek to complement the existing planning system, recognising that both systems will adapt and co-evolve

over time. Terrestrial planning policy and development plan documents already include policies to address coastal and estuarine planning. The marine planning system in Wales will sit alongside and interact with other Welsh and UK planning regimes. MCAA (2009) Schedule 6(3) instructs the Welsh Government as the Marine Planning Authority for Wales, to ensure that certain other marine plans and Planning Act plans are compatible with any Marine Plan prepared for a marine plan area. Therefore the Welsh Government will need to take all reasonable steps to secure that the WNMP for its marine planning region is compatible with the relevant Planning Act plans. In accordance with the MPS the UK Administrations are committed to ensuring that coastal areas, and the activities taking place within them, are managed in an integrated and holistic way in line with the principles of Integrated Coastal Zone Management (ICZM). The Welsh ICZM strategy is being reviewed as part of the work to develop and implement the WNMP.

General considerations

This section describes those generic and cross-cutting issues for marine planning identified in the UK MPS that are relevant to a range of ecosystem components and human activities. These include the cumulative effects of multiple activities on the marine environment; opportunities and feasibility of co-locating activities in space and time; opportunities and trends for growth in the marine economy; implications for coastal communities; engagement between the public, industry and regulators; climate change; coastal change and flooding; water and air quality; nature conservation, biodiversity and geodiversity; historic environment; seascape and underwater noise.

Cumulative effects

The MPS requires that Marine Plans should provide for continued, as well as new, uses and developments in appropriate locations. They should identify how the potential impacts of activities will be managed, including cumulative effects. Close working across plan boundaries will enable the marine plan authority to take account of the cumulative effects of activities at plan boundaries. The consideration of cumulative effects alongside other evidence may enable limits or targets for the area to be determined in the Marine Plan, if it is appropriate to do so.

Co-location and displacement

Within the UK MPS there is an expectation to '*promote compatibility and reduce conflict*' and to '*reduce real and potential conflict, maximise compatibility between marine activities and encourage co-existence of multiple uses*'. The SSE considers current thinking and approaches to co-location and displacement.

Economic Growth

Jobs and the economy are the overriding priority for the Welsh Government, as stated in the Programme for Government (Welsh Government 2014a). Properly planned developments in the marine area can provide environmental and social benefits as well as drive economic development, provide opportunities for investment and generate export and tax revenues. The marine planning system will help to promote these benefits in contributing to the achievement of sustainable development. The evidence suggests that economic growth from taking a planned approach will most likely occur in the ports and shipping, marine renewable energy, tourism and leisure and aquaculture sectors. This does not preclude that other sectors will also experience growth from a planned approach.

Engagement

To ensure that the first WNMP is a useful system the wide variety of people and communities that will benefit from it need to be engaged in its development. The approach to engagement, including when and how interested parties are to have the opportunity to input to the development of the plan, was set out in the Statement of Public Participation (SPP) for the Welsh National Marine Plan. The Welsh Government will engage directly with interested persons and parties to inform and direct the WNMP throughout the plan-making process. Engagement will be conducted in a variety of ways including social media, the internet, at meetings and events. The Marine Planning Evidence Portal provides a web-based mapping tool which when accessed reveals spatial data within the Welsh National Marine Planning Region.

Coastal Communities

Activities in the marine environment can support social and economic development of Welsh coastal communities. A report commissioned by the Welsh Government sets out a typology of Welsh coastal areas, based on their social and economic characteristics. Although every coastal community has a unique combination of characteristics, the typology helps group together those areas with similar characteristics on key indicators, e.g. age of population; employment in different sectors; health; housing; crime.

Climate Change

The UK MPS highlights the importance of understanding issues surrounding climate change and how this might be reflected in the future marine environment. It states that '*climate change is likely to mean that the UK will experience hotter, drier summers and warmer, wetter winters… increased*

drought, heatwaves, changes in seasonal precipitation and the intensity of weather events such as rainfall leading to flooding'. Specifically, the potential impacts of climate change on the UK's marine environment include '*relative sea level rise, increased seawater temperatures, ocean acidification and changes in ocean circulation*'.

This SSE presents the evidence base and key considerations for climate change in Wales in the context of marine planning. Key issues for marine planning include:

- Unlike the land-based projections, limited data is available on climate scenarios specifically for the marine environment.
- Sea level rise could increase the risk of coastal erosion and physical damage to infrastructure, habitats (including protected habitats such as SACs, SPAs and SSSIs), coastal paths and agricultural land through flooding and wave action.
- Significant ecological impacts may arise due to seawater temperature changes, ocean acidification and earlier and prolonged stratification of the water column.
- Water quality in certain areas may deteriorate due to agricultural/urban run-off and sewerage overflows due to increased intensity of rainfall events.
- Many key seabird species are predicted to vacate sites in Wales over the next 100 years due to climate change and seabird associated ecotourism activities are anticipated to suffer as a result (Pinnegar et al. 2012).
- The potential issues related to climate change are overarching and could lead to significant impacts in numerous sectors (e.g. agriculture, aquaculture, fishing, tourism and recreation).
- It is likely that adaptation of terrestrial environments will be required to improve coastal resilience.
- Marine planning should consider both the potential impacts of climate change (e.g. sea level rise), but it should also consider the potential to facilitate actions to mitigate climate change, such as the development of offshore renewable energy generation and carbon capture and storage (CCS) and apply an integrated approach.
- Future developments should be encouraged to take account of the potential impacts of climate change over their estimated lifetime (MPS) (HM Government 2011).

Coastal Change and Flooding

The coast of Wales is home to a wide range of habitats and landforms which have been shaped and affected by storms, especially beaches, cliffs and wave-cut platforms, sand dunes and vegetated shingle and saltmarsh. They include biodiversity and geodiversity features of national and

international importance which can experience significant morphological change following storm events. The coastline is important to the people, communities and economy of Wales. Many of the country's towns and cities are located in coastal areas, supported by a range of local and national infrastructure. The coastal areas are an important attraction to visitors from both within and outside of Wales and provide an important contribution to its national economy.

Coastal erosion is occurring along 23% of the Welsh coastline (UKMMAS 2010a). An estimated 415 km of man-made sea defence structures exist to protect over £8 billion of assets from coastal erosion and tidal flooding (Wales Audit Office 2009). The national network of coastal protection and defence infrastructure has evolved and developed over many years, in order to protect and manage the risks to important and sensitive coastal areas and communities.

This SSE presents the evidence base and key considerations for coastal change and flooding in Wales in the context of marine planning. Key issues for marine planning include:

- Sustained investment in coastal flood and erosion risk management.
- Improved information on coastal flood defence and erosion management systems.
- Greater clarity on roles and responsibilities to improve efficiency and effective management of the coastal flood and erosion risks.
- An assessment of the skills and capacity of Risk Management Authorities to determine the existing gaps and how these can best be addressed.
- More support to communities to help them become more self-sufficient and resilient.
- Locally developed and delivered plans for coastal communities and infrastructure operators.

Water Quality

The UK MPS highlights the importance of water quality in preserving clean, healthy and productive marine ecosystems, stating '*developments and other activities at the coast and at sea can have adverse effects on transitional, coastal and marine waters*'. In addition, the MPS states that UK Administrations share a common objective to '*contribute to sustainable development including the health and wellbeing of the community … by maintaining and developing a policy and regulatory system which provides modern, high quality management and treatment of surface and waste water*'.

This SSE presents the evidence base and key considerations for water quality in Wales in the context of marine planning. Key issues for marine planning include:

- Population growth and associated infrastructure will put increased demand on the sewerage network and local water companies with regard to the disposal of waste water.
- More frequent and intense storms, possibly as a result of climate change, could impact on water quality as a result of increased frequency and duration of operation of storm overflows and increased agricultural run-off.
- The updated River Basin Management plans (RBMPs) are due to be published in December 2015 and will include an updated programme of measures.
- Changes in water quality have the potential to affect other human activities, for example tourism, recreation, fisheries and shellfisheries all rely on, and are influenced by, a healthy marine environment, which includes good water quality.
- The development of industry such as nuclear power or port expansion will impact on coastal waters during their construction, operation and / or decommissioning phases.
- Climate change could lead to increased flooding and coastal erosion, which in turn could lead to increased sediment loading in estuaries and coastal areas.

Geodiversity, Biodiversity and Nature Conservation

Biodiversity and geodiversity are fundamental for a healthy marine environment. They are indicators of the health of our ecosystem and quality of life. Biodiversity describes the diversity of life and includes all species of plants and animals, the genetic variety amongst them and the complex ecosystems of which they are part. Geodiversity is the variety of rocks, minerals, fossils and structures together with the physical processes that result in their formation. The UK administrations are committed to completing an ecologically coherent network of marine protected areas (MPAs) for the protection of biodiversity and geodiversity as part of a broad based approach to nature conservation.

This SSE presents the evidence base and key considerations for nature conservation, biodiversity and geodiversity in Wales in the context of marine planning. Key issues for marine planning include:

Geodiversity

- Future large-scale seabed and infrastructure development, could lead to significant changes in the physical environment (coastal processes) both locally and further afield (it is also important to consider the cumulative effect of multiple smaller projects).
- In the long-term, climate change could have a dramatic impact upon the physical environment.

- Detailed understanding of the natural physical environment (coastal processes and solid geology) around the Welsh coastline is vital in maintaining a healthy environment.
- Changes in the physical environment as a result of human developments (at a local or sub-regional scale) need to be set against the increasing evidence of wider regional scale shifts as a result of climate change.

Marine ecology and biodiversity

- Historically, the marine environment around Wales has suffered significant habitat loss, with key examples being coastal habitat (particularly saltmarsh) and subtidal native oyster beds. A key issue is to understand better the potential opportunities to restore these ecosystems, and the development of methods to do this, as well as to identify the wider social and economic benefits that such projects could provide for Wales.
- It can be anticipated that the level of activities and developments in the marine environment will increase over the next 20 years, with potential negative impacts for marine ecology and biodiversity. A key issue is defining the key evidence gaps that need to be filled in order to ensure appropriate decisions can be made about the exploitation of the marine environment in such a way that minimises impacts on biodiversity and considers opportunities for environmental enhancements or benefits within projects.
- Marine ecology and biodiversity features face pressures from a range of sources including climate change, as discussed in the future trends section. The consequences of the feedback relationships with the wider ecosystem as a result of climate change are not clear (UKMMAS 2010b).
- Marine planning will be a key tool for ensuring that the targets and measures to be determined by the UK for the Marine Strategy Framework Directive (MSFD) can be implemented.

Marine Protected Areas

- The key issues for the MPA Network relate to both to the completion of an ecologically coherent network and to delivering effective management of that network. There are gaps in our knowledge of the extent and distribution of marine habitats and species in Welsh waters. This is an issue for assessing the completeness of the network.
- The recent Article 17 reports indicated that whilst certain MPA features, such as Bottlenose Dolphin and Grey Seal are in Favourable Conservation Status at a UK level a number of

features are not. Features not in Favourable Conservation Status include estuaries, mudflats and sandflats and large shallow inlets and bays.

- A Special Sites Database, developed by Natural Resources Wales, has identified a number of key activities understood to be impacting, or potentially impacting, MPAs. These issues include pollution, coastal squeeze, invasive species, fisheries and marine litter. These issues will be the subject of thematic plans arising from the currently-running Life+ N2K project which will look at these issues (and others) on a cross Wales basis and will provide costed actions to help tackle them.
- A remaining issue for MPA management is the lack of detailed information on the extent of activities that occur within the network and how they impact the features of interest. Improved information would support more robust decision-making regarding the use of the MPA network and thus enable better management.

Historic Environment

The UK MPS highlights the importance of the historic environment as an asset of social, economic and environmental value, not only for its cultural value, but as '*a powerful driver for economic growth, attracting investment and tourism and sustaining enjoyable and successful places in which to live and work*.' In addition, the MPS states that the UK Administrations shared view is that '*heritage assets should be enjoyed for the quality of life they bring to this and future generations, and should be conserved through marine planning in a manner appropriate and proportionate to their significance*' (Welsh Government 2014b) (Welsh Office 1996).

This SSE presents the evidence base and key considerations for the historic environment in Wales in the context of marine planning. Key issues for marine planning include:

- The potential future issues that will arise in relation to the protection of heritage assets are likely to include the effects of new infrastructure development or activities on existing coastal, intertidal, and marine heritage assets and the wider historic marine environment. Furthermore, the effects of increased footfall on the coastal historic environment and heritage assets may contribute to the damage of these sites and in turn the tourist economy. As stated, the effects of coastal erosion and damage caused by the sea to heritage assets, both positive (in uncovering) and negative (in abrasion) are also a consideration.
- The MPS states that development and implementation of marine plans should take into account the available evidence in relation to the significance of any heritage assets (or the potential for such heritage assets to be discovered) and consider how they are managed.

This highlights the importance of assessing the 'setting' and uniqueness of each heritage asset when assigning 'significance' value.

Seascape

The MPS highlights the importance of considering seascape when developing Marine Plans, noting that marine plan authorities should consider at a strategic level visual, cultural, historical and archaeological impacts not just for those coastal areas that are particularly important for seascape, but for all coastal areas, liaising with terrestrial planning authorities as necessary. The existing character and quality of seascape should be considered including how highly it is valued and its capacity to accommodate change specific to any development, noting that the effects of activities and developments in the marine and coastal area on the seascape will vary on a case-by-case basis according to the type of activity, its location and its setting. In addition, any wider social and economic impacts of a development or activity on coastal landscapes and seascapes should be considered (HM Government 2011).

This SSE presents the evidence base and key considerations for seascape in Wales in the context of marine planning. Key issues for marine planning include:

- Given the local level of detail of existing seascape character assessments in Wales, suited to local planning needs, a broader, more strategic assessment of seascape character is currently missing.
- Site selection as the most effective way of preventing significant seascape and visual effects, and encourages appropriate siting and consideration of alternatives as the first priority in any mitigation strategy.
- It is important to understand the relationship between seascape assessment and the historic environment, especially as the UK MPS specifically refers under 'seascapes' to 'historic and archaeological links'. 'Seascape/landscape/visual' and 'historic environment' are each considered as a distinct specialism with different chapters in Environmental Impact Assessment.

Air Quality

Good air quality is essential to ensure ecosystems in both coastal areas and the offshore environment are healthy, productive and balanced. Air quality can be regarded as poor when concentrations of pollutants are at a high enough level to cause harm to biodiversity, the wider environment and human health. Atmospheric pollutants can have significant impacts on

biodiversity, for example nitrogen deposition reduces the conservation value of sensitive priority habitats (RoTAP 2012). This is a major concern in relation to the protection of biodiversity and can have implications for meeting national and international conservation policy targets and obligations.

This SSE presents the evidence base and key considerations for air quality in Wales in the context of marine planning. Key issues for marine planning include:

- As offshore air quality is not routinely monitored, it is difficult to assess the current status of marine air quality (MMO 2013a). Even though current policy actions and the associated legislation has improved air quality to the required standards in most cases, further improvements can still be made with better regulation of activities.
- In particular, the potential expansion of marine activities requires careful consideration by the marine planning system in respect of the air pollution impacts; additional regulation activities may also be required.

Noise

The input of noise energy into the marine environment can occur on many spatial and temporal scales (MSFD Technical Sub-Group on Underwater Noise 2013). There is great variability in transmission of noise in the marine environment. Underwater noise from human activities may be of short duration (impulsive) or be long lasting (continuous); the repetition of impulsive sounds may become diffuse with distance and reverberation and become indistinguishable from continuous noise. Lower frequency noises will transmit further in the marine environment than higher frequency noise.

This SSE presents the evidence base and key considerations for underwater noise in Wales in the context of marine planning. Key issues for marine planning include:

- There is a general lack of understanding between transmission of underwater noise and the scale of the effect on marine organisms (either individually or at the population level). There is a lack of understanding for the sensitivities of different species to underwater noise and it is difficult to determine dose response relationships.
- The work being progressed by Member States under the MSFD will increase the knowledge base on the distribution of impulsive and ambient noise activities.
- In developing Marine Plans a strategic overview of man-made noise sources should be considered and the potential effects of noise on sensitive marine receptors assessed.

Sectoral Considerations

Wales is highly dependent on the trade, tourism and fishing industry that its seas provide. As such, protecting and sustainably developing Wales's seas is essential. Wales's marine resources support a wide range of sectors.

Aggregates

The marine aggregates sector involves the extraction of aggregates, such as sands and gravels, from the seabed. Marine aggregates make an important contribution to the Welsh economy, providing direct employment within the sector as well as within a range of ancillary activities that support the industry, including ship building and repair, exploration services, processing of aggregate at wharves, manufacture of products from marine aggregates, and agents involved in the sale of marine aggregates (UKMMAS 2010a).

This SSE presents the evidence base and key considerations for marine aggregate extraction in Wales in the context of marine planning. Key issues for marine planning include:

- Marine dredged aggregates are vitally important in south Wales as they are the only significant source of sand for concrete manufacture (Bide et al. 2013).
- Marine aggregates make an important contribution to the Welsh economy, including direct employment within the aggregate sector and indirectly (survey ships, equipment and maintenance).
- Marine aggregate extraction is spatially limited and can only take place where there are suitable resources (The Crown Estate 2014). As such, it is important that these resources are safeguarded against other marine activities which may compromise their use.
- Mineral resources are finite and can only be worked where they occur. As their extraction is subject to many constraints, it is important that society uses minerals in the most efficient and sustainable manner. Identifying the distribution of known mineral resources on the UK Continental Shelf (UKCS) and presenting them in a consistent fashion at a national scale allows minerals to be considered in the marine spatial planning process and permits more effective and sustainable management strategies to be developed (Bide et al. 2013).
- Further considerations include: disturbance / habitat loss due to sediment removal; removal of species within sediment; creation of sediment plumes by draghead disturbance, by overflow when loading sediment and by screening (sorting) of aggregate for end user requirements; changes in bathymetry / seabed topography; potential impact on sensitive receptors – nature conservation or archaeological; employment – directly in industry, but

also ancillary works – e.g. shipbuilding and construction works; sediment for coastal protection, including coastal defences; interactions with other sea users (e.g. shipping, fishing).

Aquaculture

Aquaculture includes the rearing or cultivation of aquatic organisms using techniques designed to increase the production of the organisms in question beyond the natural capacity of the species in their natural environment. It can be characterised in a number of different ways, including the organism farmed, the culture environment, the production intensity and the type of production system used. Aquaculture activities that depend on sea water include different systems of shellfish or finfish farming and seaweeds production and harvesting. Marine biomass, from seaweed harvesting for use in energy production (see section 5.5.3) is emerging as one of the newest prospective aquaculture business sectors.

This SSE presents the evidence base and key considerations for aquaculture in Wales in the context of marine planning. Key issues for marine planning include:

- The Welsh Government is committed to the sustainable development of aquaculture in Wales. This includes shellfish and finfish, in the coastal marine environment and in freshwater.
- In relation to aquaculture, Wales will focus on capacity building, increasing innovation and new developments, building on links between operators and scientific bodies as well as increasing the sustainability of the industry in its interactions with the environment.
- In Wales there has been some conflict between aquaculture businesses and the management of European Marine Sites (EMS) although the Menai Strait mussel fishery does exist within the EMS without conflict. This can lead to significant expense and delays in businesses getting off the ground. Work could be undertaken to guide developers on the best places to site their businesses to avoid such conflicts.

Defence

Defence activities that utilise the marine environment, directly or indirectly, in support of operational capability are diverse but include operational vessels and aircraft, HM Naval bases, surface and sub-surface navigational interests, underwater acoustic ranges, maritime exercises, amphibious exercises, coastal training ranges and test and evaluation ranges (UKMMAS 2010a; HM Government 2011).

This SSE presents the evidence base and key considerations for defence activities in Wales in the context of marine planning. Key issues for marine planning include:

- The construction and operation of offshore marine infrastructure, installations and activities, as well as policies on conservation designations and the health of the wider environment may impact on defence interests in certain areas. Marine plan authorities and decision makers should take full account of the individual and cumulative effects of marine infrastructure on both marine and land based MOD interests. Marine plan authorities, decision makers and developers should consult the MOD in all circumstances to verify whether defence interests will be affected (HM Government 2011).
- Non-defence activities in the marine area have the potential to impact the MOD elsewhere. Some onshore coastal defences such as aerodromes, transmitter sites and explosive stores have safeguarding zones extending over the marine area to regulate development that may otherwise affect their operation (HM Government 2011).
- Through the delivery of security for the UK and Overseas territories, the MOD contributes to the marine sector by providing survey data and cross-government surveillance[1], monitoring and enforcement activities.
- It is recognised that there are risks to the marine environment through the maintenance and deployment of operational capability. The MOD is committed to the protection of the natural and historic environment.
- Key pressures are likely to include noise from sonar and underwater explosions, habitat damage and introduction of marine litter and contaminants. A sustainable development strategy was published by the Ministry of Defence in 2008 and provides a number of objectives, measures and targets for changing the way that activities are carried out in order to reduce pressure on the marine environment, climate and communities (UKMMAS 2010a).

Navigation Dredging and Disposal

Dredging is closely linked with the Ports sector and consists of navigation dredging of ports, harbours, marinas and navigation channels to maintain navigable depths for vessels. There are two main types of navigation dredging: capital dredging and maintenance dredging. Capital dredging is the removal of material to create a greater depth than had previously been charted on UKHO Admiralty Charts. It involves the improvement of access by deepening and widening an existing

[1] The National Maritime Information Centre is responsible for providing situational awareness to central government via the Cabinet Office Briefing Room (COBR) mechanism and lead departments who deal with the impacts of environmental disasters or crises.

channel, or by creating an entirely new access channel. This is usually done in order to allow larger vessels, longer optimal tidal windows and to provide passing places in narrow channels. Maintenance dredging is required to maintain water depths in areas where sedimentation occurs. It mainly involves the removal of recently deposited unconsolidated sediments, such as mud, sand and gravel to maintain existing access to ports and ensures that all vessels using the waterway may do so safely. It is undertaken on an as-and-when basis to maintain the level of water necessary for the safe operation of vessels.

This SSE presents the evidence base and key considerations for navigation dredging and sea disposal of dredged materials in Wales in the context of marine planning. Key issues for marine planning include:

- Dredging and disposal is essential for the maintenance and development of ports, harbours and waterways for navigation, remediation and flood management. Dredged material can be a valuable resource, and can be used in environmental enhancement projects including habitat creation and enhancement, and engineering projects for construction materials, flood defence, land reclamation and beach nourishment.
- However, dredging and disposal of dredged materials may:
  - Pose a risk to marine life and ecology through changes in water quality (changes in chemistry and turbidity), noise and physical disturbance;
  - Mobilise contaminants (held in sediments from legacy industrial activities, antifouling paints, ongoing industrial or domestic maintenance and operational activities);
  - Impact designated nature conservation areas;
  - Degrade heritage assets through direct or indirect physical activity;
  - Change natural sedimentary systems via morphological changes (i.e. alterations to channel width and depth). (MMO 2013b)

Energy

A secure, sustainable and affordable supply of energy is of central importance to the economic and social well-being of the UK. The marine environment will make an increasingly major contribution to the provision of the UK's energy supply and distribution. This contribution includes the oil and gas sectors which supply the major part of our current energy needs, and a growing contribution from renewable energy and from other forms of low carbon energy supply in response to the challenges of tackling climate change and energy security. Contributing to securing the UK's energy objectives, while protecting the environment, will be a priority for marine planning (HM Government 2011).

When developing Marine Plans, marine plan authorities should identify how these will contribute to delivery of national targets and priorities, including legally binding commitments entered into under the Renewable Energy Directive (Directive 2009/28/EC) and our domestic binding target to reduce greenhouse gas emissions by 80% by 2050. This will include taking account of preferred areas for development of different energy sources, generation and distribution infrastructure and, if appropriate, setting out potential new opportunities, taking into account the most sensitive areas for biodiversity and considering carefully areas with competing and incompatible uses.

This SSE presents the evidence base and key considerations for energy activities in Wales in the context of marine planning. Key issues for marine planning include:

Oil and Gas (including Carbon Capture and Storage (CCS))

- Although there is no current oil and gas exploration and production there are a limited number of licensed blocks, including one with a significant discovery. In addition there are many blocks within Welsh Waters that are included in the 28th Oil and Gas Licensing Round and therefore future developments cannot be discounted.
- However, offshore storage of gas[2], offshore unloading of gas and provision of gas import facilities are activities which are of increasing importance to our security of supply as indigenous gas supplies decline (HM Government 2011).
- The key drivers and efforts for CCS technologies are at the UK and international scale. Continuing research and development of CCS technologies and capabilities are important factors in reducing the costs towards making CCS economically competitive and viable (MMO 2013b).

Low Carbon

- The UK has among the highest density of exploitable renewable energy resources in the world, and has the potential to become a global leader in both engineering development and energy production with Wales being a contributor. The renewable resources for Wales include wind (for both coastal and offshore); wave; tidal stream (focused inshore) and tidal range (particularly in the Severn estuary).
- The Marine Plan should take account of, and identify, areas of potential for the deployment of different renewable energy technologies. Measures should be taken to prevent, mitigate, and, where that is not possible, compensate for any potential negative impacts in line with

[2] For example see: http://www.gatewaystorage.co.uk/

legislative requirements. The Marine Plan and the marine planning process will need to be flexible in responding to emerging evidence about the impacts of new technologies; the monitoring and review arrangements for plans, in particular, will be important in this.

- The cumulative effects (both nationally and transboundary) from the construction and operation of multiple offshore renewable energy developments (most notably for offshore wind) for navigation, migratory species (e.g. birds), fisheries and visual impact are the focus of ongoing attention.
- Marine biomass, from seaweed harvesting for use in energy production is emerging as one of the newest prospective aquaculture business sectors.

Power Stations

- Water quality and resources, including temperature changes to water and radionuclide emissions.
- Coastal change and impacts from infrastructure (construction, operation and decommissioning), including flood risk.
- Biodiversity and geological conservation.
- Landscape and visual impacts.

Coal gasification

- The environmental impacts of an Underground Coal Gasification process are visual, acoustic, and include air emissions and groundwater effects.

Fisheries

The Fisheries sector covers the activities of inshore and offshore commercial fishing, including the harvesting of molluscs and crustaceans, as well as other marine organisms, e.g. algae, sponges, and seaweed (UKMMAS 2010a). Other activities associated with the sector include fisheries enforcement agencies, boat building and boat maintenance. It also includes the manufacturing and maintenance or repair of fishing gear. Other secondary activities include the processing, distribution and sale of fish for consumption.

This SSE presents the evidence base and key considerations for fisheries in Wales in the context of marine planning. Key issues for marine planning include:

- Marine Planning provides the opportunity to manage marine activities in a sustainable manner taking into account economic, social and environmental considerations. However, it

may be hampered by the paucity of good spatial data for fisheries activities (in particular for vessels less than 12 m). Other considerations include the displacement of fishing from MPAs and offshore wind farms.

- Cockle fisheries are some of the most valuable fisheries in Wales and often of great local and cultural importance.
- Crustaceans are the mainstay of much of the Welsh fishing fleet with crab and lobsters traditionally targeted via fishing with pots.
- Bass is an important species for the industry in South and West Wales as well as a mainstay of the recreational fleet.
- The consultation regarding the future of Historic Access Rights (Grandfather rights) in the Welsh inshore area closed on the 1 December 2013.

Recreation and Tourism

Coastal tourism encompasses a wide variety of activities; the key activities of which include hotels and similar accommodation, holiday and other short stay accommodation, camping grounds, caravan sites and static caravan sites, restaurants and mobile food service activities, beverage serving activities, libraries, archives, museums and other cultural activities, sports activities and amusement and recreation activities. Coastal Tourism was estimated to be worth £602 million for Wales in 2013 and generated 3.594 million trips (Great Britain Visitor Survey). Ancillary activities that support coastal tourism include event catering activities, passenger transport by road, rail, water and air, the renting and leasing of cars, recreational goods, sports goods and water transport equipment, creative arts and entertainment activities and gambling and betting activities (UKMMAS 2010a).

This SSE presents the evidence base and key considerations for recreation and tourism in Wales in the context of marine planning. Key issues for marine planning include:

- The Welsh Marine Area has a strong presence of coastal tourism where some of the benefits of the marine environment are appreciated through tourism activities (i.e. visiting marine reserves). However, there is also a cost associated with these activities which can cause potential issues to the marine environment.
- Tourism is likely to compete with several other sectors including recreation, where there will be competition for marine space. Marine and coastal users engagement (i.e. stakeholders, local authorities, and water sports associations) may be required to resolve conflicts of use

of marine space and help to weigh up the costs and benefits of sustainable tourism and the protection of the marine environment when developing marine plans.

- Climate change is likely to influence the levels of tourism and recreation with the Welsh marine area, for example when weather is good, there is likely to be more people taking vacations in Wales and greater recreational use by locals, however when weather is poor, tourism and other recreational demand is likely to be reduced.
- Increased levels of recreational activities have the potential to increase the risk of negative effects on the marine environment, however the scale and the impact of recreational activities vary considerably and therefore the impacts are hard to define.
- It is inevitable that a wide range of recreational activities (hotspots) overlap with nature conservation sites (i.e. marine reserves and SSSIs) along the Welsh coastline. Even though the character of the majority of recreational activities are well understood, there are still gaps in knowledge in respect of the interaction between recreational activity, environmental capacity and appropriate management responses, including promoting greater environmental awareness amongst users of the coastal marine resource.

Telecommunication Cabling

The principal activity in this industry is the laying, operation and maintenance of submarine telecommunication cables and their facilities. Supporting activities include the construction of utility projects and the operation of communication facilities.

This SSE presents the evidence base and key considerations for telecommunication cabling in Wales in the context of marine planning. Key issues for marine planning include:

- Telecommunications cables may interact with other sectors, such as ports, shipping, aggregate extraction and fishing. Potential impacts include:
  - disturbance to marine habitat during laying and maintenance of cables;
  - impacts associated with other sectors, e.g. fishing (snagging of gears); shipping (damage to cables from anchoring); aggregate extraction – exclusion of activities or other mitigation measures may need to be considered;
  - technology improvements for fibre optic cables allow capacity increases per cable which could allow the industry to keep pace with demand without an exponential increase in the number of cables required. (MMO 2013b)

Transport – ports and shipping

The UK National Policy Statement (NPS) for Ports (Department for Transport 2012a) represents the framework for decisions taken by the Secretary of State on proposals for new port development that are nationally (UK) significant infrastructure projects (NSIPs) under the Planning Act 2008. The NPS applies to England and Wales, including territorial waters. It is also a relevant consideration for any decisions made under the MCAA on other port development proposals. When decision makers are advising on or determining an application for an order granting development consent in relation to ports, or when marine plan authorities are developing Marine Plans, they should take into account the contribution that the development would make to the national (UK and Wales), regional or more local need for the infrastructure, against expected adverse effects including cumulative impacts. In considering the need for port developments in Wales, reference should be made to interpretations of need as set out in the NPS for Ports (HM Government 2011).

The key activities in shipping are sea and coastal water freight transport, sea and coastal water passenger transport and cargo handling. Ancillary activities that support shipping include the building and repairing of ships, the construction of water projects, navigation, pilotage and berthing, and storage and warehousing (UKMMAS 2010a). A key driver in shipping is the sufficient sea port capacity to accommodate demand for import and export of goods.

This SSE presents the evidence base and key considerations for port and shipping activities in Wales in the context of marine planning. Key issues for marine planning include:

- Ports and shipping are critical to the effective movement of cargo and people, and form an essential part of the Welsh, UK and global economies. The NPS for Ports explains to planning decision-makers the approach they should take to proposals, including the main issues which, in the UK Government's view, will need to be addressed to ensure that future development is fully sustainable. It provides detailed guidance to decision makers on a number of aspects, such as assessing the need for additional port capacity, and guidance on the scope of environmental assessment. The NPS for Ports also states that the decision maker should give substantial weight to the positive impacts associated with economic development. For example, ports have a crucial role to play in developing fields of energy production, particularly offshore wind energy and biomass.
- Ports and shipping can have environmental impacts through accidental pollution from ships in the course of navigation or lawful operations, pollution caused by unlawful operational discharges by ships, such as oil, waste or sewage, or physical damage caused by groundings

or collisions. Other pressures on the environment from shipping and ports relate to noise, airborne emissions and the introduction and spread of non-indigenous species (transported on the hulls of ships or in ballast water) (HM Government 2011).

- Increased competition for marine resources affecting the sea space available for the safe navigation of ships remains a key issue for the sector (HM Government 2011). Shipping can coexist with marine conservation, fishing and aggregate extraction but there are other uses of the sea which may be incompatible (MMO 2013b).
- A key issue is also to maintain unimpeded access to ports, with water deep enough for the largest vessels to prevent delays to commercial traffic impacting upon efficient berth utilisation and causing congestion. With the increase in deeper-drafted and wider vessels dredging is required to deepen and/or widen access to ports (UKMMAS 2010a).

Surface water management and waste water treatment and disposal

The objective shared by the UK Administrations is to contribute to sustainable development including the health and well-being of the community and the protection of the environment by maintaining and developing a policy and regulatory system which provides modern, high quality management and treatment of surface and waste water (HM Government 2011). The collection, treatment and disposal of waste water from housing and industry, the effective drainage of storm water and runoff to the sea, mitigating the effects of diffuse pollution from urban areas and agriculture by improved management and improvements to drainage design are key activities to achieve this. An important aim is ensuring that infrastructure is in place and maintained for necessary disposal activity to be carried out in compliance with EU legislative requirements[3]. Sewerage infrastructure and drainage is also essential in supporting economic and social development, and for reducing the risk of flooding in urban areas[4].

This SSE presents the evidence base and key considerations for surface water management and waste water treatment and disposal in Wales in the context of marine planning. Key issues for marine planning include:

- Although untreated waste water is mostly water, (generally less than 0.1% is solid material), without treatment the waste water produced every day would cause significant damage to the environment.

[3] This includes compliance with the requirements of the Urban Waste Water Treatment Directive, Water Framework Directive, Shellfish Waters Directive, Bathing Waters Directives and the Marine Strategy Framework Directive.

[4] Specific objectives for water and sewerage services are set out in guidance issued to the industry for each price review or price control period and in England, the government's future water strategy 'Future Water'.

Social Considerations

There are a number of coastal communities that are closely linked to the marine environment; thus it is necessary to assess social considerations. The Welsh Government commissioned a report investigating the typology of Welsh coastal communities (OCSI 2014) to consider how activities in the marine environment can support socio-economic development of Welsh coastal communities. As part of this report, a typology of Welsh coastal areas has been developed based on their socio-economic characteristics. Although every coastal community has a unique combination of characteristics, the typologies helps group together those areas with similar characteristics and evaluate them using a number of key indicators.

This SSE presents the evidence base and key social considerations for Wales in the context of marine planning. Key issues for marine planning include:

- Helping to encourage employment opportunities.
- Helping to achieve a balance of part time and full time work (i.e. move the dependence away from seasonal work).
- Helping to retain and attract high skill levels in the workforce.

Economic Considerations

There is a wide range of economic activity currently being undertaken in the marine environment within Wales. From single employee businesses to large multinational companies, the marine environment in Wales is host to a diverse range of activities across a number of economic sectors.

This SSE presents the evidence base and key economic considerations for Wales in the context of marine planning. Key issues for marine planning include:

- The amount of growth possible, given environmental considerations.
- Interactions between different marine sectors, for example upon coastal tourism through inappropriate developments.
- Maintaining the competitiveness of key sectors, such as ports and shipping.
- The ability to maximise benefits for deprived areas from expansion in marine sectors.

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Glossary

AONB	Area of Outstanding Natural Beauty
ASP	Amnesic Shellfish Poisoning
BAP	Biodiversity Action Plan
BGS	British Geological Survey
BMAPA	British Marine Aggregate Produces Association
BP	Before Present
CBD	Convention on Biological Diversity
CCC	Committee on Climate Change
CCRA	Climate Change Risk Assessment
CCS	Carbon Capture and Storage
CCW	Countryside Council for Wales
CEA	Cumulative Effects Assessment
CFP	Common Fisheries Policy
DECC	Department of Energy and Climate Change
DIN	Dissolved Inorganic Nitrogen
DIP	Dissolved Inorganic Phosphorus
DTI	Department of Trade and Industry
EAC	Ecotoxicological Assessment Criteria
EC	European Commission
EIA	Environmental Impact Assessment
ELC	European Landscape Convention
EMFF	European Maritime and Fisheries Fund
EMS	European Marine Sites
EQS	Environmental Quality Standards
EU	European Union
FCERM	Flood and Coastal Erosion Risk Management
FTE	Full Time Equivalent
GCR	Geological Conservation Review
GDP	Gross Domestic Product
GES	Good Environmental Status
GHG	Greenhouse Gas
GIS	Geographic Information System
GVA	Gross Value Added
GW	Gigawatt
HRA	Habitats Regulation Assessment
HSC	Historic Seascape Characterisation
ICES	International Council for the Exploration of the Sea
ICZM	Integrated Coastal Zone Management
IMAD-P	Interim Marine Aggregates Dredging Policy
IMO	International Maritime Organisation
INNS	Invasive non-native species
IPCC	Intergovernmental Panel on Climate Change
JNCC	Joint Nature Conservation Committee

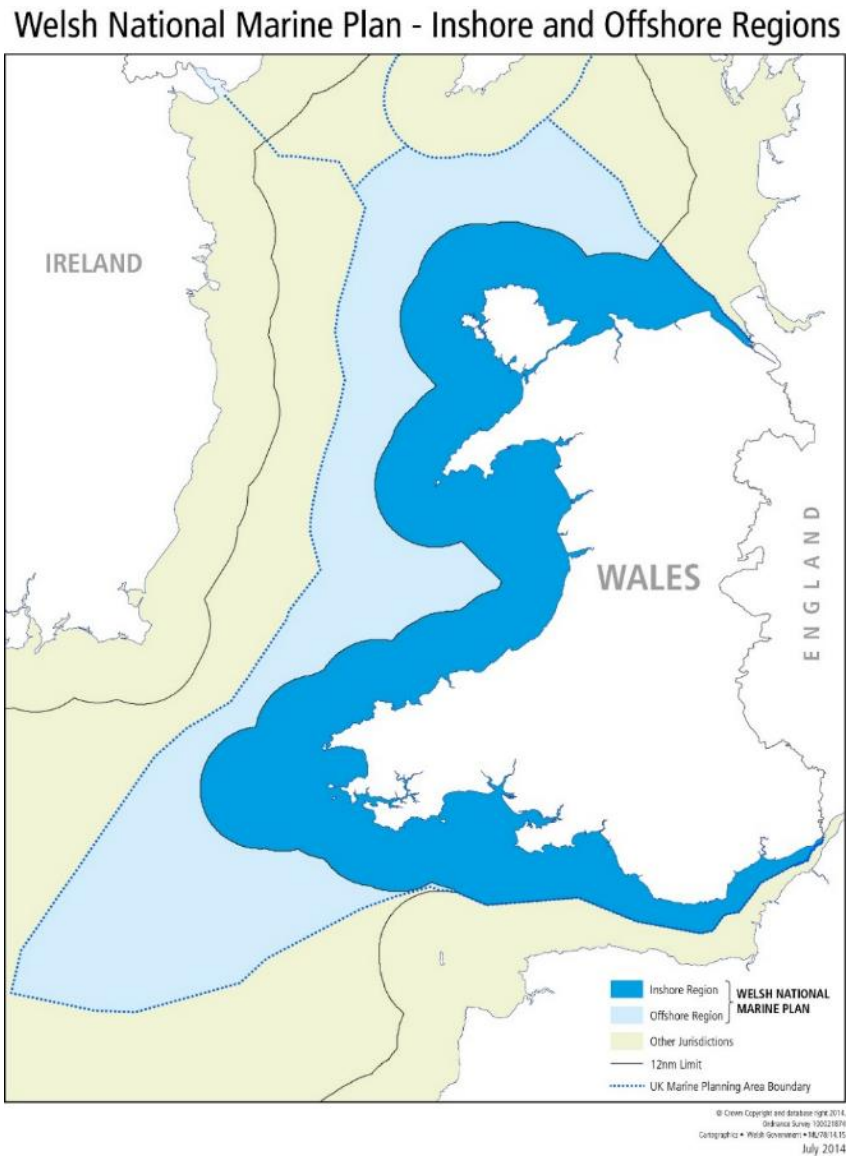
LNG	Liquefied Natural Gas
MCAA	Marine and Coastal Access Act 2009
MCZ	Marine Conservation Zone
MMO	Marine Management Organisation
MNR	Marine Nature Reserves
MOD	Ministry of Defence
MPA	Marine Protected Area
MPS	Marine Policy Statement
MRESF	Marine Renewable Energy Strategic Framework
MSFD	Marine Strategy Framework Directive
MSY	Maximum Sustainable Yield
MU	Management Unit
MW	Megawatt
nm	Nautical mile(s)
NMVOC	Non-methane Volatile Organic Compounds
NPS	National Policy Statement
NRW	Natural Resources Wales
ODS	Ozone Depleting Substances
PPW	Planning Policy Wales
PSP	Paralytic Shellfish Poisoning
RAWP	Regional Aggregate Working Party
RBMP	River Basin Management Plan
RTS	Regional Technical Statement
SA	Sustainability Appraisal
SAC	Special Areas of Conservation
SEA	Strategic Environmental Assessment
SMP	Shoreline Management Plans
SPA	Special Protection Areas
SPP	Statement of Public Participation
SSE	Strategic Scoping Exercise
SSSI	Sites of Special Scientific Interest
TEV	Total Economic Value
UCG	Underground coal gasification
UK	United Kingdom
UKCS	UK Continental Shelf
UNFCCC	United Nations Framework Convention on Climate Change
UWWTD	Urban Waste Water Treatment Directive
VMS	Vessel Monitoring System
VOC	Volatile Organic Compounds
WAM	Wales Activity Mapping
WFD	Water Framework Directive
WNMP	Welsh National Marine Plan
WRMP	Water Resources Management Plan

1 Introduction

1.1 The Welsh National Marine Plan

The Marine and Coastal Access Act 2009 (MCAA) (HM Government 2009a) provides the statutory basis for a new plan-led system for the UK marine environment. The purpose of marine planning under the MCAA is to help achieve sustainable development in the marine area. Welsh Ministers are the marine plan authority responsible for creating marine plans for both the inshore region (0 - 12 nm) and offshore region (beyond 12 nm) of Wales (Figure 1).

Figure 1 The Welsh Marine Planning Region



The Welsh Government consulted on the approach to Marine Planning for Wales in February 2011 through the 'Sustainable Development for Welsh seas: Our Approach to Marine Planning in Wales' (Welsh Assembly Government 2011).

Having considered the responses, the Welsh Government has confirmed the intention to put in place a national system of marine planning and to develop a Welsh National Marine Plan (WNMP). The Welsh Government has committed to putting the WNMP process in place in 2015. In accordance with the MCAA the WNMP will be subject to an evaluation within 3 years of adoption and a review within 6 years of adoption (European Commission) (HM Government 2009a).

All four UK administrations adopted the UK Marine Policy Statement (MPS) in March 2011. On adoption of the MPS, the MCAA placed a duty on the Welsh Government to ensure that Marine Plans are prepared for the Welsh Marine Planning Region (HM Government 2009b). .The WNMP must conform with the UK MPS (HM Government 2011). The MPS states that *'Marine Plans will be based on a sound evidence base, as far as possible. This will identify issues to be addressed in the plan and inform plan development. The evidence base will be developed from a wide range of sources including existing plans, the plan area community, science advisors, statutory and other advisors, industry and other marine users'* (HM Government 2011). This Strategic Scoping Exercise is the first step towards ensuring that the WNMP is based upon a sound evidence base as required by the MPS.

The MPS also states that the process of marine planning will:

- Achieve integration between different objectives;
- Recognise that the demand for use of our seas and the resulting pressures on them will continue to increase;
- Manage competing demands on the marine area, taking an ecosystem-based approach;
- Enable the co-existence of compatible activities wherever possible; and
- Integrate with terrestrial planning.

The WNMP will build on the framework provided by the MPS to reflect the specific needs and interests of Wales. The WNMP will enable Welsh Government to plan for and guide the management of Wales's seas; integrating economic, social and environmental considerations and engaging with communities to help shape the future.

All public authorities taking authorisation or enforcement decisions that affect or might affect the UK marine area must do so in accordance with the UK MPS unless relevant considerations indicate otherwise.

Once adopted the WNMP will support and guide marine authorisation and enforcement decisions. It will do this by:

- Clarifying marine policy objectives and priorities.
- Directing and guiding decision makers and users of our seas.

The Welsh Government is committed to the UK vision for 'clean, healthy, safe, productive and biologically diverse oceans and seas'. In January 2009 the UK administrations published joint High Level Marine Objectives for achieving this vision (HM Government 2009c). These are based on the broad principles of:

- Achieving a sustainable marine economy.
- Ensuring a strong, healthy and just society.
- Living within environmental limits.
- Promoting good governance.
- Using sound science responsibly.

The Welsh Government has published the draft Vision and Objectives for the WNMP which builds upon the UK vision. The UK High Level Marine Objectives alongside the Welsh Government Programme for Government objectives (http://wales.gov.uk/about/programmeforgov/?lang=en) are proposed as the strategic objectives for the WNMP. Further details can be found on the Welsh Government website (www.Wales.Gov.Uk/marine).

Marine planning requires an understanding of how marine space and the use of marine natural resources may be managed to optimise their use by multiple, often interdependent interests in order to maximise social, economic and environmental benefits. This will entail evaluations of the possible uses of natural resources and opportunities for development by multiple or single activities, recognising that the marine environment is already used / enjoyed by multiple stakeholders (for livelihood and pleasure). When developing Marine Plans, opportunities for integrating policy outcomes should be maximised.

1.2 Natural Resource Management and the Environment Bill

The Welsh Government is taking forward a new approach to the management of natural resources in order to drive sustainable economic growth and to improve the quality of life and increase the range of opportunities for everyone who lives and work in Wales. Their aim is to enable a step change in the delivery of sustainable natural resource planning and use in Wales by taking a more proactive, evidence-based and joined-up approach. Priorities include fostering green growth to create jobs and tackle poverty, the efficient use of Wales's natural resources, and steps to enhance the resilience and diversity of natural resources and the key sectors that depend on them, particularly in the context of a changing climate.

The creation of Natural Resources Wales in April 2013 (drawing together three historically separate delivery bodies into a single, integrated organisation, focused on Wales's needs) was the first step to achieving this ambition. Looking ahead, a new statutory framework (to be introduced through the Environment Bill) will ensure that Wales has the necessary legislation in place for smarter and more integrated planning and management of natural resources to secure maximum benefit for Wales's current and future wellbeing.

This approach to natural resource management builds on the Welsh Government's commitment to sustainable development. The Programme for Government reinforces the importance of sustainable development as the central organising principle in defining the best development path for Wales and the principles of sustainable development are embedded in the legal definitions of natural resource management to be established under the Environment Bill.

1.3 Strategic Scoping Exercise

The MPS requires plan-making authorities to use the best available evidence in plan making. In order to ensure that Welsh Government is in a position to do so, it has initiated this Strategic Scoping Exercise (SSE) to assess the spatial distribution of natural resources and human activities within Wales's marine area and to understand at a strategic level the key issues that marine planning should take account of.

The SSE is a technical, evidence gathering and analysis exercise to build on the overarching information provided in the MPS to help inform the development of a marine plan for Wales. It presents relevant information, at a strategic level, identifies trends and any key issues that marine planning should take into account.

The SSE focuses on strategic marine evidence available at the Wales scale. Evidence has been collated that relates to the topics and sectors covered by the MPS. The evidence has been structured and presented in a way which reflects the likely scope and structure of the WNMP.

The overall aims of the SSE are:

- To ensure that planning is based upon the best possible evidence gathered from as wide a range of available sources as possible.
- To facilitate the marine planning process through engagement with and taking account of stakeholder views.
- To identify all the major use sectors, their spatial distribution and their interaction both with each other and the natural environment through the collection and analysis of available evidence, data and information.
- To inform discussion of key issues for planning arising from the evidence.
- To identify, as far as possible, technical future opportunities for key sectors.
- To identify any key evidence gaps.
- To provide the basis for the next steps in the planning process.
- To provide the proposed scope of the Sustainability Appraisal and Strategic Environmental Assessment process for the Welsh Marine Planning activities.

Gathering and assessment of evidence to identify strategic issues for marine planning will be an on-going process as new data and information is continually generated, planned developments become reality and the requirements of the various sectors change.

This SSE report will be used to inform discussions with stakeholders on:

- The adequacy of the evidence base and identification of any evidence gaps.
- The key issues that marine planning should take into account and address.
- The development of a vision and objectives for a Welsh National Marine Plan.
- The evidence baseline to be used to inform the SA (incorporating SEA) scoping process.

1.4 Approach to Evidence in the SSE

The Welsh Government recognises that, as set out in the UK MPS, protecting and enhancing the marine environment, whilst also enabling marine industries to prosper and ensuring better outcomes for society through the use and stewardship of our seas, requires good evidence.

This SSE has collated and summarised the evidence base available in order to support the Welsh Government and interested parties in developing and implementing the Welsh National Marine Plan. The evidence base includes status of the marine natural resources (e.g. biodiversity and geodiversity); general considerations (e.g. climate change; air and water quality; noise; historic environment; seascape) and specific sectors (e.g. aggregates; aquaculture; defence; navigation dredging and disposal; energy; fisheries; recreation and tourism; telecommunication cabling; transport – ports and shipping; surface water management and waste water treatment and disposal). Further evidence in relation to these sectors are also presented as part of the social and economic considerations towards the end of this report. The evidence in this SSE has been collected from a wide variety of public sources in the peer-reviewed and grey literature.

The SSE has been developed through a stepwise process of evidence identification, collation and analysis. The introductory Chapters provide the context for marine planning, the relationship with other planning regimes and a series of general considerations. For each of the subsequent sections the SSE presents supporting evidence for:

- A general introduction to the topic / natural resource / sector.
- A summary of the key issues for marine planning.
- An overview of current policy.
- An overview of the status of the topic.
- An overview of the potential future trends for the topic.
- Supporting maps where data are available.

The current SSE has been produced iteratively with input from a range of Government policy leads and technical specialists and specialists from partner organisations, in particular Cefas, Natural Resources Wales and The Crown Estate. The SSE has also been shared with and benefited from the Welsh Government's Marine Planning Reference Group. This has facilitated refinement of the content, ensuring a clear Welsh focus and a quality assured product.

The SSE builds upon a wide range of previous work. In particular the Welsh Government's Marine Renewable Energy Strategic Framework (MRESF) and the Charting Progress 2 assessment of the status of the UK marine environment prepared by the UK Marine Monitoring and Assessment Strategy (UKMMAS) community.

Marine Renewable Energy Strategic Framework (MRESF)

The MRESF project provides a range of marine evidence of relevance to Wales and the marine planning process. It investigated the potential marine renewable energy resource of Welsh Territorial Waters and considered potential scenarios for the sustainable development of that resource primarily as an aid to policy development and also an indicator of resource for potential developers.

The project was undertaken by RPS Group and consisted of three stages, starting in 2007 with Stage 1, which was focused on the initial literature reviews, data gathering, stakeholder engagement and GIS mapping. Stage 2 was conducted primarily in 2009-2010 and involved a number of discrete reports, each aimed at increasing the knowledge base for a number of key data gaps in Welsh Territorial Waters identified as part of Stage 1. Stage 3 drew on the findings of Stages 1 and 2 to develop the MRESF.

The analysis and GIS mapping undertaken for MRESF, termed the 'Approach to Sustainable Development' had an overall aim of enabling the potential energy resource available in areas of different levels of constraint to be assessed to provide an evidence base for determining the sustainability of different levels of wave and tidal stream power generation.

The Approach to Sustainable Development Report (RPS 2011) presents the final outputs of the Marine Renewable Energy Strategic Framework (MRESF). The MRESF will be an essential management tool for the sustainable development of wave and tidal energy in Wales. The evidence collection, collation and analysis work undertaken for the MRESF is of considerable value to the wider Welsh Marine Planning process and is being fed into the developing evidence base that will be presented through this SSE and also the Welsh Marine Planning Portal.

Charting Progress 2

The Charting Progress 2 report for the UK seas (UKMMAS 2010c) is based on a robust, peer-reviewed evidence base and describes progress made since the first *Charting Progress* report published in 2005. It is a source of the key findings from UK marine research and monitoring and is intended to be used in policy-making to help manage our oceans and seas as we move toward the goal of clean, safe, healthy, productive and biologically diverse oceans and seas. As such, its contents are of great value to Wales and the marine planning process.

The UK Marine Monitoring and Assessments Strategy (UKMMAS) has established evidence groups to undertake detailed assessments, the outputs are presented in comprehensive and fully-referenced technical reports known as a 'Feeder Report'. The assessments draw on monitoring data collected by marine institutes and agencies across the UK, other relevant information and research undertaken at research institutes and universities. The four Feeder reports produced by the UKMMAS evidence groups are:

- The Productive Seas Evidence Group (PSEG) Feeder Report (UKMMAS 2010a) provides evidence on the use of the marine environment and identifies both the socio economic value and resulting pressures of these activities on the environment.
- The Healthy and Biologically Diverse Seas Evidence Group (HBDSEG) Feeder Report (UKMMAS 2010b) provides evidence on cetaceans, marine and estuarine fish, marine habitats, microbes, plankton, seabirds and waterbirds, seals and turtles.
- The Ocean Processes Evidence Group (OPEG) Feeder Report (UKMMAS 2010d) provides evidence covering the state of the ocean processes through components such as circulation, weather and climate, waves, temperature, salinity, carbon (including acidification), sea level, turbidity and sedimentary processes.
- The Clean and Safe Seas Evidence Group (CSEG) Feeder Report (UKMMAS 2010e) provides evidence on hazardous substances, radioactivity, eutrophication, oil and chemical spills, marine litter, underwater noise, microbiological contamination and algal toxins.

Each of the Feeder Reports was peer-reviewed by independent UK and international experts outside Government and revised following the comments received. A stakeholder workshop was held to present and discuss the findings of the Feeder Reports with industry representatives and environmental non-governmental organisations and to consider any additional information. *Charting Progress 2* is a summary document which draws on the detailed evidence and conclusions from the Feeder Reports. It examines all the evidence together with a summary on the impact of climate change, and provides an assessment of the overall status of the UK's seas. This SSE has built on the strong evidence base presented in the Charting Progress 2 Feeder Reports expanding with further evidence specific to Wales where necessary.

Areas of opportunity

The Welsh Government will work closely with partners to understand the opportunities that Welsh seas can provide for the people of Wales. One aspect of this has involved working closely with The Crown Estate to understand the technical opportunities that may be available in Welsh waters. This

collaboration will, where appropriate, include use of outputs from The Crown Estate's marine resource system (MaRS). MaRS is used by The Crown Estate as a decision-support tool. The tool is used, where appropriate, to model future technical opportunity; however, for some sectors, data limitations or gaps in knowledge mean that it is not possible to 'model' opportunity using MaRS tools. Sectors for which the MaRS tool has been applied are: telecommunication cabling; aggregates; energy (pipelines, carbon capture and storage, offshore wind farms, wave energy extraction, tidal stream devices) and marine biomass. For each of those sectors the Crown Estate has produced maps of future technical opportunity, these are provided in the relevant sections of the SSE.

The Crown Estate used the following two types of dataset to identify and refine a future technical opportunity for each business sector described above:

1. Resource Areas - identify an area of the marine space which contains natural resources including energy, minerals, landfall and storage resources relevant to the business sectors that are leased by the Crown Estate.
2. Key Resource areas – areas of resource that are potentially extractable given assumptions made about available technology out to 2030.

Areas of future technical opportunity are presented homogenously (i.e. the assumption could be made that there is no difference between what the opportunity represents for each of the areas); however it is important to note that in reality there are varying degrees of technical suitability within and between them. The approach to the identification of future technical opportunity for each sectors and the main sources of data and knowledge, along with any criteria used are summarised in Table 1 below. Whilst areas of future technical opportunity are all located within the limits of the parameters set out in Table 1, there is natural variation of optimal resource and/or depth conditions across and within the areas themselves.

The MaRS analysis is restricted by the extent of available data sets for a number of sectors including offshore wind farms, tidal stream devices and marine biomass. Cells / regions where input data was incomplete were removed from the analysis. This largely relates to areas close to the shore where, for example, there is limited tidal resource data available. The modelling results therefore only cover all cells where there is full data coverage (i.e. all input datasets are present).

Table 1 Areas of future technical opportunity identified and the criteria used for each sector by Crown Estate. Table also shows the relevant Section of the report where the sector information can be found.

Report Section	Sector	Key Resource Area Identified	Criteria used
Aggregates	Aggregates	Future technical opportunity has been derived from the BGS Resource Assessment Study, a project commissioned by The Crown Estate that produces a classification of the aggregate available on the seabed of the UKCS.	No specific criteria used.
Energy Oil & Gas (including Carbon Capture and Storage)	Pipelines	Key landing zones (or future technical opportunity) have been established by identifying notable sections of territorial waters driven by the location of existing offshore oil and gas production assets, potential future fields, CO_2 storage opportunities and the presence of existing pipeline infrastructure.	No specific criteria used.
	CO_2 Transportation and Storage	Future technical opportunity was established by combining known CO_2 storage interests and associated infrastructure (where infrastructure are not specifically identified as a known interest, existing pipelines intersecting storage site interests have been included), the Captain Sandstone geological formation, the Hewett field including infrastructure that intersect these areas, and major existing and planned CO_2 emitters as identified by the CO_2 storage team.	No specific criteria used.
Energy Low Carbon	Offshore Wind Fixed Foundation	MaRS modelling has been used to identify future technical opportunity. A minimum wind resource threshold of 8m/s was applied and areas less than 60m in water depth were considered appropriate for fixed foundation turbines and areas over 40m in water depth were considered suitable for floating wind technology. A minimum depth threshold of 5m was used and no maximum depth threshold was applied.	Wind speed: 8 – 15m/s Water Depth: 5 – 60m
	Offshore Wind Floating Technology		Wind speed: 8 – 15m/s Water Depth: >40m
	Tidal Stream	MaRS modelling has been used to identify future technical opportunity. A minimum tidal resource threshold of 1.5m/s mean spring peak current was applied and areas over 5m in water depth were considered appropriate for tidal stream technology development out to 2030. No maximum depth threshold was applied as all locations of good tidal resource are located in relatively shallow waters.	Tidal Resource: >1.5m/s mspc Water Depth: >5m
	Wave	MaRS modelling has been used to identify future technical opportunity. A minimum wave mean power density threshold of 20kW/m was applied and areas between 10 and 200m in water depth were considered appropriate for wave energy technology development out to 2030.	Wave Resource: >20kW/m Water Depth: 10-200m
Tele-communication cabling	Cables	Key landing zones (or future technical opportunity) have been established by identifying important sections of territorial waters driven by the location of existing offshore generation assets, onshore infrastructure, and the presence of existing telecommunication cable infrastructure.	No specific criteria used.
	Emerging Sectors		
Energy Low Carbon	Marine Biomass	MaRS modelling has been used to identify future technical opportunity. A minimum and maximum tidal resource threshold of 0.5m/s and 2m/s mean spring peak current were applied and areas between 25m and 50m in water depth were considered appropriate for marine biomass projects.	Tidal Resource: 0.5 - 2m/s mspc Water Depth: 25-50m

1.5 Sustainability Appraisal & Strategic Environmental Assessment

Sustainability Appraisal (SA) is a form of assessment that considers the social, economic and environmental effects of a plan or programme in relation to the aims of sustainable development.

The Welsh National Marine Plan will be developed in accordance with the MCAA. Schedule 6 (Part 10) of the MCAA states that:

> *'(1) A marine plan authority preparing a marine plan must carry out an appraisal of the sustainability of its proposals for inclusion in the plan.*
>
> *(2) The authority may proceed with those proposals only if it considers that the results of the appraisal indicate that it is appropriate to do so.*
>
> *(3) The marine plan authority must publish a report of the results of the appraisal.*
>
> *(4) The report is to be published when the marine plan authority publishes the consultation.'*

The Welsh Government is therefore undertaking a SA of the Welsh National Marine Plan.

In meeting the requirement to undertake an SA, Welsh Government must also address the requirements of the European Union Directive 2001/42/EC on the Assessment of Certain Plans and Programmes on the Environment, more commonly known as the Strategic Environmental Assessment (SEA) Directive. This has been transposed into UK regulations as the Environmental Assessment of Plans and Programmes Regulations 2004 (SI 2004 No. 1633) hereafter referred to as the SEA Regulations. This is a law that sets out to integrate environmental considerations into the development of plans and programmes.

The approach undertaken to SA and SEA will reflect guidance produced by the UK Government (Office of the Deputy Prime Minister 2005) which advises that an integrated approach to SA/SEA should be adopted so that the SA process incorporates the requirements of SEA. In practice, this involves extending the breadth of SEA (from predominantly environmental considerations) to embrace wider social and economic concerns. The net result is an integrated process which incorporates sustainability considerations into plan-making through an iterative approach which seeks to predict and evaluate the likely significant effects of Plan proposals and alternatives and propose measures to avoid, minimise, mitigate or offset any adverse effects that are identified through the planning process and to identify opportunities to maximise positive effects.

At the SA scoping stage the following SEA requirements (Schedule 2) are relevant:

> *'1. An outline of the contents and main objectives of the plan or programme, and of its relationship with other relevant plans and programmes.*
>
> *2. The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme.*
>
> *3. The environmental characteristics of areas likely to be significantly affected.*
>
> *4. Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Council Directive 79/409/EEC on the conservation of wild birds(1) and the Habitats Directive.*
>
> *5. The environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation.'*

1.5.1 How this Strategic Scoping Exercise relates to the SA and SEA process

In addition to establishing the evidence base for the WNMP this SSE also sets out the relevant environmental information for the SA and SEA in each of the topic chapters.

The contents of this SSE are of particular importance because the SEA Directive and Regulation stipulates that any assessment should identify the likely significant effects of a proposed plan or programme on issues such as 'biodiversity, flora and fauna, population, human health, water, air, climatic factors, material assets, cultural heritage, including architectural and archaeological heritage and landscape'. Table 2 provides a list of the SEA Topic Areas and identifies how these have been addressed within this SSE, demonstrating compliance with the requirements of the SEA Regulations.

The key issues for the sustainable development of Welsh seas of relevance to marine planning that arise from the review of baseline conditions are summarised in each sub-section of this SSE. This includes proposed appraisal criteria and guide questions. This is supported by proposed definitions of significance that will help the reader understand how the appraiser will determine the impact of the Welsh National Marine Plan against the appraisal criteria.

Table 2 Coverage of SEA Topic Areas in this SSE

Annex I SEA Directive Effects Topics	Topics Considered in this SSE Report
Biodiversity, Flora and Fauna	- Nature Conservation, Biodiversity and Geodiversity - Noise - Water Quality
Population	- Social Considerations - Economic Considerations - Recreation and Tourism
Human Health	- Social Considerations - Noise
Soil	- Aggregates - Water Quality
Water	- Water Quality - Surface Water Management and Waste water Treatment and Disposal
Air	- Air Quality
Climatic Factors	- Climate Change - Coastal Change and Flooding
Material Assets	- Defence - Oil and Gas (including Carbon Capture and Storage) - Low Carbon - Power Stations - Coal Gasification - Fisheries - Telecommunication Cabling - Ports and Shipping - Aggregates - Navigation Dredging and Disposal - Aquaculture
Cultural Heritage, including architectural and archaeological heritage	- Historic Environment
Landscape	- Seascape

The SEA Regulations require that the Welsh Government consult with the relevant statutory environmental consultees when deciding on the scope and level of detail of the information that must be included in the appraisal. Given the proposed scope of this appraisal, which could affect the offshore environments of England and Ireland, the statutory consultees whose views will be sought are those listed in Table 3.

Table 3 SEA Scoping Consultees

Consultees
• Natural Resources Wales; • Cadw (Welsh Government historic environment service); • Welsh Government; • Environment Agency; • English Heritage; • Natural England; Department of the Environment's 'Environment and Heritage Service', Northern Ireland; • Environmental Protection Agency, Republic of Ireland

Following receipt of consultees views, stakeholder feedback and any further information provided, the appraisal framework will be reviewed and where appropriate revised. The amended appraisal framework will then be used to complete the appraisal of the emerging WNMP policies.

1.5.2 Habitats Regulations Assessment

Whilst the Welsh National Marine Plan itself can have no direct effects on the natural environment, the activities carried out pursuant to the Plan might do so. These could include effects on habitats or species in respect of which certain sites have been identified as of Community importance (hereafter European Sites). Such sites include Special Areas of Conservation (SACs) designated under Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora and Special Protection Areas (SPAs) designated under Council Directive 2009/147/EC on the Conservation of Wild Birds. Ramsar Sites (designated under the 1976 Ramsar Convention) are not European sites but under UK policy are given the same level of protection.

In accordance with Regulation 61(1) of The Conservation of Habitats and Species Regulations 2010 (SI 2010 No. 490)[1] ('the Habitats Regulations'), there is a need to consider whether the Welsh National Marine Plan is likely to have a significant effect on any European sites. A Habitats Regulations Assessment will be undertaken and published alongside the Draft Welsh National Marine Plan.

2 Integration with other planning regimes

The marine planning system in Wales will sit alongside and interact with other Welsh and UK planning regimes. MCAA (2009) Schedule 6(3) instructs the Welsh Government as the Marine Planning Authority for Wales, to ensure that certain other marine plans and Planning Act plans are compatible with any Marine Plan prepared for a marine plan area. Therefore the Welsh Government will need to take all reasonable steps to secure that the WNMP for its marine planning region is compatible with the relevant Planning Act plans. Schedule 6 (3) of the Marine and Coastal Access Act 2009 states that: *In the case of the Welsh National Marine Plan, each of the following is a 'relevant Planning Act plan'—*

a) any development plan - a development plan in the case of Wales, is to be read in accordance with section 38(2) to (4) of the Planning and Compulsory Purchase Act 2004 (c.5)
b) the Wales Spatial Plan – People, Places, and Futures (2004 updated 2008) – is to be read in accordance with section 60 of the Planning and Compulsory Purchase Act (2004).

The WNMP will also need to conform to the MPS. The MPS states that integration of marine and terrestrial planning will be achieved through:

- Consistency between marine and terrestrial policy documents and guidance.
- Liaison between respective responsible authorities for terrestrial and marine planning (including at the marine plan development, implementation and review stages).
- Sharing the evidence base and data where relevant and appropriate so as to achieve consistency in the data used in plan making and decisions.

According to the MPS the marine planning process should ensure appropriate harmonisation between marine policy guidance and existing terrestrial planning. Any marine plan should seek to complement the existing planning system, recognising that both systems will adapt and co-evolve over time. Terrestrial planning policy and development plan documents already include policies to address coastal and estuarine planning. The terrestrial planning boundaries currently extend to mean low water spring tides, and it is planned that the WNMP boundary will extend up to the level of mean high water spring tide. This creates an intentional overlap to help ensure that both marine and land planning jointly address their area of responsibility and not be restricted by a neighbouring, defined but separate boundary at mean low water spring tide.

To help achieve integration of the WNMP and terrestrial planning at the coast the Welsh Government undertook a compatibility review of the relevant Planning Act plans (Figure 2). This

took account of all existing, and in development, relevant Local Authority, National Park, Area of Outstanding Natural Beauty (AONB), River Basin Management, Shoreline Management and Flood Risk Management plans. The review had regard to any other plans prepared by a public or local authority in connection with the management of the sea or the coast including relevant cross-border plans. In addition the policies/topics were broken down into minor and major policies. The policies/strategies that are in depth, mentioned regularly and connect throughout a plan were identified as major. Minor policies/strategies that reflected only brief or fleeting mention were also identified.

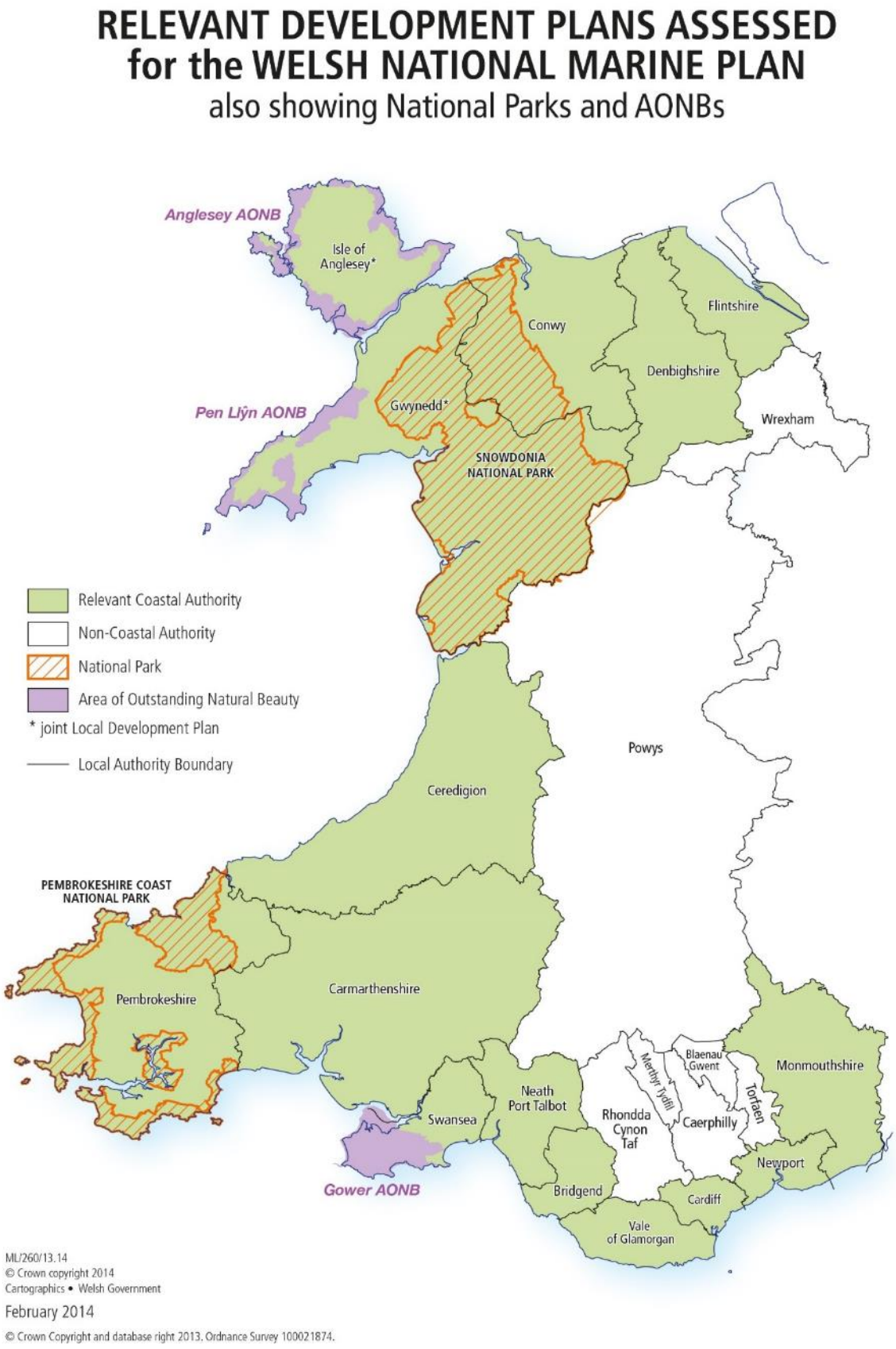
The review covered fifteen Welsh counties (Anglesey and Gwynedd prepared their development plan jointly, therefore there are fourteen coastal plans), ten English Local Authorities, two AONB's and one National Park plan. The review focused on the topics within the MPS and compared these to the relevant planning authority plans. The MPS contains eighteen policy areas. These cover all aspects of planning and marine use.

The Welsh Government looked for topic overlap in the relevant development plans and took detailed notes on aims, policies and strategies contained therein. The results were then compiled. It was found that for many topics, for example flooding, they have been comprehensively planned for by each and every authority. Other topics such as national defence got little attention as Local Authorities have few powers over national defence.

The Welsh Government also had a duty to look at the plans of adjacent authorities, and so reviewed the plans of the English Counties of Gloucester and Merseyside. Merseyside is a combined authority, with three coastal areas (The Wirral, Liverpool and Sefton). As well as the Welsh Authorities and the adjacent English ones shown above, to be absolutely thorough the Welsh Government reviewed the development plans of all the English Authorities facing the Irish Sea.

In addition to looking at compatibility the Welsh Government have a duty to have 'due regard' to other statutory management plans. These include Shoreline Management Plans (SMPs), Port Authorities Plans, River Basin Management Plans (RBMP), Water Resources Management Plans (WRMP), Special Areas of Conservation (SAC) and Marine Nature Reserve Plans. For completeness the Welsh Government also gave consideration to non-statutory plans. These included salmon and eel action plans, Sites of Special Scientific Interest (SSSI) management plans, and beach management plans.

Figure 2 Map showing Relevant Development Plans Assessed for the WNMP



SMPs consider the risks posed to coastal areas by coastal processes. There are four SMPs covering the Welsh coastline. These are; SMP19 Anchor Head to Lavernock point, SMP20 Lavernock point to St. Ann's Head, SMP21 St Ann's Head to Great Orme's head, and SMP 22 Great Orme's Head to Scottish border. The only port Authority in Wales is the Milford Haven Port Authority. They produced The Milford Haven Waterway Recreation Plan (2011) that covers the whole of the waterway, and for the port they also produced a Waste Management Plan (2013). These plans complement the local development plan. In addition RBMPs were also considered and regarded. They look at the ecological health of surface water bodies. As well as achieving traditional chemical standards all water bodies need to achieve good ecological status (GES), or potential to, under the EU Water Framework Directive. RBMPs that cover Wales include the Severn, Western Wales and Dee. The Welsh Government also considered two bordering plans for North West England and South West England. RBMPs will be updated and published in 2015. The review also took account of WRMPs that have been produced by all water companies to fulfil their requirements under the Water Act 2003. All relevant WRMPs were given due regard but of note only the Welsh Water draft WRMP was relevant identifying supply and demand deficits in six water resource zones.

The review also looked at the Habitats Directive and Special Areas of Conservation. The Habitats Directive (Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora) requires the establishment of SACs for the conservation of habitats and species that are of European importance. SACs are an EU-wide network of nature protection areas which aim to assure the long-term survival of Europe's most valuable and threatened species and habitats. There are eleven SACs covering Welsh waters, including two cross border sites with England (the Severn Estuary and the Dee Estuary). Some are also small sites and designated as Sites of Special Scientific Interest (SSSI) from which they get their management. Management Schemes exist for five of the SACs: Pen Llŷn a'r Sarnau; Cardigan Bay; Pembrokeshire Marine, Carmarthen Bay & Estuaries and the Severn Estuary. These management schemes do not however set out to plan. Under Regulation 35 of the Conservation of Habitats and Species Regulations 2010, Natural Resources Wales (NRW) have a responsibility to advise relevant authorities (the various statutory authorities and agencies responsible for the European Marine Sites) on the conservation objectives and also what activities may cause damage or disturbance to the special features.

As part of the Strategic Environmental Assessment (SEA) AMEC also looked at the programmes and strategies of 80 overarching documents (Appendix A). In conclusion the Welsh Government review and the SEA assessment have fulfilled the requirements of the MCAA (2009) and the UK MPS (2011) in relation to integrating the WNMP with other plans and planning regimes.

The WNMP also shares a border with England, Ireland, Northern Ireland and The Isle of Man as illustrated by Figure 1. The UK Administrations are committed to the co-ordination of marine planning across administrative boundaries where practicable. Coordination will include planning for activities which extend across national or Marine Plan area boundaries, and the sharing of data between plan authorities (HM Government 2011). This will also be facilitated by the UK-wide marine evidence base collected through monitoring programmes under the UK Marine Monitoring and Assessment Strategy (UKMMAS) community and its reports on the state of the UK seas.

The Welsh Government will work proactively with bordering administrations to share evidence, information and approaches to European and UK marine planning process.

The coastal zone comprises the coastal strip (which will be of varying width depending on local geography), the foreshore and coastal waters out to 12 nm (the limit of devolved statutory powers in relation to certain maritime issues). The coast and estuaries are highly valued environments, as well as social and economic assets. Integrated Coastal Zone Management (ICZM) aims to bring together all parties that develop, manage and use the coast; to combine opinions and ensure it is sustainably managed.

The Welsh Integrated Coastal Zone Management Strategy aims to provide a management framework to facilitate integrated working on the coast by the different interests involved in managing coastal assets, helping to ensure that these assets are maintained and enhanced for the benefit of present and future generations. It also sets out the links that must be made between diverse national and local policies and strategies so that the people involved in managing and using the coast can do so in a way that takes into account the needs of others. The ICZM Strategy for Wales is being developed within the UK strategy and alongside the relevant strategies for England, Scotland, Northern Ireland and Eire, within the framework provided by the EU Recommendation on ICZM.

In accordance with the MPS the UK Administrations are committed to ensuring that coastal areas, and the activities taking place within them, are managed in an integrated and holistic way in line with the principles of Integrated Coastal Zone Management (ICZM). The Welsh ICZM strategy is being reviewed as part of the work to develop and implement the Welsh National Marine Plan.

3 General considerations

This section presents the evidence in relation to generic and cross-cutting issues that will inform the development of the WNMP. These include: achieving good environmental and ecological status (in line with the requirements of European Directives); the cumulative effects of multiple activities on the marine environment; opportunities and feasibility of co-locating activities in space and time; opportunities and trends for growth in the marine economy; implications for coastal communities; engagement between the public, industry and regulators; climate change; coastal change and flooding; water and air quality; nature conservation, biodiversity and geodiversity; historic environment; seascape and underwater noise.

These general considerations will relate to each other and, also to each of the sector specific topic areas. In developing the WNMP sector specific policies, the evidence presented for these general considerations will be taken into account.

3.1 Good Environmental Status and Good Ecological Status

The UK MPS describes a wide range of legislative provisions (and other biodiversity and ecologically relevant obligations) at the international and national level that Marine Plans need to take into account. These include the Marine Strategy Framework Directive (MSFD) (Directive 2008/56/EC) and Water Framework Directive (WFD) (Directive 2000/60/EC). Marine Plans will contribute to meeting the objectives of these Directives, particularly in relation to any measures under those Directives which have a spatial dimension. Marine plan authorities will need to consider how Marine Plans can shape activities within the marine area to support the goals of these Directives, as well as those of other relevant pieces of EC legislation.

3.1.1 Marine Strategy Framework Directive – Good Environmental Status

The EU Maritime Spatial Planning Directive and the Marine Strategy Framework Directive (MSFD) (European Commission, 2008) contain key components of the European Integrated Maritime Policy to provide a coherent and strategic framework for joined up maritime governance. The MSFD came into force on 15th July 2008 and was transposed into law on a UK wide basis by the Marine Strategy Regulations 2010. The UK is collaborating with member states on the implementation of the MSFD through contributions to both EU and OSPAR Convention initiatives. A number of existing European Directives and Regulations will contribute to the delivery of MSFD including the Water Framework Directive, the Habitats Directive and the Common Fisheries Policy.

The MSFD was developed in response to concerns that although existing legislation protected the sea from some specific impacts, it was largely sectoral and fragmented. There was also recognition that since some of the activities that impact on the marine environment are managed at a European or international level (e.g. fisheries and shipping) and other impacts can cross national boundaries (e.g. litter, eutrophication, noise), national action to protect the marine environment needs to be supported by a framework to ensure action is taken across Europe.

The MSFD requires Member States to put in place the necessary management measures to achieve Good Environmental Status (GES) in their marine waters by 2020. GES involves protecting the marine environment, preventing its deterioration and restoring it, where practical, while using marine resources sustainably. It is the first EU legislative instrument exclusively concerned with the protection of marine biodiversity, as it contains the explicit regulatory objective that '*biodiversity is maintained by 2020*', as the cornerstone for achieving GES. The Marine Policy Statement, highlights that marine planning will be a key tool for ensuring that the targets and measures to be determined by the UK for the MSFD can be implemented.

The Directive covers the extent of the marine waters over which the UK claims jurisdiction. This area extends from the landward boundary of coastal waters as defined by the Water Framework Directive (WFD) (which is equivalent to Mean High Water Springs) to the outer limit of the UK Renewable Energy Zone. It also includes the area of the continental shelf beyond the renewable energy zone over which the UK has a claim. There is some overlap between the waters covered by the WFD and the MSFD: the WFD relates to improving and protecting the chemical and biological status of surface waters throughout River Basin Catchments from rivers, lakes and groundwaters through to estuaries (transitional) and coastal waters to 1 nm out to sea and overlaps with MSFD in coastal waters (12 nm for chemical status). The MSFD includes coastal waters (as defined by the WFD) but does not include WFD transitional waters (e.g. estuaries and coastal lagoons). For estuaries, the boundary between the two directives is the 'bay closing line' which is the seaward limit of 'Transitional Waters' as defined under the WFD. MSFD explicitly recognises the overlaps with WFD and makes it clear that in coastal waters, MSFD is only intended to apply to those aspects of GES which are not already covered by WFD (e.g. noise, litter, aspects of biodiversity).

The Directive enshrines that Member States must apply an ecosystem-based approach to the management of human activities. In this context, this means ensuring that the collective pressure of human activities is kept within the levels compatible with the achievement of GES, ensuring that the

capacity of the marine ecosystem to respond to human-induced changes is not compromised, whilst enabling the sustainable use of the marine environment now and in the future. Each Member State is required to develop a strategy for its marine waters to work towards the aim of achieving or maintaining Good Environmental Status by 2020; however, a key requirement of the Directive is that European Member States must take a coordinated approach to implementation, cooperating with other Member States in the relevant Marine Region or subregion to ensure each element of their marine strategies is coherent and coordinated. In addition, because the Directive follows an adaptive management approach, the Marine Strategies must be kept up-to-date and reviewed every 6 years. For the UK, the Marine Strategy Part One: UK Initial Assessment and Good Environmental Status (Marine Strategy Part One) was published in December 2012 (HM Government 2012). Part Two of the UK Marine Strategy – Programme of Monitoring for measuring progress towards Good Environmental Status and the Programme of Measures for achieving Good Environmental Status is scheduled for completion in 2015.

The Directive defines Good Environmental Status as: '*The environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive*' (Article 3).

Good Environmental Status means that the different uses made of the marine resources are conducted at a sustainable level, ensuring their continuity for future generations.

In addition, Good Environmental Status means that:

- Ecosystems, including their hydro-morphological (i.e. the structure and evolution of the water resources), physical and chemical conditions, are fully functioning and resilient to human-induced environmental change;
- The decline of biodiversity caused by human activities is prevented and biodiversity is protected;
- Human activities introducing substances and energy into the marine environment do not cause pollution effects. Noise from human activities is compatible with the marine environment and its ecosystems.

To help Member States interpret what Good Environmental Status means in practice, the Directive sets out, in Annex I, eleven qualitative descriptors which describe what the environment will look like when Good Environmental Status has been achieved:

- Descriptor 1. Biodiversity is maintained
- Descriptor 2. Non-indigenous species do not adversely alter the ecosystem
- Descriptor 3. The population of commercial fish species is healthy
- Descriptor 4. Elements of food webs ensure long-term abundance and reproduction
- Descriptor 5. Eutrophication is minimised
- Descriptor 6. The sea floor integrity ensures functioning of the ecosystem
- Descriptor 7. Permanent alteration of hydrographical conditions does not adversely affect the ecosystem
- Descriptor 8. Concentrations of contaminants give no effects
- Descriptor 9. Contaminants in seafood are below safe levels
- Descriptor 10. Marine litter does not cause harm
- Descriptor 11. Introduction of energy (including underwater noise) does not adversely affect the ecosystem

As these descriptors cover broad topics, the European Commission produced in 2010 a set of detailed criteria and indicators to help Member States determine what each descriptor means in practice and measure progress. The Marine Strategy Part One builds on those and sets out the UK characteristics of Good Environmental Status and targets and indicators.

Marine Strategies developed through the MSFD must take an ecosystem-based approach to the management of human activities, ensuring that the collective pressure of such activities is kept within levels compatible with the achievement of good environmental status and that the capacity of marine ecosystems to respond to human-induced changes is not compromised, while enabling the sustainable use of marine goods and services by present and future generations. It is therefore critical that the marine planning process in Wales recognises this requirement of the MSFD and, therefore, clearly identifies and takes account of the current and potential future pressures resulting from human activities upon marine ecosystems, including consideration of cumulative effects (section 3.2).

3.1.2 Water Framework Directive - Good Ecological Status

The EU Water Framework Directive (WFD) for integrated river basin management for Europe was adopted on 23rd October 2000. The purpose of the Directive is to establish a framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. It will ensure that all aquatic ecosystems and, with regard to their water needs,

terrestrial ecosystems and wetlands meet Good Ecological Status by 2015, which includes water quality, biodiversity and hydromorphology. The Directive requires Member States to establish river basin districts and, for each of these, a river basin management plan. The Directive envisages a cyclical process where river basin management plans are prepared, implemented and reviewed every six years. There are four distinct elements to the river basin planning cycle: characterisation and assessment of impacts on river basin districts; environmental monitoring; the setting of environmental objectives; and the design and implementation of the programme of measures needed to achieve them.

In summary, the Directive requires that all surface waters and groundwaters within defined river basin districts must reach at least 'good' status by 2015. It will do this for each river basin district by:

- Defining what is meant by 'good' status by setting environmental quality objectives for surface waters and groundwaters.
- Identifying in detail the characteristics of the river basin district, including the environmental impact of human activity.
- Assessing the present water quality in the river basin district.
- Undertaking an analysis of the significant water quality management issues.
- Identifying the pollution control measures required to achieve the environmental objectives.
- Consulting with interested parties about the pollution control measures, the costs involved and the benefits arising.
- Implementing the agreed control measures, monitoring the improvements in water quality and reviewing progress and revising water management plans to achieve the quality objectives.

3.2 Cumulative Effects

The term 'cumulative' is applied to significant effects in the Environmental Impact Assessment Directive (2011/92/EU), whereas the Habitats Directive (92/43/EEC) describes 'in combination' effects and the Marine Strategy Framework Directive (2008/56/EC) refers to 'cumulative and synergistic' effects. This SSE uses the term 'cumulative effects' as a general term relating to the above regulatory drivers. Cumulative Effects Assessment (CEA) is the systematic procedure for identifying and evaluating the significance of effects from multiple stressors and/or activities and for providing an estimate on the overall expected impact to inform management measures.

All activities in the marine environment will result in effects, e.g. aggregate extraction changes the morphology of the seabed (e.g. localised lowering); sea defences change habitats by introducing new substrate (e.g. rock, concrete, steel). The extent of impact is determined by the nature and scale of these effects on particular environmental receptors (e.g. benthic organisms, fish, marine mammals, birds, protected areas, vulnerable coastal communities, habitats).

In simple terms, an activity (e.g. navigation dredging) has an effect (e.g. deepening of a channel) which may result in an impact (e.g. change in benthic habitat). However, single activities may have multiple effects and the fact that there are multiple activities occurring in the marine environment means that the extent and magnitude of these effects may be combined. The assessment of such cumulative effects needs to consider some basic principles:

- Cumulative effects from single activities

  Single activities may have multiple (cumulative) effects, e.g. navigation dredging has the potential to: deepen and widen a channel – influencing water flow direction and energy; re-mobilise contaminants in seabed sediments; re-suspend sediments into the water column; introduce noise.

- Cumulative effects from multiple activities

  Any combination of activities (e.g. dredging, pile-driving, rock placement) associated with marine sectors (e.g. offshore renewable energy, aggregate extraction, fishing) may have multiple (cumulative) effects (e.g. offshore renewable energy development; oil and gas exploration and extraction; aggregate extraction; military activities may all introduce noise to the marine environment).

- Cumulative effects on single receptors

  Single receptors may be sensitive to multiple (cumulative) effects, e.g. effects on benthic habitats (seafloor integrity) can result cumulatively from offshore renewable energy development; fishing; aggregate extraction; navigation dredging.

- Cumulative effects on multiple receptors

  Multiple receptors may be sensitive to multiple (cumulative) effects, e.g. navigation dredging; oil spills; agricultural run-off may all introduce / re-mobilise contaminants in the marine environment - fish and marine mammals have been demonstrated to be sensitive to contaminants; pile-driving, seismic surveys and military activities may all introduce noise into the marine environment - fish and marine mammals have been demonstrated to be sensitive to

noise effects; certain species of fish and marine mammal are inextricably linked in predator prey relationships. Fish and marine mammals may therefore cumulatively be exposed to contamination, noise and food supply effects.

It is therefore essential for any cumulative effects assessment to state and justify which combination of sectors, activities, effects and receptors are included (and which excluded). Whilst this appears a logical and straightforward statement the practicalities of achieving it are complex, e.g. effects may be acute or chronic; different combinations of chronic effects may result in acute effects; different combinations of effects may interact (i.e. additively, synergistically, antagonistically, dependently or independently).

The UK MPS requires that Marine Plans should provide for continued, as well as new, uses and developments in appropriate locations. They should identify how the potential impacts of activities will be managed, including cumulative effects. Close working across plan boundaries will enable the marine plan authority to take account of the cumulative effects of activities at plan boundaries. It is also likely to be necessary to consider cumulative effects at the regional sea scale. The consideration of cumulative effects alongside other evidence may enable limits or targets for the area to be determined in the Marine Plan, if it is appropriate to do so.

Ongoing work to refine understanding of cumulative effects and their assessment through CEA includes a need to:

- Reach agreement on the terminology, definitions and approach(es) to CEA;
- Take stock of current data and evidence, and trialling of the approach(es) to CEA;
- Ensure an ongoing programme to review (and where necessary update) the approaches to CEA.

Examples of relevant recent and ongoing UK work to understand cumulative effects and their assessment include:

- Renewable UK: Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms - considers a number of practical solutions in order to overcome the challenges of cumulative impact assessment. These including defining what a meaningful assessment is, and tackling challenges on scoping, data, assessment and monitoring and mitigation. http://www.renewableuk.com/en/publications/index.cfm/cumulative-impact-assessment-guidelines

- Natural England: NECR147 generic framework for informing cumulative impact assessments related to Marine Protected Areas - develops a generic framework for undertaking CIA and provides clear guidance on the processes and steps which could be adopted when undertaking robust and comprehensive CIA for all types of project affecting MPAs. http://publications.naturalengland.org.uk/publication/6341085840277504
- MMO Evaluation of the current state of knowledge on potential cumulative effects from offshore wind farms (OWF) to inform marine planning and marine licensing (MMO 1009). http://webarchive.nationalarchives.gov.uk/20140507202222/http://www.marinemanagement.org.uk/evidence/documents/1009.pdf
- MMO strategic approach to cumulative effects (MMO 1055). https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/389876/MMO1055_Report_Final.pdf
- MMO Draft Guidelines for Marine Environmental Risk Assessment (unpublished).
- JNCC Vulnerability Assessment process for benthic habitats (unpublished).
- UKMMAS ongoing work on pressures and environmental indicators.

Examples of relevant recent and ongoing international work to understand cumulative effects and their assessment include:

- The OSPAR Intersessional Correspondence Group (ICG) – Cumulative Effects & ICG-COBAM (Coordinated Biodiversity Assessment & Monitoring) work within the Joint Assessment Monitoring Programme to bring together international expertise from its Contracting Parties to develop indicators and approaches to regional sea (MSFD) assessments for activity-pressure effects on the marine environment (individually and cumulatively). ICG-C has ongoing work on clarifying terminology, definitions and approach(es) to CEA. The work of this group links to the UK Marine Monitoring and Assessment Strategy (UKMMAS).
- EU FP7 funded projects, e.g. ODEMM (http://www.liv.ac.uk/odemm/), Devotes (http://www.devotes-project.eu/), Knowseas (http://www.knowseas.com/).
- CUMULEO model for effects of human activities at sea, https://www.wageningenur.nl/en/show/CUMULEO-model-for-effects-human-activities-at-sea.htm.
- HARMONY - Development and demonstration of Marine Strategy Framework Directive tools for harmonization of the initial assessment in the eastern parts of the Greater North Sea sub-region (Andersen et al. 2013).

- ICES, various working groups (e.g. Working Group on Integrated Assessments of the North Sea (WGINOSE) http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/SSGRSP/2013/WGINOSE13.pdf). Includes agreements for greater collaboration between OSPAR and ICES on cumulative effects assessment.

3.3 Co-location and displacement of activities

Within the UK MPS there is an expectation to '*promote compatibility and reduce conflict*' and to '*reduce real and potential conflict, maximise compatibility between marine activities and encourage co-existence of multiple uses*'.

Co-existence has been defined as '*where multiple development, activities or uses can exist alongside or close to each other in the same place and/or at the same time*' and co-location has been defined as '*where multiple developments (often structures), activities or uses co-exist in the same place by sharing the same footprint or area in the marine environment. 'Footprint' can include both the physical location of a development per activity, e.g. a built structure, and a wider are associated with the development or activity, e.g. a surrounding safety zone'* (MMO 2013c).

Globally, there are numerous studies investigating the effective use of marine space, e.g. Barents Sea, Massachusetts, Great Barrier Reef and Southwest New Brunswick (MMO 2013c), however very few have specifically considered active mechanisms for co-location or co-existence. Examples of activity/compatibility matrices (which examine interactions between co-existing sectors rather than developing co-location) include: Scotland's National Marine Plan (The Scottish Government 2011); the Firth of Clyde sectoral interactions study (Thompson et al. 2008); WINDSPEED (van der Wal et al. 2009; 2011); the Belgian GAUFRE project (Maes et al. 2005); UNESCO-IOC Marine Planning Manual (UNESCO-IOC 2009) and Dorset C-Scope (C-Scope 2010; 2012). Such matrices provide a generic screening for investigating which activities have the potential for co-location based on physical constraints given the nature of particular activities and developments but do not include the more complex environmental, social and economic interactions (MMO 2013c).

Co-location and co-existence are therefore emerging and important issues but with a limited evidence base. The MMO have started to consider co-location and co-existence considerations and how they may be actively applied in marine planning. Co-existence (including co-location) and displacement are issues that have arisen frequently through discussions between the MMO and

stakeholders during the development of the plans for the East marine area in England. The MMO has adopted three policies for co-location and displacement in the context of marine planning, which may be directly transferred to the Welsh National Marine Plan:

- **Gov 1:** Appropriate provision should be made for infrastructure on land which supports activities in the marine area and vice versa.
- **Gov 2:** Opportunities for co-existence should be maximised wherever possible (i.e. activities can be carried out without significant impediment in the same area - they may be separated spatially (vertically or laterally) or through being carried out at different times).
- **Gov 3:** Proposals should demonstrate in order of preference:
    a. that they will avoid displacement of other existing or authorised (but yet to be implemented) activities.
    b. how, if there are impacts resulting in displacement by the proposal activity, they will minimise them.
    c. how, if the impacts resulting in displacement by the proposal activity, cannot be minimised, they will be mitigated against.
    d. the case for proceeding with the proposal if it is not possible to minimise or mitigate the impacts of displacement.

A framework for co-existence has been commissioned by the MMO, however work is outstanding to further develop, implement and test the approach (MMO 2014). The MMO proposed framework for co-existence comprises three stages:

- **Screening:** in this step, locations within which activities clearly cannot co-exist are identified.
- **Initial assessment:** a qualitative / semi-quantitative assessment of potential interactions, between human activities or between the natural environment and human activities, is undertaken using readily available information and simple assessment tools.
- **Detailed assessment:** a detailed quantitative (monetised) assessment is undertaken building on the initial assessment and using existing and potentially novel collected data, using more complex assessment tools where appropriate.

MMO (2014) suggests that the screening is the most appropriate for marine planning purposes because current limited information is likely to preclude the use of detailed assessments, and project or location specific assessments are unlikely to be feasible. The MMO report goes on to state that the complexity of the assessments potentially requires a wide range of spatial and non-spatial data and information to characterise the interactions and impacts, particularly where it might be

necessary to seek to value costs and benefits of 'co-existence' and 'no co-existence' options. The relative significance of some of the interactions and impacts varies at site level, which therefore requires a level of site specific data.

MMO (2013a) states that the co-location decisions need to consider social and economic as well as environmental and engineering issues, due to potential consequences for: the productivity or profitability of an activity; the economic development conditions or prospects of an area and the status of the marine environment. The willingness and/or attitude of the parties involved towards co-location / co-existence are dependent on the net benefit that the co-location / co-existence brings to their activities or interests. This is an important consideration for Marine Planning if sectors are to be encouraged to co-locate / co-exist (i.e. it is relatively straightforward on paper to suggest the compatibility of sectors to co-locate / co-exist but unless there are incentives for the sectors, achieving co-location / co-existence may be challenging).

The study by Syvret et al. (2013) investigates the potential for co-locating aquaculture production and offshore wind farms in Welsh waters. This suggests that trials, such as seabed mussel cultivation by Deepdock Ltd at the North Hoyle offshore wind farm, provide a basis for further investigation of how the two sectors may work together. However, the report highlights (based on experiences from Germany) that for co-location to progress from conceptual to practical and commercially viable projects requires some form of legislation or planning regulation that specifically requires sectors (e.g. offshore wind and aquaculture) to investigate the potential for co-location or multi-functional use of marine space (suggesting that this may require intervention at a UK Government rather than Welsh Government level). Syvret et al. (2013) conclude that '*In an effort to attain effective marine spatial planning, compatibility will be a function of knowing what is done where. However, commercial confidence will only be attained when risks can be effectively controlled and are perceived to be worth the increased workload.*'

The MPS states that marine plan authorities should consider the potential social and economic impacts of other developments on fishing activity, as well as potential environmental impacts. For example, marine plan authorities should have regard to the impacts of displacement and whether it is possible for vessels to relocate to other fishing grounds. They should also consider the potential impacts of this displacement on the viability of fish stocks and on the ecosystem in the alternative fishing grounds. They will also wish to consider and measure the social and economic impacts on local communities of any reduction in fishing activity, redistribution of fishing effort or associated

impact on related businesses as the result of a marine development. In considering displacement of fishing activity, it will be important to consider implications beyond the boundaries of the WNMP by considering other marine planning regions to where activity is displaced to ensure that a comprehensive picture of impacts is developed and unintended consequences are avoided. In many cases, there will be opportunities for co-existence between fishing and other activities that will be taken into account.

One of the main areas of discussion regarding displacement is currently focussed on the relationship between the fishing and offshore wind farm sectors. Disruption or displacement of fishing activities by wind farms is recognised by both sectors as a significant issue (BERR 2008). This point is also identified in the OSPAR (2006) review of the potential impacts of offshore wind farm developments. There is little evidence on the direct consequences of displacement with most occurrences being addressed through dialogue between the parties involved rather than via regulatory controls. Blyth-Skyrme (2011) recognises that effort displacement and knock-on effects are possible impacts resulting from any redistribution of fishing activity but that these effects are difficult to predict and are site specific, such that generalisations cannot be made.

Blyth-Skyrme (2010) notes that displaced fishing activity could impact other fishing activity, and that understanding where knock-on displacement effects end may be critical. The assessment of cumulative impacts on fisheries from offshore renewable energy developments is likely to remain highly challenging (Blyth-Skyrme 2010), particularly because understanding how fishing effort displacement will affect fishing activity continues to be problematic. The Fishing Liaison with Offshore Wind and Wet Renewable Group (FLOWW) published guidelines in 2008 (BERR 2008) which sets out a framework for dialogue between fishermen and offshore wind farm developers on the assessment of the value of fishing activity and any disruption (defined as temporary exclusion from normal fishing zone during construction, maintenance etc.) or displacement (defined as permanent closure of fishing grounds directly caused by a wind farm/cable route).

Cooper (2005) through a qualitative analysis identified the potential loss of grounds for trawl fisheries due to marine aggregate extraction may result in the displacement of vessels into other areas leading to conflicts with other gear types. Cooper (2005) also identified that the increased distances offshore that these relatively small fishing vessels (<14 m) may be working as a direct consequence of displacement from extraction areas has implications for vessel safety. However, more recent research by Vanstaen (2010) looked at evidence of changes in fishing effort related to

marine aggregate activity, through a quantitative analysis of fishing vessel monitoring (VMS) data. This suggested no significant reduction in mobile fishing effort across licensed areas, with compliance monitoring data for these areas showing clear evidence of trawl and scallop dredge scars across actively worked extraction areas.

3.4 Economic Growth (Blue Growth)

Jobs and the economy are the overriding priority for the Welsh Government, as stated in the Programme for Government (see Welsh Government 2011a; 2014a). The Welsh Government also places sustainability at the centre of everything it does. Along with the other UK Administrations the Welsh Government agreed the UK High Level Marine Objectives (HLMOs). These are based on the broad principles of sustainable development:

- Achieving a sustainable marine economy.
- Ensuring a strong, healthy and just society.
- Living within environmental limits.
- Promoting good governance.
- Using sound science responsibly.

In 'achieving a sustainable marine economy' all four administrations agreed to the following:

- Infrastructure is in place to support and promote safe, profitable and efficient marine businesses.
- The marine environment and its resources are used to maximise sustainable activity, prosperity and opportunities for all, now and in the future.
- Marine businesses are taking long-term strategic decisions and managing risks effectively. They are competitive and operating efficiently.
- Marine businesses are acting in a way which respects environmental limits and is socially responsible. This is rewarded in the marketplace.

The UK Marine Policy Statement guides decision-makers to take a presumption in favour of consent into the marine planning system. Properly planned developments in the marine area can provide environmental and social benefits as well as drive economic development, provide opportunities for investment and generate export and tax revenues. The marine planning system will help to promote these benefits in contributing to the achievement of sustainable development.

These commitments will also take account of the EU Blue Growth Strategy which aims to ensure the sustainable development of EU marine and coastal sectors. The Blue Growth strategy suggests that the potential of our seas, oceans and coasts can be harnessed to create new job opportunities, promote innovation and deliver sustainable growth. There are three components to the strategy. Firstly, to develop sectors that have a high potential for sustainable jobs and growth, such as, aquaculture, marine renewable energy, marine mineral mining, marine biotechnology and marine and coastal tourism (highlighted in the strategy as five potential sectors for growth in Europe). Secondly, to provide knowledge, legal certainty and security in the blue economy. Thirdly, sea basin strategies are developed to ensure tailor-made measures and to foster cooperation between countries.

Whilst the chapters contained in this SSE detail the policy or sector-specific aims and goals in relation to information and evidence, the Welsh National Marine Plan will seek to identify and resolve conflicting priorities and identify and facilitate opportunities. This will enable a proactive, opportunity based approach to sustainable economic growth in the marine area utilising EU, UK, Welsh National and local evidence and information as appropriate.

The evidence available and summarised in this SSE suggests that economic growth from taking a planned approach to managing Welsh seas will most likely occur in the ports and shipping, marine renewable energy, tourism and leisure and aquaculture sectors (see Chapter 7). This does not preclude that other sectors will also experience growth and / or could also benefit from a planned approach. Closer working with the terrestrial planning regime to incorporate the associated landward effects of marine developments can be reasonably expected to have positive impacts on terrestrial supply chains and lead to indirect employment and growth. However, it is also recognised that it is methodically difficult to measure both the direct and indirect growth that may occur due to lack of social and economic evidence in the marine area. A longer term aim of the planning process will be to prioritise and address such methodical problems and evidence gaps. More detailed evidence and analysis is contained within the sector chapters of this SSE and summarised in Chapter 7 (Economic Considerations).

3.5 Engagement

To ensure that the WNMP is a fit for purpose a wide variety of people and communities that will benefit from it need to be engaged in its development. The approach to engagement, including when and how interested parties are to have the opportunity to input to the development of the

plan, was set out in the Statement of Public Participation (SPP) for the Welsh National Marine Plan (Welsh Government 2014c) which was published on 13th June 2014, following responses to the consultation.

The SPP provides the basis of engagement and outlines ten different stages of development Table 4.

Table 4 The Ten WNMP Stages of Engagement

Stage	Schedule
1. Initial meetings to consult stakeholders on the approach to a Welsh National Marine Plan	December 2010 – February 2011
2. Prepare consultation on the Welsh approach to marine planning	January – February 2011
3. Consult on an approach to marine planning in Wales	February 2011 – May 2011
4. Consider the responses to the marine planning consultation	May 2011 – November 2012
5. Prepare and consult on the Statement of Public Participation	September 2013 – Spring 2014
6. Develop and consult on plan scope, vision and objectives	Summer 2014
7. Develop and consult on the draft WNMP and the Sustainability Appraisal	Summer 2014 – Spring 2015
8. Publish consultation responses and revise WNMP	Summer 2015
9. Final considerations, adoption and publication of the WNMP and associated documents	End of 2015
10. Implement and evaluate the WNMP	2016 onwards

The Welsh Government will engage directly with interested persons and parties to inform and direct the Welsh National Marine Plan (WNMP) throughout the plan-making process. Engagement will be conducted in a variety of ways including social media, the internet, at meetings and events.

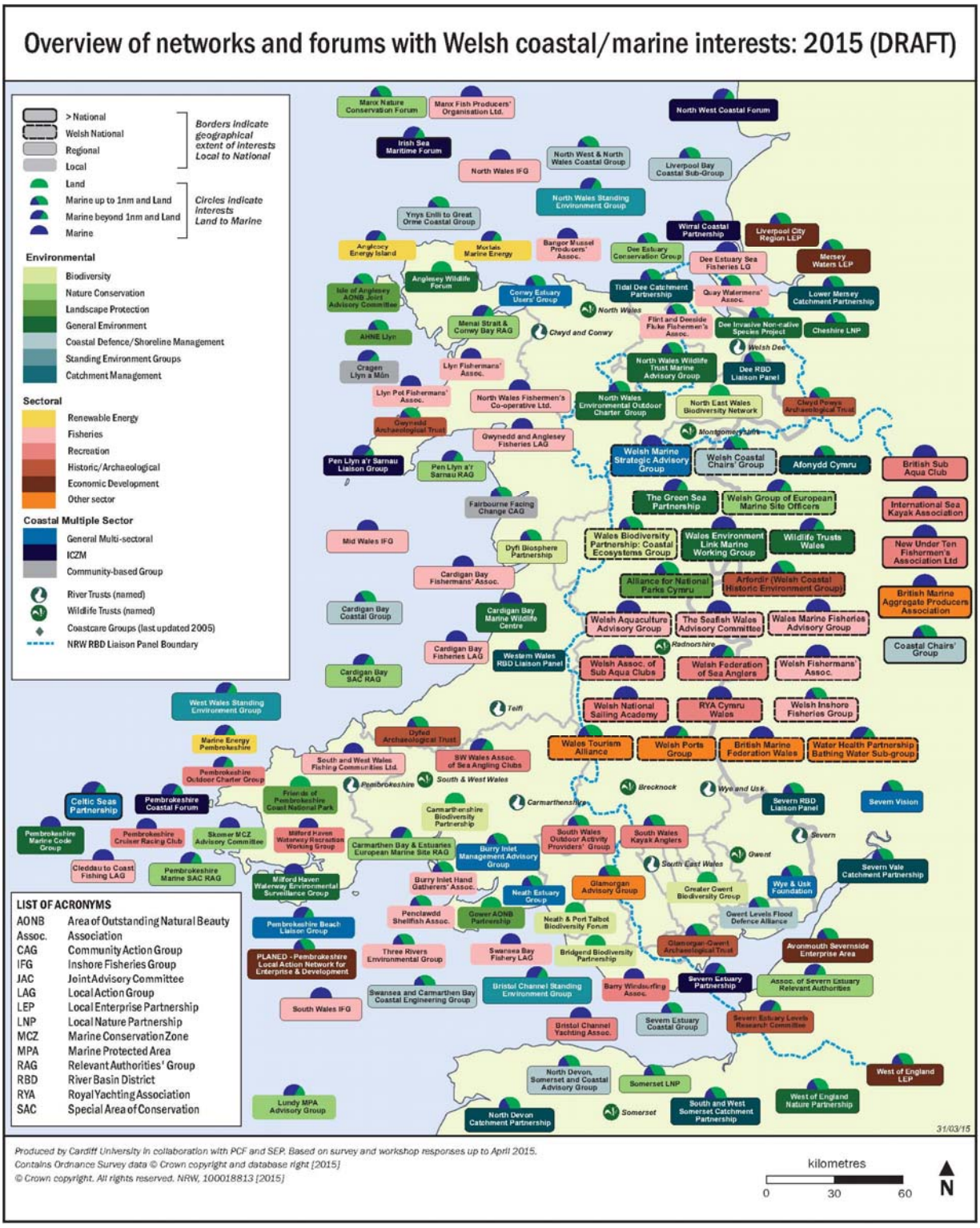
The Welsh Government recognise that information shared too early in the WNMP process may be counter-productive and of limited value to people. As such, it will be important to strike a balance ensuring that the phases in the development of the WNMP are shared at appropriate times without overloading people. All engagement will need to be fully compliant with the Welsh Government's policy commitments on Rights and Equalities, respecting the Welsh Language, the Rights of Children and social inclusion.

The Marine Planning Evidence Portal (http://lle.wales.gov.uk/apps/marineportal/) provides a web-based mapping tool which displays spatial data within the Welsh National Marine Planning Region. This will allow all those with an interest to see the evidence base for the Welsh National Marine Plan and to comment on the spatial data that will inform marine planning.

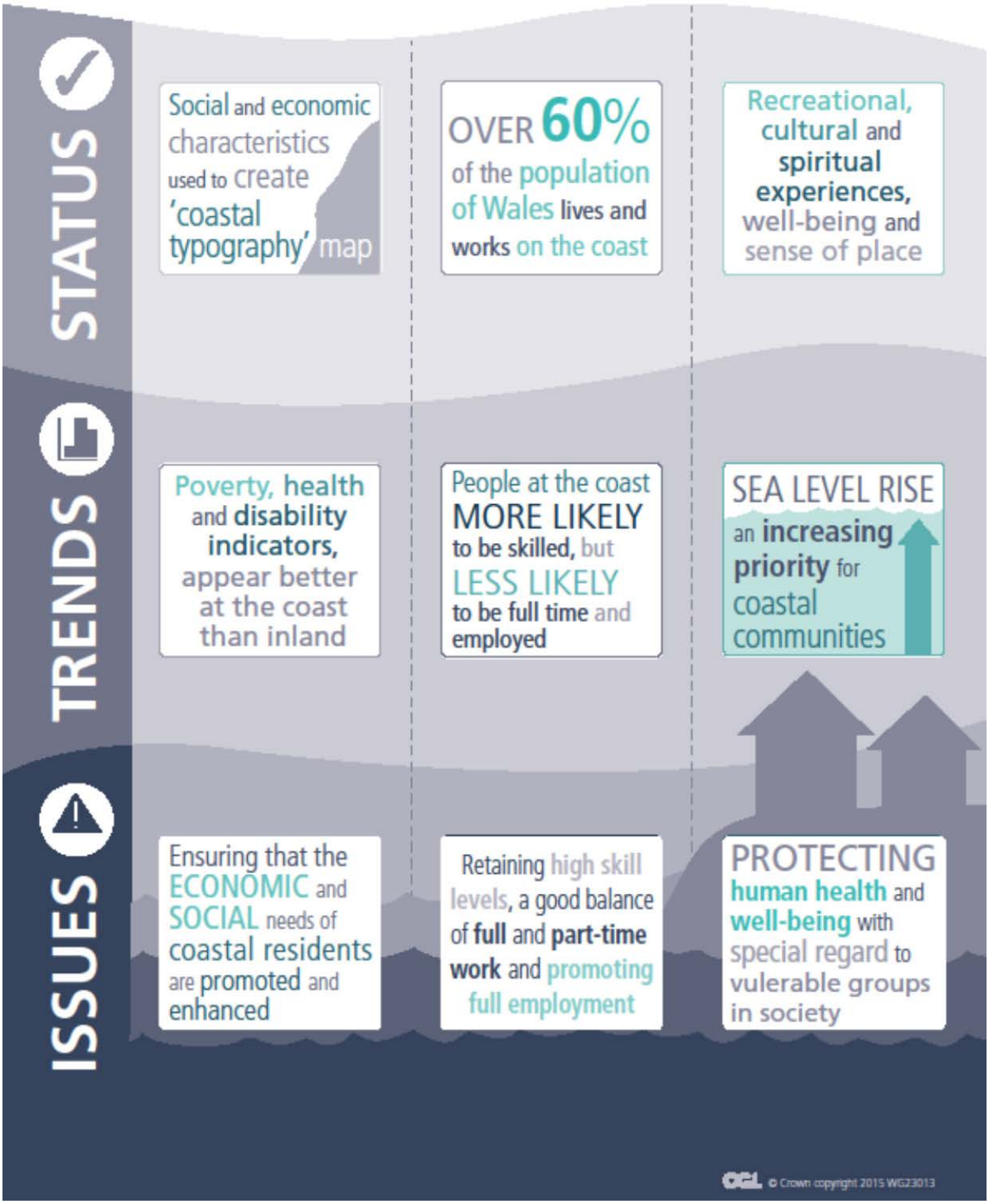
The study of coastal groups (Welsh Government 2013a) provides an overview of the current distribution of groups with an interest in the coastal and the marine area of Wales (Figure 3). The Welsh Government recognises that this network is not static, with existing groups changing and new ones emerging, so have work underway to ensure that the directory is refreshed. Figure 3 demonstrates the diversity of interests, locations and the importance that society places on the Welsh coast and marine resources. It also highlights the importance that the Welsh Government places in ensuring that it incorporates sufficient opportunities for engagement with the public and these interest groups during the development of the WNMP.

The Welsh Government will engage with these existing fora and work with them, and through them, to access their wider stakeholder networks. The Severn Estuary Partnership and the Pembrokeshire Coastal Forum are particularly well established and proactive coastal partnerships that could be seen as providing very effective models of engagement at the local level. It will be key to identify ways of working effectively with such groups in order to deliver meaningful engagement in the development of the WNMP.

Figure 3 Groups, networks and forums with Welsh coastal/marine interests: 2015



COASTAL COMMUNITIES



3.6 Coastal Communities

The Welsh National Marine Plan will seek to use the evidence within this SSE to provide positive economic, social and environmental benefits to our coastal communities and users of the marine and coastal areas. Our engagement with coastal communities will be important for increasing our understanding of the key issues and opportunities on the coast, helping us to fill evidence gaps and encouraging innovative ideas to help increase wealth and well-being in our coastal areas.

Welsh seas provide a range of ecosystem goods and services, including: leisure and recreation; cultural and spiritual experiences; climate change adaptation; air and water quality. We know that people see the marine and coastal environment as intrinsically important, for its habitats and species, seascape and landscape features, its beauty, heritage and 'sense of place'. Taken together, these marine and coastal areas represent hugely important economic, environmental and social assets for the Welsh coastal communities and, more widely, Wales. Over 60% of the population of Wales lives and works on the coast, with all of the major cities and many important towns also located there. The Welsh marine environment supports an important communications and transport network and Welsh ports are vital for international trade; Welsh waters support valuable fishing activity and aquaculture developments and aggregates extraction that feeds local construction projects.

The Welsh marine area also supports the development of renewable and non-renewable energy installations to help deliver Wales's policies for climate change, low carbon energy and green jobs. Marine resources also provide tourism and recreation opportunities contributing £2.5 bn per year to the Welsh economy. Furthermore, some 32% and 70% respectively of the Welsh inshore area and coastline is designated (under European Union Directives and UK law) for its environmental quality and its outstanding beauty, and heritage contributes to culture and well-being. Flood management activities also feature along the Welsh coastal areas.

The Welsh Government recognises that Wales's tourism, transport, fisheries and marine renewable energy activities, amongst others, are vital to the needs and vibrancy of coastal communities. The UK Marine Policy Statement also recognises the wider benefits that marine planning will have to coastal communities in securing sustainable economic growth in regeneration areas as well as areas that already benefit from strong local economies.

A report commissioned by the Welsh Government (OCSI 2014).sets out a typology of Welsh coastal areas, based on their social and economic characteristics. The methodology was similar to that used to characterise the coastal communities of the English planning region (MMO 2011). Whilst every coastal community has a unique combination of characteristics, the typology helps group together those areas with similar characteristics on key indicators. The nine categories of types of coastal communities are:

- Age of population;
- Level of qualification;
- Proportion of benefit claimants;
- Employment in different sectors;
- Health;
- Housing (dwelling type, owned/rented);
- Access and transport (car ownership);
- Crime; and
- Deprivation and low income.

There were significant variations across the typologies in specific categories and some overlap in definition which can be difficult to interpret. The nine coastal typology categories sit under four key groups labelled A, B, C and D. An overview of each of the coastal typologies is shown in Table 5 and the distribution around Wales is summarised in Figure 4.

The report (OCSI 2014) found that people in coastal areas are more likely to be in employment than in non-coastal areas but that employment is slightly more likely to be on a part-time basis. Skills levels were found to be higher in these areas. People were more likely to be employed in hospitality sectors and less likely to be employed in manufacturing than people in non-coastal areas. The report found that poverty levels were lower in coastal Wales and that levels of poor health and disability were also lower than non-coastal areas. Coastal areas were found to have higher than average levels of overcrowded housing and housing lacking central heating than non-coastal areas. All available evidence and information will be considered when developing the WNMP, and gaps in data will be identified with consideration given to the need to address key areas.

Further details about each of the coastal communities identified by the (OCSI 2014) typologies report are presented in the following sections.

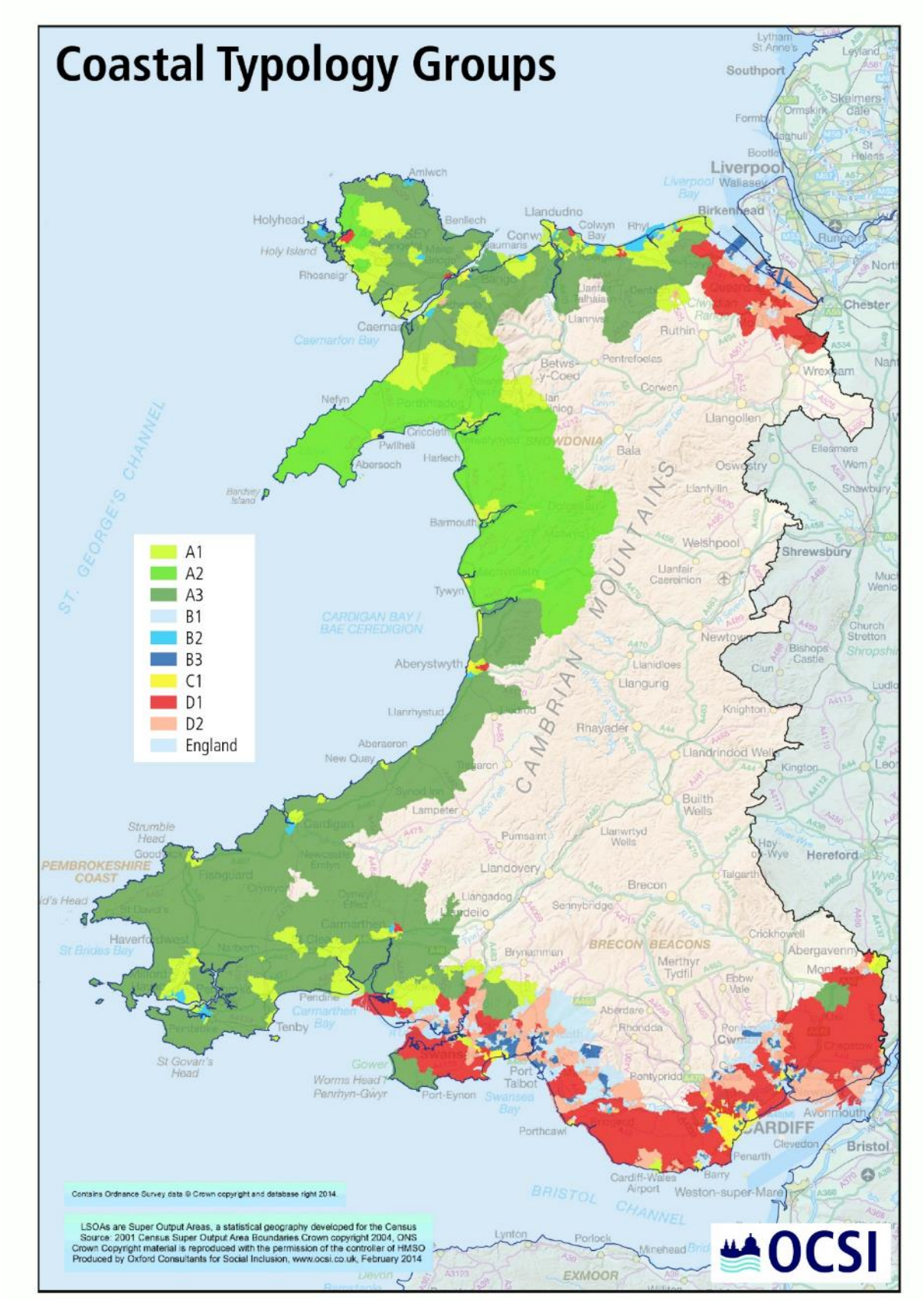
Table 5 Overview of Coastal Typologies

1 Typology Category	2 Overview	Example locations
A1	Retirement areas primarily located in smaller market towns, less developed resorts	Conwy, Pwllheli
A2	Predominantly rural areas, sparsely populated or in smaller settlements , with people employed in tourism sectors	Harlech, Criccieth
A3	Predominantly rural areas, sparsely populated or in smaller settlements, with a well-qualified population	St Davids, Benllech
B1	Towns and cities which have lost their primary markets, and are facing the challenge to find new ones. This group includes a range of single industry coastal towns, including mining areas, industrial heartlands and former agricultural centres	Maesteg, Burry Port
B2	Challenges relating to poor skills and high levels of worklessness often in older poor quality housing. This group includes a range of single industry coastal towns, including seaside resorts and ports. Some evidence of jobs growth in recent years	Holyhead, Milford Haven
B3	High levels of deprivation across all indicators, and a very high proportion of people living in social rented accommodation	Social housing estates in Swansea, Cardiff
C	City and market town service centres with highly skilled populations and dynamic economies, but relatively high levels of deprivation among older people and children	Central Cardiff, Bangor
D1	Affluent areas predominantly on the edge of towns and in satellite towns around larger coastal cities	Close to commuter towns: Cowbridge, Penarth
D2	Towns characterised by high levels of employment typically in industrial sectors, and a stable population.	Broughton, Pencoed

3.6.1 A1

These areas are predominantly located in smaller towns with higher concentrations in North Wales. A higher proportion of jobs in the areas are connected with tourist industries than across other typology groups, with fewer jobs in knowledge industries. 'Market towns' areas have a higher than average proportion of people of pensionable age (22%), compared to the Wales average of 18%. The proportion of people receiving benefits is lower than the seaside and coastal average for all major types of benefit. These areas are relatively peripheral, with higher travel times to key services than the coastal average. This is reflected in higher levels of short distance commuting, long distance commuting, home working and self-employment than the coastal average.

Figure 4 Map of Coastal Typologies



3.6.2 A2 and A3

'Rural tourism' and 'Rural chic' areas share similar characteristics in terms of population density, distance to services, benefit claimant rates and housing characteristics. However, areas classified as rural chic have a higher proportion of adults qualified to degree level (27.3%) than areas classified as 'Rural tourism' (24.4%). Both areas also have a relatively high proportion of older people (24% - 27%) but this is particularly the case for the 'Rural tourism' classification. There are also differences in employment characteristics, with a higher proportion of people employed in hotels and catering (8% - 10%) and other tourist industries in 'Rural tourism'.

3.6.3 B1

These areas are characterised by a low proportion of people with degree level qualifications (17.9%) and a high proportion of people involved in blue collar activities - manufacturing, waste management, transport storage and communication. By contrast, there are lower proportions of people involved in managerial and professional occupations (7.4% compared to the Wales average of 9.2%). These sectors have been struggling in recent years and jobs growth has been lower on average in these areas (3.5%) than across coastal areas (6.2%) and Wales as a whole (7%). Deprivation levels are relatively high with a high proportion of people on all main benefit types (10.5%) with high levels of seasonal unemployment.

3.6.4 B2

A high proportion of people are involved in activities associated with ports including marine transport, storage and communication (1.7%). There is also a relatively strong concentration of people involved in tourism related activities included hotels and catering (9.2%) suggesting that they are more closely tied to coastal related activities. These areas have higher than average levels of people receiving out of work benefit (7.1%) and child and pensioner poverty. However, jobs growth has been strong in recent years (16%).

3.6.5 B3

Just under half of the population in this classification group (43%) lives in social rented housing (significantly above the average across coastal areas 16%). These areas have very high levels of deprivation on many measures:

- Education: The lowest proportion of people with degree level qualifications (11.3%) and the lowest levels of pupil attainment of all typology groups;

- Employment: Highest proportion of people receiving Jobseekers Allowance (6.8%) and Incapacity Benefit (15.5%) and the lowest overall employment rate (52.6%). Highest levels of under-employment (part time working – 34.4%) and highest seasonal variations in unemployment;
- Health: Highest proportion of people who have self-reported that they have a limiting long-term illness (23.9%). Highest levels of people providing intensive unpaid care (4.3%). Highest proportion of people receiving disability benefits (12.4%); and
- Crime: Highest levels of crime.

3.6.6 C

High proportion of people qualified to degree level (31.4%) and a high proportion of people working in high skilled sectors including real estate, renting and business activities and health, professional, scientific and technical activities and education. Employment is less likely to be part time than across other typology groups. However, deprivation levels are generally higher than the coastal average particularly for older people and children (25.6% children in poverty in 2011, compared to the Wales average of 22.6%). A higher proportion of people live in private rented accommodation than the coastal and national average. A high proportion of people live in flats (both in purpose built blocks and converted houses) and population densities are high.

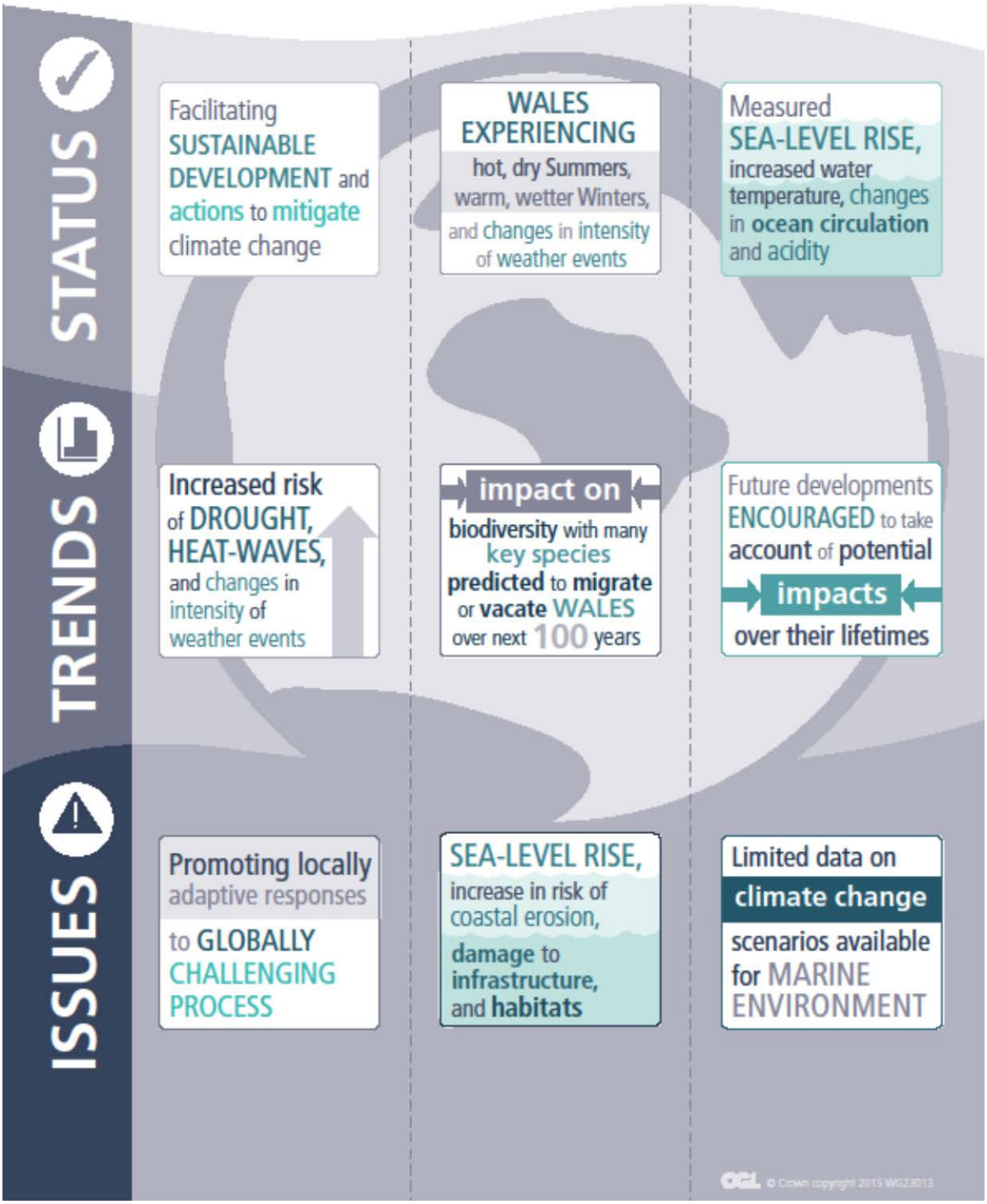
3.6.7 D1

Half of the people living in these areas reside in detached housing and approximately 30% live in housing with eight or more rooms. People are more likely to own their own homes in these areas than across all other typology groups. Employment in these areas is largely concentrated in managerial and professional occupation groups (13.1%) and in high skilled employment sectors including finance and real estate and business activities, professional, scientific and technical activities, public administration and education.

3.6.8 D2

These areas have a more stable population with fewer people moving in or out of the area in a given year (9%) than the coastal average (12%). The areas have a strong economy with a higher proportion of people in full-time employment compared with other typology groups. In general, employment is more concentrated in manufacturing than the average across coastal areas. Deprivation levels are generally lower than the coastal and national average. However, the proportion of people qualified to degree level is similar to the coastal average (26%).

CLIMATE CHANGE



3.7 Climate Change

3.7.1 Overview and background

The Marine Policy Statement (MPS) highlights the importance of understanding issues surrounding climate change and how this might be reflected in the future marine environment. It states that '*climate change is likely to mean that the UK will experience hotter, drier summers and warmer, wetter winters… increased drought, heatwaves, changes in seasonal precipitation and the intensity of weather events such as rainfall leading to flooding*'. Specifically, the potential impacts of climate change on the UK's marine environment include '*relative sea level rise, increased seawater temperatures, ocean acidification and changes in ocean circulation'*.

Globally, oceans play a critical role in reducing the contribution of carbon dioxide (CO_2) to climate change, for which burning of fossil fuels is a primary contributor. The oceans currently take up (absorb) more CO_2 than they release and, therefore, help to reduce the rate of increase in the atmosphere. However, this process results in the oceans becoming more acidic (lower pH) which could potentially reduce their capacity to take up CO_2 in the future (UKMMAS 2010d), whilst also harming marine life.

Ocean climate is largely defined by its temperature, salinity, ocean circulation and the exchange of heat, water and gases (including CO_2) within the atmosphere. The functioning of the marine ecosystem is highly dependent on changes to both ocean climate and acidification (MMO 2013b). In considering future plans for the marine environment, it will be necessary to appreciate the likely impacts of climate change, including our ability to maintain the Good Environmental Status (see section 3.1) of the marine environment and the way we use and value our marine natural resources.

To adapt effectively, planners and decision-makers need as much good information as possible on how climate will evolve, and supplying this is the aim of the recent projections of UK climate change in the 21st century, known as UKCP09 (work is currently ongoing to update this information). They are one part of a UK government and devolved administrations programme of work to put in place a new statutory framework on, and provide practical support for, climate change adaptation. The projections have been designed to help inform the difficult choices that planners and other decision-makers will need to make, in sectors such as transport, water resources and coastal defences, to ensure the UK is adapting well to the changes in climate that have already begun and are likely to grow in the future (Jenkins et al. 2009a).

3.7.2 Key issues for Marine Planning

- The consequences of climate change create a challenge to the management of natural resources and marine planning will have to balance and adapt traditional approaches to conservation.
- Unlike the land-based projections, limited data is available on climate scenarios specifically for the marine environment; UKCP09 only provided one marine scenario, from one model run and for one future time horizon (2070-2099).
- Sea level rise increases the risk of coastal erosion and physical damage to infrastructure, coastal habitats (including protected sites), coastal paths and agricultural land through flooding and wave action.
- Soft coastal defence options as part of adaptation are likely to be necessary to mitigate coastal erosion/flooding and will require appropriate marine aggregate resources to enable this.
- Significant ecological impacts may arise due to seawater temperature changes, ocean acidification and earlier and prolonged stratification of the water column. Rising water temperatures result in faster growth rates for species which are more tolerant of higher temperatures, whereas prolonged periods of warmer summer temperatures can adversely affect cold water species and intertidal shellfish.
- Increases in regional sea temperatures has triggered the northern expansion of species more commonly found in warmer waters, as a consequence sub-tropical species are occurring with increasing frequency in European waters and sub-arctic species are receding northwards. As such, non-native invasive species could potentially impact marine ecosystems, water quality as well as contributing to increased ocean acidification and harmful algal blooms.
- Water quality in coastal areas may deteriorate due to agricultural / urban run-off and sewerage overflows due to increased intensity of rainfall events.
- Many key seabird species are predicted to vacate sites in Wales over the next 100 years due to climate change and, as a result, seabird associated ecotourism activities are anticipated to suffer (Pinnegar et al. 2012).
- As a result of climate change the Tourism Comfort Index shows an increase in the frequency of months suitable for tourism activity around the coastal zone of North West Europe, providing potential for enhanced opportunities for Welsh tourism. Three case studies in ADAS (2010) indicated that the number of days favourable for peak tourist activity will increase by the 2050s.

- The potential issues related to climate change are overarching and could lead to significant impacts in numerous marine sectors (e.g. aquaculture, fishing, tourism and recreation). However, future marine planning should aim to mitigate the effects of climate change in areas at risk whilst also recognising, and being in a position to prosper from, the benefits that could arise. For example, sea level rise could be damaging to tourism in some coastal resorts, whilst providing potential opportunities for growth in others.
- It is likely that adaptation of terrestrial environments will be required to improve coastal resilience. In the future, up to three-quarters of intertidal coastal habitats may not be able to adapt naturally to sea level rise where they are blocked from migrating inland by 'hard' sea defences. This is known as 'coastal squeeze' and it can have significant implications for protected habitats and maintenance of sea defences. Adaptation measures such as managed realignment, will allow coastal habitats to respond naturally to sea level rise, at the same time creating habitats and improving natural coastal defences by removing barriers to inland migration. In employing such adaptation responses, compatibility of terrestrial and coastal planning processes with marine planning will be essential. The MPS suggests this kind of approach will ensure '*inappropriate types of development are not permitted in those areas most vulnerable… while also improving resilience of existing developments to long term climate change*'.
- The UK has committed to reducing CO_2 emissions by 80% by the year 2050 compared to 1990 baseline levels. Wales's target is for a 3% annual reduction in carbon equivalent emissions from 2011 'in areas of devolved competence', in effect excluding the power sector and energy intensive industries, and to achieve at least a 40% reduction in all greenhouse gas emissions by 2020. Therefore, not only should marine planning consider the potential impacts of climate change (e.g. sea level rise), but it should also consider the potential to facilitate actions to mitigate climate change, such as the development of offshore renewable energy generation and carbon capture and storage (CCS).
- Future developments should be encouraged to take account of the potential impacts of climate change over their estimated lifetime (MPS) (HM Government 2011). Most marine industries are accustomed to dealing with climatic uncertainty given the varied and potentially hostile nature of the ocean environment. Therefore, future adaptation is likely to include a range of independent actions, for example designing more robust vessels/structures and changing behaviours to target new fish, as well as deliberate actions involving government, codes of practice and amended legislation (Pinnegar et al. 2012).

3.7.3 Current Policy

There are several key UK and Welsh national and international legislative objectives and targets relating to issues of climate change covering emissions, reduction and adaptation that will require consideration.

The Intergovernmental Panel on Climate Change (IPCC)

In 2013-2014 the IPCC released its Fifth Assessment (AR5) report (IPCC 2014), which emphasised that climate change is happening now, that human activities are the dominant cause and that there is a need for urgent and concerted global action if we are to avoid dangerous levels of climate change and adapt to the climate change that is predicted to occur.

United Nations Framework Convention on Climate Change (UNFCCC)

The UNFCCC is an international environmental treaty that was produced at the United Nations Conference on Environment and Development (UNCED) (also known as the Earth Summit) in Rio de Janeiro, June 1992. The goal of the UNFCCC is to prevent dangerous anthropogenic (i.e., human-induced) interference of the climate system.

Kyoto Protocol

The Kyoto Protocol to the UNFCCC commits its Parties by setting binding emission reduction targets. It was adopted on 11th December 1997 and entered into force on 16th February 2005. On 8th December 2012, the 'Doha Amendment to the Kyoto Protocol' was adopted, updating the original framework for the second commitment phase (2013-2020) and revising the list of Greenhouse Gases (GHGs) for which monitoring and reductions are required.

EU Action on climate change

Preventing dangerous climate change is a strategic priority for the European Union. In April 2013 the European Commission adopted an EU Strategy on adaptation to climate change. The strategy aims to contribute to a more climate-resilient Europe through enhancing the preparedness and capacity to respond to the impacts of climate change at local, regional, national and EU levels. As well as reducing the impacts of climate change, the EU has also committed to reducing overall greenhouse gas emissions by 20% below 1990 levels by 2020 and by 80% by 2050.

UK Climate Change Act 2008

The Climate Change Act was passed in 2008 and provides a framework to develop an economically credible emissions reduction path for the UK. It commits the UK to reducing emissions by at least 26% in 2020 from 1990 baseline levels and at least 80% in 2050. It also requires the UK Government to set legally binding 'carbon budgets' to cap the amount of GHGs released in the UK over a five-year period. The first four carbon budgets have been established in legislation and run up to 2027. The Climate Change Act also requires:

- *A UK-wide climate change risk assessment:* that must take place every five years (see below for further information);
- *A national adaptation programme:* which must be put in place and reviewed every five years, setting out the UK Government's objectives (including non-devolved areas), proposals and policies for responding to the risks identified in the CCRA. In Wales, policies to address the impacts of climate change are being embedded into Sectoral Adaptation Plans (for Natural Environment; Infrastructure; Communities; Business and Tourism; Health);
- *Reporting on action taken to reduce emissions and deal with the impacts of climate change*: The Welsh Government is required to report on the action they have taken to reduce emissions and deal with the impacts of climate change which takes the form of the Welsh Government's Climate Change Strategy and Annual Progress Reports.
- *Adaptation Reporting Powers:* which enable Welsh Ministers to direct reporting authorities to prepare climate change adaptation reports. To date Welsh Ministers have not directed any reporting authorities to prepare reports. However, they are supporting organisations in Wales to assess and manage climate risks by issuing statutory guidance and by providing advice and tools through an Adaptation Knowledge Transfer Programme (HM Government 2013a).

UK Climate Change Risk Assessment (UK CCRA)

The UK CCRA brings together an overview of climate change risks and opportunities based on the analyses described in the individual sector reports and other sources of information. This includes the 'Marine and Fisheries' sector (Pinnegar et al. 2012) which comprises not only maritime industries, but also marine biodiversity and ecosystem functioning. It is intended to provide information to policy makers on the vulnerability of the UK and future risks and opportunities due to climate change (reviewed every 5 years). The separate 'UK Climate Change Risk Assessment: Government Report', also published in January 2012, outlines the UK Government's views on some of the issues raised, highlighting actions already in place to manage the risks and plans for the

future. As well as the UK report there is a Welsh report of the UK CCRA, which highlights the main risks for Wales. There is a high degree of uncertainty regarding the scale of impacts of climate change on the marine environment owing to the complexity of processes and the difficulty of predicting future change. However, non-native invasive species could potentially have a large impact on marine ecosystems, as well as a decline in marine water quality and increases in harmful algal blooms and ocean acidification.

The UK Committee on Climate Change (UK CCC)

The UK CCC is an independent, statutory body established under the Climate Change Act, formed to advise the UK Government and Devolved Administrations (e.g. the Welsh Government) on emissions targets and report to Parliament on progress made in reducing GHG emissions and preparing for climate change. The role of the CCC includes providing independent advice on setting and meeting carbon budgets and monitoring progress in achieving these targets (CCC 2014). An Adaptation Sub-Committee was set up in 2009 and this sets the direction for adaptation matters including independent advice on preparing for climate change.

The Climate Change Commission for Wales

The Climate Change Commission for Wales liaises with the UK CCC and facilitates the Welsh Government's efforts to tackle climate change by providing policy advice, scrutinising and reporting on progress and facilitating cross-sectoral action in Wales.

Marine Climate Change Impacts Partnership (MCCIP)

The MCCIP was formed to provide a co-ordinating framework for the UK to consider matters concerning climate change, facilitating the transfer of high quality evidence on marine climate change impacts to policy advisors and decision-makers, as well as guidance on adaptation. Specifically, this includes the supply of evidence and advice to partners to enable them to individually and collectively plan for the challenges and opportunities presented by the impacts of climate change in the marine environment (MCCIP 2010). An important output of the MCCIP programme is the Annual Report Card (ARC) (Figure 5) which synthesises the previous year's work in a highly accessible and actionable format providing updates on our understanding of how climate change is affecting UK seas (MCCIP 2013).

Figure 5 MCCIP Annual Report Card

The Climate Change Strategy for Wales

The Welsh Government's Climate Change Strategy and Delivery Plans published in 2010 outlines the action to be taken to realise the Programme for Governments commitments around reducing greenhouse gas emissions in areas of devolved competence and support for effective adaptation to the consequences of climate change. Within the Strategy there is commitment defined by two targets: to reduce emissions within areas of devolved competence by 3% (each year from 2011) and reduce all Welsh emissions by 40% from 1990 levels by 2020.

As well as reducing emissions there is a commitment to build considerations of climate change impacts into Welsh Government business planning through the production of Sectoral Adaptation

Plans (SAPs). SAPs will identify the risks and opportunities for sectors (using evidence from the Climate Change Risk Assessment and key stakeholders), analyse the current policy response, identify any gaps and barriers to effective action and put in place a programme for embedding climate change into delivery across all portfolios. The SAPs will be the principal mechanism through which the Welsh Government seeks to deliver climate resilience for the coming century. The Welsh Government is currently developing SAPs including one for the natural environment.

River Basin Management Plans (RBMPs)

Three River Basin Management Plans (RBMPs) cover the Welsh coast (Dee River, Western Wales and Severn River) and each one discusses the potential impacts of climate change in their regions (Natural Resources Wales 2014a). This includes consideration of the change in risk, due to climate change, of not achieving Water Framework Directive (WFD) objectives (i.e. 'good status') and the likely contribution of actions to future climate change through their impact on emissions of GHGs.

3.7.4 Current Status

Temperature, salinity and stratification

Over the last century annual daily mean-temperatures in Wales have increased by about 0.7°C (Jenkins et al. 2009b). Table 6 shows projected changes in air temperature and precipitation by the 2050s over the Irish Sea and Southwest approaches marine regions which overlap with Welsh waters. The projections are presented at three probability levels (10%, 50% (i.e. the central estimate) and 90%) to provide a range; it is very *unlikely* that the outcome will be less than the 10% value and very *likely* that the outcome will be less than the 90% value (Lowe et al. 2009). It can be seen that increases in mean temperature are predicted over Welsh waters, with a slightly greater increase expected in the summer. Projected changes in precipitation suggest an overall decrease during the summer and an increase during the winter over the Irish Sea and Southwest approaches.

Table 6 Changes in winter and summer mean temperature (°C) and precipitation (%), averaged over marine regions, by the 2050s under the Medium emissions scenario, as reported in the UKCP09 (Lowe et al. 2009)

Region	Mean Summer Temperature (°C)			Mean Winter Temperature (°C)			Mean Summer Precipitation (%)			Mean Winter Precipitation (%)		
	10%	50%	90%	10%	50%	90%	10%	50%	90%	10%	50%	90%
Irish Sea	0.3	1.5	2.9	0.6	1.4	2.3	-25	-12	0	-1	+6	+14
Southwest approaches	1.3	2.2	3.2	1.2	1.9	2.9	-43	-23	-2	0	+11	+28

The projected changes in air temperature and precipitation shown in Table 6 are shown for a medium emissions scenario. However UKCP09 include the effect of emissions uncertainty by presenting separate probabilistic projections of future climate change for three scenarios of future emissions. These were the A1FI, A1B and B1 scenarios in the IPCC Special Report on Emission Scenarios (SRES) renamed for simplicity in UKCP09 as High, Medium and Low respectively. The increase in air temperature has been reflected by a rise in sea surface temperature (SST) around the UK of about 0.7°C over the last 30 years. Furthermore, seven of the warmest years in UK coastal waters since records began in 1870 have occurred in the last decade (MCCIP 2008; cited in Lowe et al. 2009).

Figure 6 shows the anticipated change in sea surface temperature by the end of the 21st century in comparison to the 1961-1990 baseline period, whereby the greatest increase will be experienced in autumn (defined as September to November). This, and all the climate projections in the UKCP09 marine report (Lowe et al. 2009), are based on a medium emissions scenario. Unlike the land-based projections, limited data is available on climate scenarios specifically for the marine environment; UKCP09 only provided one marine scenario, from one model run and for one future time horizon (2070-2099). In particular, larger increases of between 2.5 and 4°C are projected for the Celtic Sea and Irish Sea (Lowe et al. 2009). Increases in seawater temperature could lead to changes in plankton, fish communities and food chains, as well as affecting the survival of fish eggs and larvae or plankton (MMO 2013b). Projects such as MarClim (http://www.mba.ac.uk/marclim/) have provided strong evidence that recent climate change has resulted in changes in the abundance, population structure and biogeographic ranges of a number of intertidal indicator species, mirroring changes offshore.

Trends in the salinity of UK marine waters are less apparent, although the evidence suggests a freshening to a minimum in the 1980s-1990s followed by a subsequent increase in salinity (Evans *et al.*, 2003; Holliday *et al.,* 2008a; cited in Lowe et al. 2009). However, in contrast to the relatively large increases in temperature predicted for the Celtic Sea and Irish Sea by the late 21st century (2070-2098), salinity changes in these regions are expected to be less than the rest of the UK (Figure 7).

Figure 6 Potential changes to sea surface temperature (2070-2099) for Welsh waters based on a medium emissions scenario.

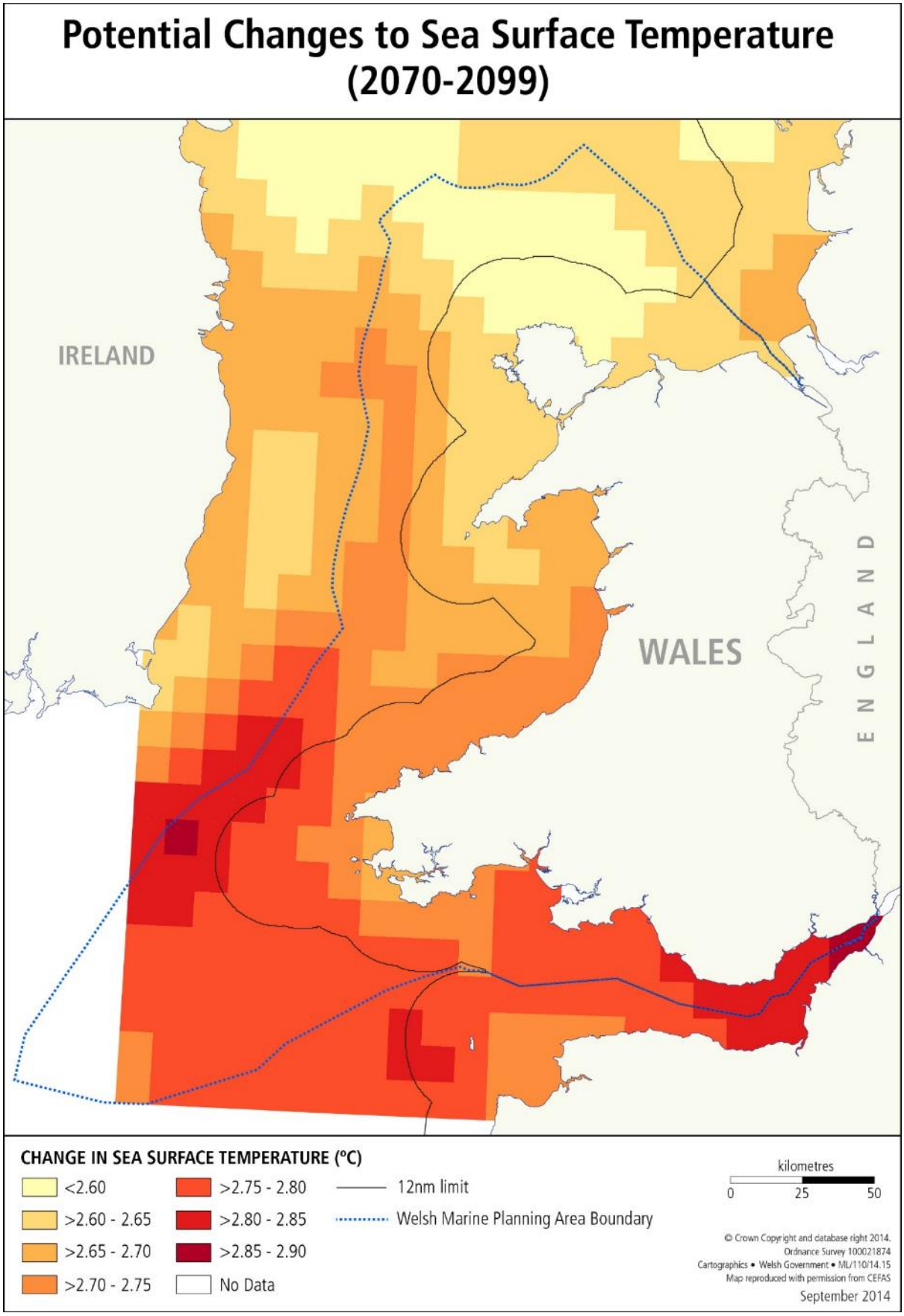
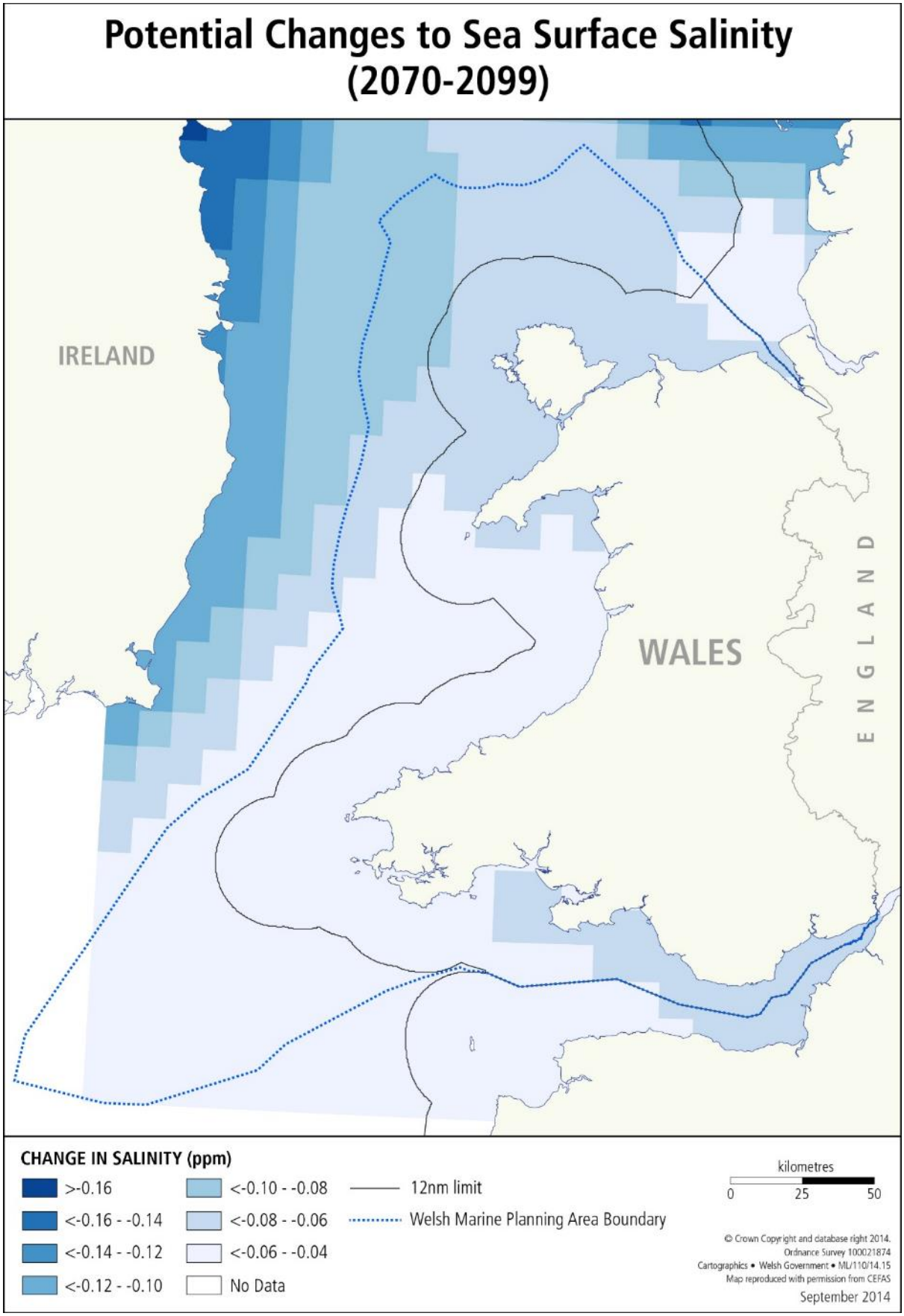


Figure 7 Potential changes to sea surface salinity (2070-2099) for Welsh waters based on a medium emissions scenario.



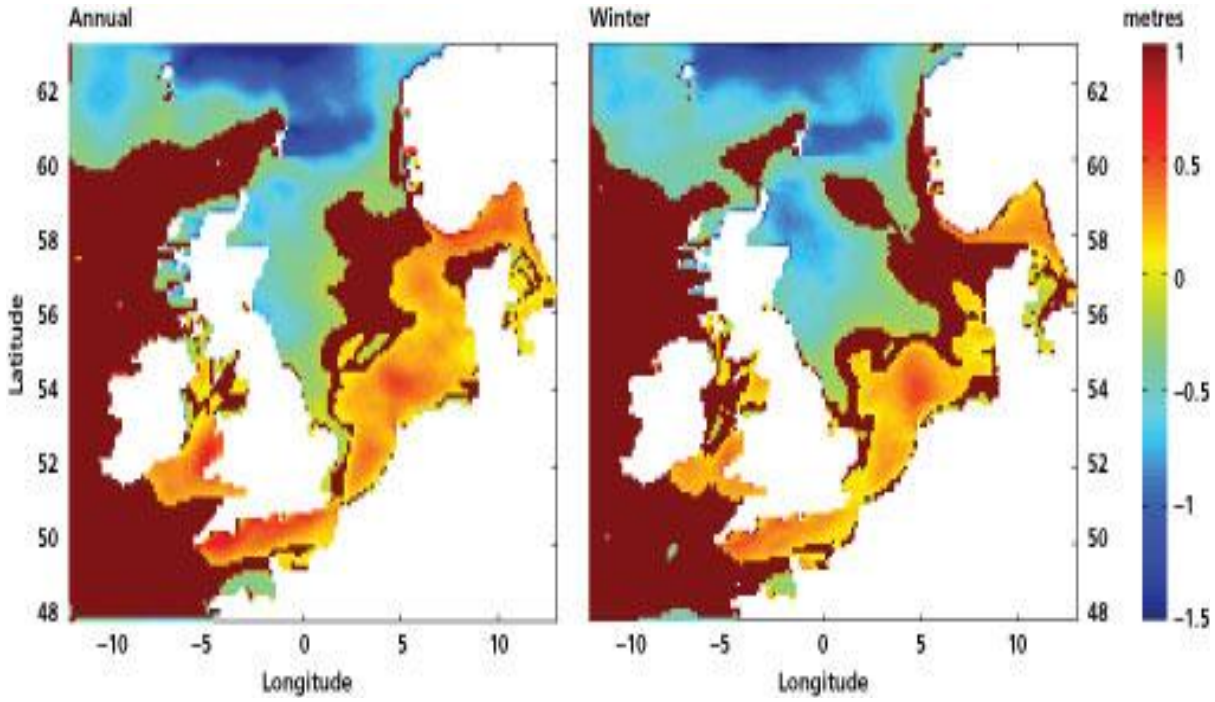
There are several thermal and tidal fronts that occur in the Irish Sea. It is generally mixed in winter, but in spring and summer a complex patchwork of mixed and stratified areas develops (Simpson and Bowers 1981). The positions of the frontal boundaries between these areas are determined by the balance between thermal inputs and tidal mixing, with wind and waves having only a second order influence (Young and Holt 2007). The stratification of the shelf seas around the UK is predicted to continue to occur in the summer; however, the strength of this stratification is expected to increase in the future. In addition, the period of stratification is projected to become longer starting around 5 days earlier and breaking down 5-10 days later each year (Jenkins et al. 2009a).

Waves and storms

Waves affect marine operations (e.g. transport, fishing and offshore infrastructure) and coastal communities (e.g. coastal erosion and structural damage), as well as the physico-chemical properties of the marine environment (e.g. stratification and sediment transport) (UKMMAS 2010d). The Met Office uses a network of Marine Automatic Weather Stations (MAWS) on moored buoys and Light Vessels to assess significant wave height around the UK. The largest waves typically occur to the north and northwest of the UK, with the Irish Sea relatively sheltered in comparison (UKMMAS 2010d).

There is some suggestion of a change in frequency and intensity of storms around the UK. For example, in the case of the Irish Sea, although there is a slight increase in the severity of the most extreme events, the frequency of extreme wind and wave events may be slightly reduced (Woolf and Wolf 2013). Simulations run as part of the UK Climate Projection 2009 (UKCP09) investigations suggest that in the future, the mean annual and winter maxima of significant wave heights are generally expected to increase to the South West of the UK, including the Welsh coastline. Figure 8 shows changes in mean annual and winter maxima of significant wave height from 1960–1990 to 2070–2100 (left panel is mean annual maxima and right panel is mean winter (December-January-February) maxima - areas that are coloured dark red are points where the differences are statistically insignificant at the 95th percentile level). Changes in the winter mean wave height for the UK are projected to be between -35 cm and +5 cm and changes in the annual maxima are projected to be between -1.5 m and +1 m (Lowe et al. 2009). Although highly uncertain, the wave climate around the UK in the winter may roughen appreciably in the future which could cause more frequent disruption to ferry services across the Irish Sea (Pinnegar et al. 2012).

Figure 8 Winter maxima significant wave height (from Lowe et al. 2009)



The impacts of the significant storm surges (combined with powerful waves and high tides) of December 2013 and January 2014 are described in(Natural Resources Wales 2014b). Whilst the report notes that the full impact on coastal habitats and species will not be fully understood for several years, a number of impacts are described, e.g.

1. algae, barnacles and molluscs were scoured from substrata or damaged and biogenic reefs were eroded;
2. the nature and shape of the coastline was markedly altered in several locations;
3. large volumes of beach sand were lost, exposing rock substrata, coarser material was driven inshore, and natural features, such as shingle ridges, were reshaped;
4. frontal sand dunes and soft diff were severely affected due to erosion, slumping and breaching.

Natural Resources Wales (2014b) concludes that in general, the impacts on habitats and species have demonstrated that Welsh natural wildlife resources are vulnerable to the impacts of extreme weather events, which can have cumulative and long-term effects on population status and site condition. The report makes recommendations about improving incident response from an environmental perspective, the need for improved collaboration with partner organisations and the need to improve the monitoring and recording of environmental change.

Sea level

During the 20th century, sea level around the UK increased by approximately 1.4 mm per year, with notably increased rates experienced during the 1990s (e.g. between 3 and 4 mm per year). This suggests a slightly lower increase in sea level compared to the global average (UKMMAS 2010d). Mean sea level around the UK is predicted to rise between 11.6 and 75.8 cm (range between low emissions 5th percentile and high emissions 95th percentile scenarios) by the year 2095. In addition, sea level rise projections for Cardiff (South Wales), comparable to results presented for London, indicate a rise of approximately 21 to 68 cm (range of 5th to 95th percentile for medium emissions scenario) for the same period. This is amplified further by the gradual subsidence predicted for the south of the UK as a result of isostatic rebound (Lowe et al. 2009). However, across Wales the rate of isostatic rebound is not consistent, the north Wales coastline shows little movement, whereas areas of the south Wales coastline are sinking by approximately 0.5 mm/year.

Ocean circulation

The Atlantic Meridional Overturning Circulation incorporates the Gulf Stream and provides a warm water flow past the west of the UK, strongly influencing UK climate by warming the prevailing westerly airflow. This circulation is fundamental to the distribution of salt, deep-ocean heat and hence regional climate, of pollutants and of many species carried by the flow during their lifecycle. Circulation is temporally and spatially variable and, thus, it is difficult to describe any generally persistent circulation patterns in UK waters. There are only a few regions where the long-term circulation has been convincingly measured, for example the mean northwards flow of water through the Irish Sea. The main input of water to the Irish Sea is from the Atlantic, flowing south to north through St. George's Channel, west of St David's. The overall flushing time for the Irish Sea as a whole is about one year (Knight and Howarth, 1999; cited in UKMMAS(2010d)). Most regions of the Irish Sea are continuously mixed because tidal currents are strong. However, part of Cardigan Bay experiences strong seasonal stratification in the summer and can be separated from the well-mixed areas by tidal mixing fronts (UKMMAS 2010d). It is highly feasible that the impacts of climate change could lead to an alteration in patterns of ocean circulation through the Irish Sea including, Welsh waters.

Acidification

Atmospheric concentrations of CO_2 are continuing to rise and increased absorption by the oceans will accelerate ocean acidification. Both modelling and observational studies have suggested that the absorption of CO_2 by the global ocean has already decreased pH levels by 0.1 since 1750 (Orr *et*

al., 2005; cited in Pinnegar et al. 2012). The main concern is that the present day rate of change is faster than at any time during the last 55 million years (Pearson and Palmer, 2000; cited in Pinnegar et al. 2012).

It is predicted that acidification will continue as CO_2 emissions increase, with decreasing pH levels of around 0.1 units in the 2020s, and a decrease between 0.25 and 0.47 pH units by the end of the 21st century (depending on the emission scenario used). Evidence from experiments and observations indicate that future ocean acidification will affect many marine organisms, with implications for ecosystems and ecosystem services (Williamson et al. 2013). This would have negative consequences, particularly those organisms with calcareous ($CaCO_3$) shells including commercially important shellfish species (MMO 2013a). It is considered that the shellfish industry in Wales could be affected by the lowering of seawater pH in the UK, losing between £28.4 million (4.2% of total shellfish net present value (NPV)) and £59.1 million (8.8%) per annum by the year 2080 (Pinnegar et al. 2012).

In addition, ocean acidification also reduces the ability of the oceans to absorb more CO_2, and, therefore, buffer the potential effects of global warming. Climate warming may increase rates of pelagic carbon cycling, making less carbon available to the benthic systems resulting in reduced benthic biomass, with potential knock-on effects for marine food webs (MMO 2013a).

Ecosystems and biodiversity

Impacts of a changing climate on marine ecosystems and biodiversity can come about as a result of: increased temperature; earlier spring season; sea level rise and; increased frequency of extreme events (Mitchell et al. 2007). The effects of climate change on ocean circulation and acidification described above also have implications for ecosystems and biodiversity.

The 2013 Marine Climate Change Impacts Partnership (MCCIP) Report Card (MCCIP 2013) highlighted the impacts climate change can have on the vision for a healthy and biologically diverse marine ecosystem. For shallow and shelf subtidal habitats, climate impacts are evident in changes in distributions and abundances of various species. Coastal Habitats are vulnerable to a wide range of impacts; recent work suggests dune wetlands may dry out over the next 50 years and transform to dry grassland and dune vulnerability may increase as a result of erosional narrowing of beaches and dunes. Changes in distribution and seasonal timing of some plankton production, linked to climate change, are well documented. This can have consequences for many plankton predator species,

including the larvae of many commercial fish species. Changes in prey abundance, species composition, energetic quality or synchronisation may have profound effects on the breeding success of many seabirds (Daunt and Mitchell 2013). An increase in the frequency of extreme weather events could also affect breeding habitat and create unfavourable foraging conditions, which may lead to increased mortality of adults and chicks. Models anticipate significant shifts in the distribution of species (usually northwards), with some species being excluded from the UK altogether in the future and others arriving and becoming established for the first time. Many key seabird species will vacate sites in Wales over the next 100 years, in particular species such as Puffin and Gannet, affecting seabird associated ecotourism (Pinnegar et al. 2012).

MarClim monitoring sites are incorporated within Wales's annual marine intertidal survey programme (led by Natural Resources Wales). This monitoring has identified range extensions at the northern limits of the geographical distributions of typically southern, warm water species *Osilius lineatus* (toothed topshell), *Gibbula umbilicalis* (flat topshell), *Chthamalus montagui* (Montagu's stellate barnacle), *Chthamalus stellatus* (Poli's stellate barnacle) and *Balanus perforatus* (acorn barnacle) since the mid-1980s (Mieszkowska et al. 2005).

Two of the major topic areas set out in the Environment Strategy for Wales are in relation to tackling climate change and include adaptation to the inevitable impact that it will have on the environment of Wales, and the protection of biodiversity, including an objective to ensure that all statutory sites are in favourable condition. NRW (and its predecessor CCW) have undertaken work to assess the vulnerability of Welsh marine habitats to the impacts of human activities and climate change (Jolley et al. 2012) and are undertaking an assessment of Welsh marine habitats. Jolley et al (2012) identify the most vulnerable habitats amongst littoral rock and sediments, and sublittoral sediment habitats, with much less vulnerability for infralittoral and circalittoral rock biotopes. The most vulnerable UKBAP habitats included estuarine rocky habitat, tide-swept channels, maritime cliff and slopes, intertidal mudflats, coastal saltmarsh, littoral and sublittoral chalk (and other soft rock), subtidal mixed muddy sediments, sheltered muddy gravels, oyster beds, blue mussel beds and mud habitats in deep water.

3.7.5 The future

Due to an anticipated time lag between emissions and temperature rise, past emissions are expected to contribute an estimated further 0.2°C increase per decade in global temperatures for the next 2 to 3 decades (IPCC 2013). However, in accordance with the UK Climate Change Act 2008,

the UK is committed to a reduction in emissions of 80% in the year 2050 compared to 1990 levels. In order to achieve this target, significant development of the renewable energy sector is likely to be necessary, including significant exploitation of marine natural energy resources (e.g. wind, wave and tidal energy).

In England and Wales, there is at least £150 billion worth of property and 430,000 ha of agricultural land at risk from coastal flooding. The area at risk of coastal flooding equates to a coastline of 3,500km in length, of which 3,200 km is defended. Furthermore, there are approximately 100,000 properties in areas that could be eroded if not protected (Woolf and Wolf 2013). The National Strategy for Flood and Coastal Erosion Risk Management in Wales (Welsh Government 2011b) estimates that currently 3% (500 km^2) of agricultural land in Wales is at risk from flooding (estimated to rise to 5% (750 km^2) by 2080. 123,000 domestic properties are estimated to be at risk from flooding from rivers and the sea and a further 97,000 from rivers, sea and surface water. It is estimated that over 80% of 'water' related infrastructure, 22% of electricity related infrastructure, 22 km of motorways, 2,300 km of other roads and 400 km of railway lines are all at risk from flooding from the rivers and the sea.

Historically, coastal erosion has been low in Wales, however, with sea levels projected to rise by around a metre over the next 100 years, both coastal erosion and the impacts on coastal communities are set to increase significantly (Welsh Government 2011b). Approximately 346 km (23%) of the Welsh coastline is being eroded, while 415 km (28%) is defended from erosion (Masselink and Russell 2013). The impact of sea-level rise, storm surges and increased storminess could affect coastal infrastructure. For example, infrastructure supporting ports that are located in low lying geographic areas will be vulnerable to risks (Wright 2013).

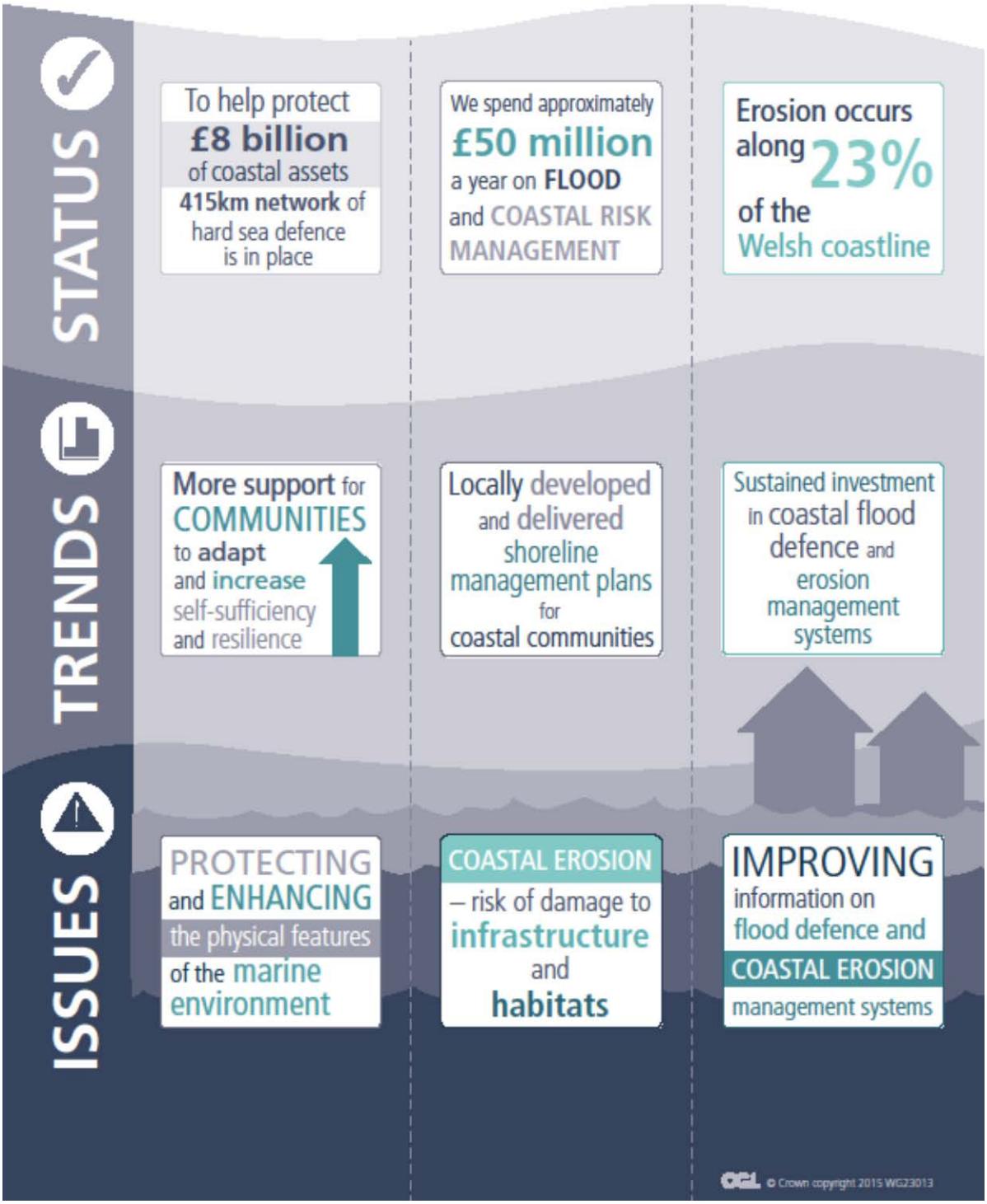
In addition to the human cost, sea level rise and increased storminess leading, to flooding and coastal erosion, change the landscape and can have profound effects on habitats and biodiversity. Around 75% of the Welsh coast is designated and protected for its environmental importance. Where coastal protection works lead to a loss of intertidal habitat within European designated sites (known as Natura 2000 sites) additional habitat will need to be found to compensate for these losses. This will place more pressure on coastal resources and finances (Welsh Government 2011b). Natura 2000 sites are comprised of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). Information on these sites in offshore waters can be found at http://jncc.defra.gov.uk/page-1445 and http://jncc.defra.gov.uk/page-1414. The JNCC interactive

maps may also be a useful resource: http://jncc.defra.gov.uk/mczmap and http://jncc.defra.gov.uk/page-5534.

Climate change projections suggest that weather patterns will continue to change and that Wales will experience an increase in the intensity of rainfall, the frequency of sudden storms, and a rise in sea levels. Taken together, these factors are likely to increase the likelihood and consequences of coastal flooding and erosion. Following the severe winter coastal storms Wales experienced in 2013 and 2014, a comprehensive assessment was commissioned by the Minister for Natural Resources and Food. The Wales Coastal Flooding Review undertaken by Natural Resources Wales was published in 2014 took a two-phased approach. Phase one was a swift review of the impacts across the whole of the country from the coastal flooding events and phase two looked into the wider lessons learnt from these events and flood risk management in affected areas. Further information on the Wales Coastal Flooding Review is provided in Section 3.8.

According to information contained in the three RBMPs associated with the Welsh coast, demand for water is likely to increase for domestic, leisure industry, agricultural and industrial uses as a result of rising temperatures. Similarly, climate change projections suggest that there is likely to be increased contamination from nutrients from farmland and sewerage overflows due to compacted soils and less frequent but more intense rainfall events (Natural Resources Wales 2014a). This could potentially impact the ability to maintain or achieve good environmental status in terms of WFD objectives.

COASTAL CHANGE and FLOODING



3.8 Coastal Change and Flooding

3.8.1 Overview and background

The coast of Wales is home to a wide range of habitats and landforms which have been shaped and affected by the weather, coastal processes and human activity, especially beaches, cliffs and wave-cut platforms, sand dunes and vegetated shingle and saltmarsh. They include biodiversity and geodiversity features of UK and Welsh national and international importance which can experience significant morphological change following storm events.

The coastline is important to the people, communities and economy of Wales. Many of the country's towns and cities are located in coastal areas, supported by a wide range of infrastructure. The coastal areas are an important attraction to visitors from both within and outside of Wales and provide an important contribution to the Welsh national economy.

Approximately 60% (1.9million) of the population of Wales live on, or near to, the coast and the coastal and marine environment supports an estimated 93,000 jobs, with visits to the coast accounting for over 40% of overnight stays in Wales (Welsh Assembly Government 2008a).

In addition to flood risk, the Welsh coast is also exposed to erosion risks. The coastal areas are dynamic and subject to change. Some of the erosion experienced is over relatively long periods of time, whilst some instances can happen very rapidly. Coastal erosion is occurring along 23% of the Welsh coastline (UKMMAS 2010a). An estimated 415 km of man-made sea defence structures exist to protect over £8 billion of assets from coastal erosion and tidal flooding (Wales Audit Office 2009). The UK and Welsh national network of coastal protection and defence infrastructure has evolved and developed over many years, in order to protect and manage the risks to important and sensitive coastal areas and communities.

The national infrastructure network is managed and maintained by a wide range of public and private sector organisations, as well as private owners. Some of the structures within this network have been specifically constructed for coastal flood or erosion protection. Others have been constructed for another primary purpose, such as railway embankments and highway retaining walls, but provide a degree of coastal protection as a secondary function.

Significant coastal flooding incidents typically come from the combination and interaction of high tides, induced tidal surges, wind strength and direction, as well as local impacts such as the

performance of existing defences and high river flows leading to 'tide-locking'. It is the dynamic interaction of these mechanisms and the sensitivities to different parts of the coast that add complexity and difficulty in accurate local forecasting, warning and incident management.

Coastal flood risk is an important national issue for Wales. Much of the large scale flood risk is characterised as low likelihood but high consequence which brings with it complex challenges of management. Managing Wales's national coastal flood risk has evolved considerably over time and is a complex process of managing the interaction of the natural and manmade assets and structures providing a coastal defence to flooding. There are many organisations and individuals with responsibility for managing flood risk as both a primary and secondary function. It is likely that coastal flood risk and erosion risk will increase in the future which poses challenges of affordability and will require debate regarding the acceptable levels of risk at a UK and Welsh national and local level and the appropriate levels of long term adaptation.

3.8.2 Key issues for Marine Planning

Following the Welsh National Coastal Flooding Review by Natural Resources Wales (NRW) in response to the floods of December 2013 and January 2014 the following key issues and areas of future investment were identified alongside 47 recommendations (Natural Resources Wales 2014b).

These can be grouped into six priority areas where improvements can be made:

1. Sustained investment in coastal flood and erosion risk management.
    - This includes flood forecasting, warning, awareness, responses and recovery and flood defences and includes monitoring the effectiveness of existing structures and potential areas for new investment.
    - A more transparent framework is recommended to aid decision making and prioritisation with more clarity over long term defence budgets.
    - Greater evaluation of the impacts of climate change scenarios on railway and highways infrastructure and long term adaptation.

2. Improved information on coastal flood defence and erosion management systems.
    - This includes regularly assessing the current condition of defences including natural features and the areas that need protection and how these change over time.
    - Data collected from these assessments must be maintained, monitored and regularly updated.

3. Greater clarity on roles and responsibilities to improve efficiency and effective management of the coastal flood and erosion risks.

4. An assessment of the skills and capacity of Risk Management Authorities to determine the existing gaps and how these can best be addressed.

5. More support to communities to help them become more self-sufficient and resilient.
    - This includes those communities affected by flood risk and the wide range of organisations tasked to improve management of Welsh National Flood Risk.
    - Improving community self-sufficiency by helping communities better understand their local flood risk to help them prepare and plan for it. Within the local community they will also have their own internal support mechanism to offer support and share experience to improve community resilience.

6. Locally developed and delivered plans for coastal communities and infrastructure operators.With increased flooding risk due to global dimate change there is a need for increased adaptation to this evolving risk.
    - This needs to be supported nationally and set in the strategic framework provided by Shoreline Management Plans.

Biodiversity and geodiversity features are vulnerable to coastal change and flooding, e.g.

- Morphological changes can impact habitats, species and geodiversity affecting the ability to meet national and international legislative drivers in terms of designated sites/biodiversity.
- The ecosystem services provided by natural habitats (beaches/intertidal, saltmarsh, sand dunes, shingle) may be compromised, including their role as a natural coastal defence.

Tourism and recreation may also be affected by coastal change and flooding, e.g.

- A high quality coastal environment is important for tourism, the revenue from which contributes significantly to the Welsh Economy. This includes the role and importance of assets such as the Wales Coast Path, and how the line of the route will need to adapt over time to cope with coastal change / climate change.
- If amenity beaches (with their range of designations) are impacted from coastal change and flooding how will this be managed (e.g. will there be an increasing need to import sand to maintain amenity value?)

- Other aspects of access, recreation and enjoyment, including seascape, character, and the historic environment will be affected by coastal change.

Under Planning Policy Wales (PPW) all of these aspects are considered within Shoreline Management Plans (SMPs), which aim to set the policy context over a 100 year timeframe, enabling adaptation to climate change to be delivered where possible, building resilience and delivering sustainability in the process, taking into account all relevant factors at the coast. SMPs would take into account, for example, the potential for soft defence as part of adaptation, and the marine aggregate resource requirements that would be needed to support this.

PPW identifies that before major developments are allocated in a development plan it will be essential to demonstrate that a coastal location is required. Where development is considered to satisfy this test it should be designed so as to be resilient to the effects of climate change over its lifetime. PPW identifies that when drawing up policies and proposals for their area, local planning authorities must acknowledge that government resources for flood and coastal defence projects are directed at protecting 'existing' developments and are not available to provide defences in anticipation of future development.

Planning permission usually runs with the land, therefore existing properties in coastal locations at risk of erosion cannot be controlled through the planning system unless there is a proposed change in the use of that land or a new development proposed on it.

Consequently, the planning system has a limited influence in addressing the legacy issue of development along the coast that is (or will be) at risk from coastal erosion or flood risk. However, the planning system will have a role, in conjunction with flood and coastal erosion risk management policy, to ensure that appropriate coastal defences can be built or maintained; that new development is not built in areas identified for managed retreat; and if necessary, identifying alternative locations for the relocation of properties.

The long-term nature of coastal erosion and the fact that few assets have been lost over the last century can lead to complacency amongst both the public and policy developers alike; however National Coastal Erosion Risk Mapping (NCERM) models predict a marked increase in erosion and asset loss which will require continued monitoring and a collaborative approach to policy direction.

3.8.3 Current Policy

The high level strategic direction of travel for Flood and Coastal Erosion Risk Management (FCERM) is set by the Welsh Government National FCERM Strategy (Welsh Government 2011b), published in 2011 (The National Strategy).

The Welsh National Strategy identifies the following four overarching objectives:

1. Reducing the consequences for individuals, communities, business and the environment from flooding and coastal erosion.
2. Raising awareness of and engaging people on flood and coastal erosion events.
3. Providing an effective and sustained response to flood and coastal erosion events.
4. Prioritising investment in the most at risk communities.

The flooding in January 2014 indicated there are a range of associated direct impacts: community, financial and environmental. In addition there are a range of indirect impacts and costs including:

- Emergency services response and recovery.
- Repair and restoration of infrastructure.
- Local business losses, for example visitors choosing not to visit the Welsh coastline but go elsewhere either in the UK or overseas. This would represent a financial loss to Wales and Welsh communities.

'*Implementing these objectives will be the responsibility of everyone involved in or affected by flood and coastal erosion risk management. This includes: the Welsh Government; the Welsh Risk Management Authorities; and the people of Wales.*

By working together we can reduce the risks we face and improve the quality of life for communities across Wales' (Welsh Government 2011b).

There are 31 Risk Management Authorities (RMAs) in Wales including NRW, the 22 lead local flood authorities, Internal Drainage Boards and Water Companies.

Flood forecasting seeks to forecast complex dynamic systems and translate them into timely specific local warnings. Flood forecasting and warning is not an automated process; it is based on detailed science and data, but requires the day to day interpretation and judgement by professional, skilled and experienced staff. Given the complexities this is a very challenging task.

Coastal forecasting is carried out on an 'all-Wales' basis by the Flood Forecasting Centre with NRW responsible for issuing flood warnings. Coastal forecasting and warning are intrinsically linked and not independent activities. Uncertainties inherent in the forecasting process can influence local decisions concerning flood warnings. Equally, local information such as wave over-topping can help to improve the forecasting models. Both coastal forecasting and flood warning evolve and develop over time as additional information, experience and data is gathered and can be used to validate the analysis and decision making process.

The first National Strategy for Flood and Coastal Erosion Risk Management in Wales was published in 2011 (Welsh Government 2011b). One of the overarching objectives of this strategy is prioritising investment in the most at risk communities. Analysis of the National Coastal Erosion Risk Map (Environment Agency 2014) has shown that, by following current policy over the next century, approximately 600 properties are at risk from coastal erosion as well as around 10 km of road and rail infrastructure. With no intervention, the projected risk rises to over 4000 properties and more than 50 km of road and rail infrastructure.

The Welsh National Network of Coastal Defences and Erosion Protection has been developed and evolved over many years to help meet local needs. At individual locations this can consist of individual structures such as walls and embankments, but in many locations is provided by a complex interaction between the foreshore conditions and the defences. Foreshore conditions can include offshore structures, groynes, salt-marsh and beaches. These can help to manage the movement and loss of sediment, as well as dissipate wave energy before it hits the defence line. The high profile flooding to Aberystwyth in early January 2014 demonstrated the destructive power of high energy waves.

Protection of a particular location or community may be provided by multiple individual assets which act together as a *'system'*. The standard of protection to these areas can be determined by the '*weakest component of the system*'. It is often these weak points which can fail or be overwhelmed when placed under the stress of significant storms.

At some locations there may be a primary defence line / structure, which provides the majority of the sea defence, in particular to still water levels, which is also supplemented by secondary defences set back inland, such as walls and embankments. These secondary defences can help to control the volume of water accumulating from wave spills, for example. At some locations coastal defence is provided by manual interventions such as closing of tidal doors and installation of barriers.

3.8.4 Current Status

Substantial resources have been invested in improving forecasting and warning processes, building and testing professional partner relationships and increasing awareness and resilience to coastal flooding. The storms in January 2014 offered a reminder of how exposed and vulnerable Welsh coastal areas can be to flooding and the impacts to local infrastructure, people and economy of Wales. Over £245 million will be invested in flood and coastal erosion risk management over the life of the present Government supported by almost £50 million from Europe. In addition to this, Welsh Government will receive almost £50 million from the European Regional Development Fund over the period.

Collectively reviewing performance following large storm events, such as those experienced in December 2013 and January 2014, is important so that lessons can be learnt to help Wales become better prepared, and as a nation, become more resilient to such conditions when they occur in the future.

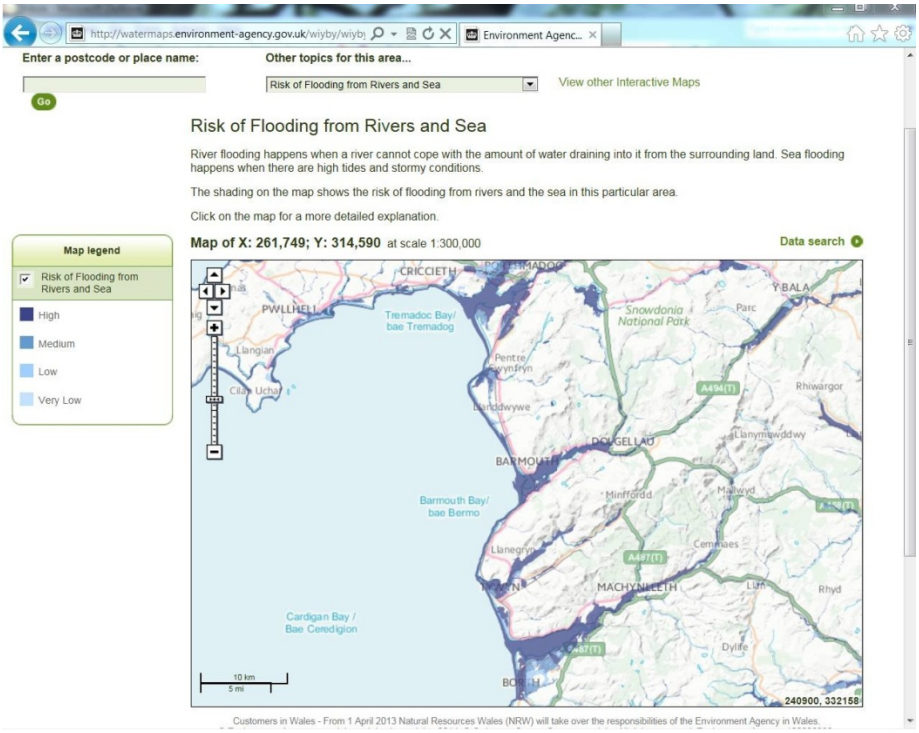
Flood risk is a combination of the likelihood and consequences (or impacts). Flood defences do not stop all flooding but reduce the likelihood of flooding occurring. Clearly this is positive, but the loss of connectivity between the community and the direct local risk can result in a false sense of security and a loss of community awareness of the flood risks.

Much of the large scale flood risk in Wales is characterised as low likelihood but high consequence which brings with it complex challenges for management. Phase 2 of the review made recommendations which have the potential to deliver a step change in national resilience to coastal flooding. These recommendations will help deliver the objectives stated in the Welsh Government's National Flood and Coastal Erosion Risk Management Strategy (NFCERMS) (Welsh Government 2011b). Delivery of the recommendations in the NFCERMS will need the support and cooperation of many people and organisations across Wales.

Online tools, e.g. the Environment Agency's Risk of Flooding from Rivers and Sea interactive map (Figure 9), are available which shows the areas at risk of flooding from rivers and the sea.

Natural Resources Wales works closely to align messages and escalation of potential events with the Met Office to ensure the general public receive consistent messages from professionals.

Figure 9 Risk of Flooding from Rivers and Seas interactive map (http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?&topic=floodmap#x=357683&y=355134&scale=2)



Shoreline Management Plans (SMPs) are non-statutory policy documents for coastal defence management planning. They currently provide a large scale assessment of the risk associated with coastal processes and present a policy framework to address these risks. The second phases of these plans (SMP2s) have recently been completed and consider a 100 year timeframe across three epochs for proposed management. There are four SMP2s covering Wales which have been adopted locally by respective Local Authorities:

- SMP no 19: Anchor Hard to Lavernock Point, being the 'Severn Estuary' SMP2 available at: http://www.severnestuary.net/secg/smpr.html
- SMP no 20: Lavernock Point to St Ann's Head, being the 'South Wales' SMP2 available at: http://www.southwalescoast.org/content.asp?id=58
- SMP no 21: St Ann's Head to the Great Orme, being the 'West of Wales' SMP2 available at: http://www.westofwalessmp.org/content.asp?nav=23&parent_directory_id=10
- SMP no 22: The Great Orme to the Scottish Border, being the 'North Wales and North West England' SMP2 available through contacting coastal Local Authorities within this geographic area.

The approach to Flood and Coastal Erosion Risk Management has shifted in recent years from being focussed on flood defence, to a more holistic risk management approach. This follows direction in

the European Flood Risk Regulations (2009) and the Flood Water and Management Act (2010) and is set out in the Welsh Government's National Strategy.

Flood defences will continue to play a very important role in the management of flood risk, particularly around the coast, however a risk management approach places these defences within a wider framework of flood risk management actions.

Some of the areas where flood risk management has developed in Wales in recent years are:

- Improvements in the understanding of coastal flood risk and its representation to partners and communities, through improvements in coastal modelling and mapping.
- Improvements in the understanding of coastal erosion risk and mapping.
- Production of Local Flood Risk Management Strategies and preparation of Flood Risk Management Plans across all local authorities in Wales.
- Preparation of the second phase Shoreline Management Plans (SMP2).
- Flood Awareness Wales improving local understanding and community preparedness for flooding.
- Significant investment in the construction of new coastal defences, across Wales including major schemes at Borth, Colwyn Bay, Rhyl, Riverside at Newport and Fairbourne.
- Investment in the maintenance and reconstruction of existing coastal defences. This can range from routine inspections and minimal works through to full reconstruction or major improvements: such as Tidal Clwyd Embankments.
- Incident management, testing and exercising and response, built upon the improved forecast information and the development of strong local and national partnerships.
- Creation of the Flood Forecasting Centre at Exeter to service Wales and England. The Flood Forecasting Centre went live on 1 April 2009. It is fully operational 24 hours a day, 7 days a week, http://www.ffc-environment-agency.metoffice.gov.uk/
- Improvements in the quality of the daily published UK forecast information and improved distribution of this routine information to professional partners and to the wider public via the national media networks.
- Improvements in the coverage and quality of flood forecasting and flood warning service improving the ability to identify potentially significant coastal incidents with a longer lead time.
- Improvements in quantity and quality of discussion between professional partners in advance of flood incidents.

In addition, there is also significant social, health and well-being impacts on affected individuals and communities associated with flooding events. Approximately 80,000 properties are potentially at risk around the coast of a 0.1% chance incident (this is a flood incident that has a 1 in 1000 chance of occurring in any given year).

Reviews of coastal flood risk have reinforced the scale and significance of Wales's coastal flood and erosion risk and the need to manage this both now and into the future.

3.8.5 The future

The challenge to continue to manage the risks associated with the Welsh coast is considerable, and in the future will require difficult national and local choices around acceptable levels of risk, affordability and adaptation.

The '*Future flooding in Wales: flood defences'* report produced by Environment Agency Wales (2010) considered the impacts on flood risk of different investment scenarios up to 2035. In 2010 this assessment concluded:

> '*To maintain the numbers of properties at flood risk in 2035 at levels comparable to present day may require around three times the current level of investment in flood defences*'.

Everyone in Wales has a stake in the management of the national flood and erosion risk. This includes people living remote from the coast, as well as those individuals and communities directly affected by the risks and the decisions made to manage these risks. A more flood resilient Wales will require a mature national debate on flooding management and embedded partnerships across all of Welsh society. It must continue to work to build stronger working partnerships between professional partners and communities.

The Intergovernmental Panel on Climate Change (IPCC) state that it is very likely that the 21st Century sea level rise rate will exceed the 1971-2000 rate for all modelled emissions scenarios (see section 3.7). An increase of 0.5 m is estimated to result in 10- to 100-fold increase in the frequency of sea level extremes (relative to present day) in northern Europe by the end of the century (Church et al. 2013).

Storminess and precipitation extremes are also important factors that will be exacerbated by climate change and contribute to the increased flood and erosion risk (Met Office and Centre for Ecology & Hydrology 2014). Future projections of storminess are still highly uncertain, due in part to resolution limitations of climate models, while there is no evidence to counter the basic premise that a warmer world will lead to more intense daily and hourly heavy rainfall events (Met Office Hadley Centre 2014). However, climate change experiments by Kendon et al (2014) show increases in winter hourly rainfall and intensification of short-duration rainfall in summer, with significantly more events exceeding the high thresholds indicative with flash flooding which contributes to improving confidence in climate model predictions.

Climate change projections anticipate that there will be more frequent and serious storms, as well as increasing sea levels, in the coming years. It is not foreseeable or affordable to defend the entire Welsh coastline into the future and it will become increasingly more important that all responsible and affected parties work together to respond to these challenges and manage these increasing risks. It is therefore important that these increasing risks are collectively managed especially in south and mid-Wales where isostatic land subsidence will also inevitably exacerbate sea level rise.

Welsh Government have worked with NRW and representatives of Welsh Risk Management Authorities to prepare a consultation document to inform the development of a National Programme of Investment for Flood and Coastal Erosion Risk Management. This will help prioritise areas at highest risk and direct funding accordingly. The coastal erosion process is very different to flood models but we hope to be able to bring both together in such a flood and coast risk index.

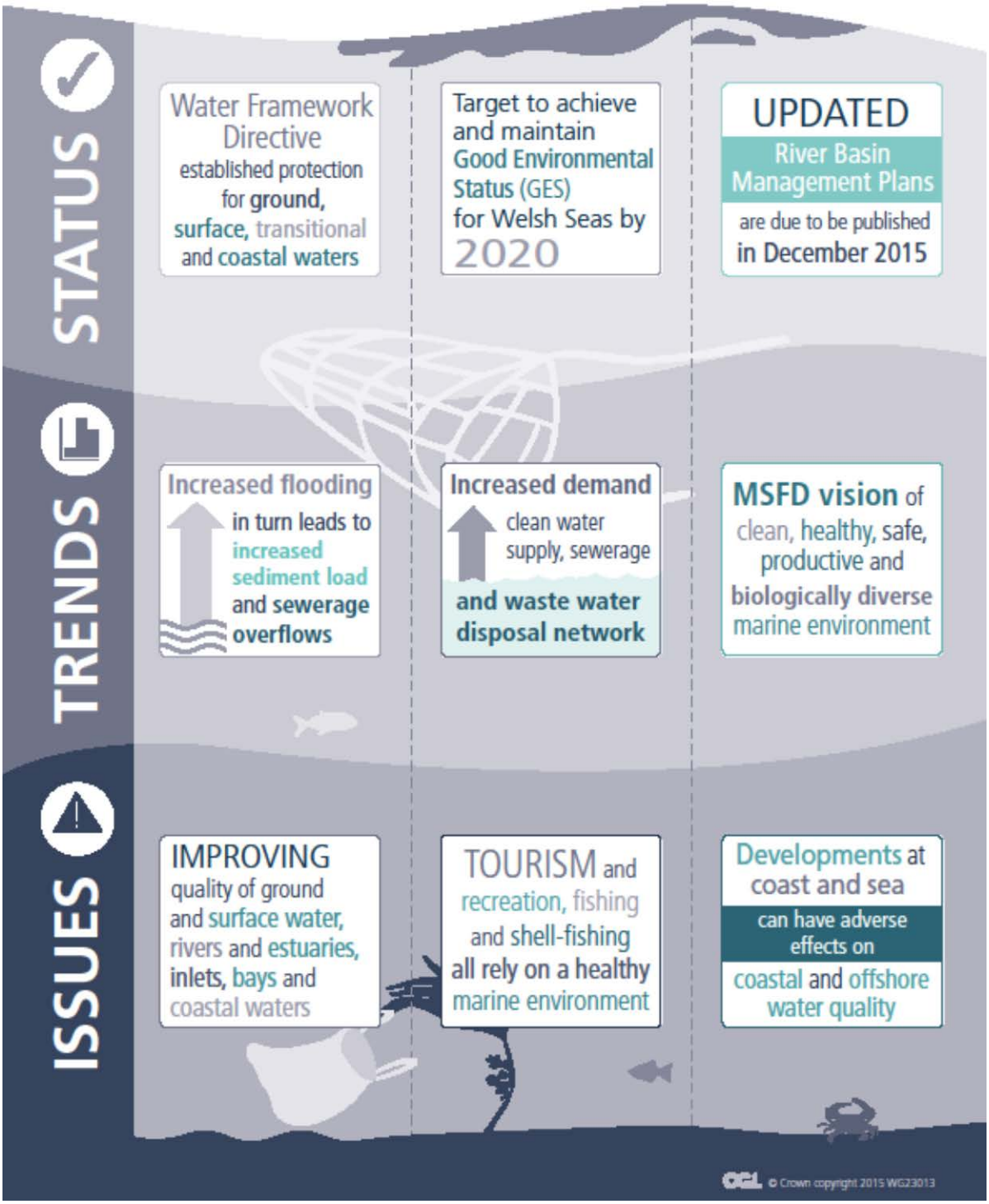
The long-term issue of coastal erosion and implementing coastal retreat is not straightforward with each area subject to unique circumstances. There is also an environmental balance to be understood along the coast, loss of protected or valuable agricultural land may create better coastal habitats for wildlife or restore a more natural coastal dynamic.

4 Natural Resources

Wales faces many challenges, including tackling relatively high rates of poverty, ensuring the provision of jobs and income and tackling the threats of climate change and flooding. Wales has a wealth of natural resources which are key to meeting these challenges. Natural resources provide energy, prosperity, security, protection health and well-being. Through a process of Integrated Natural Resource Management the Welsh Government aims to optimise those benefits for the long term, recognising that the resilience of natural resources will be essential to the well-being of future generations.

Aberystwyth beach (Crown copyright)

WATER QUALITY



4.1 Water quality, marine litter, sediment quality and contaminants in biota

4.1.1 Overview and background

The UK MPS highlights the importance of water quality in preserving clean, healthy and productive marine ecosystems, stating '*developments and other activities at the coast and at sea can have adverse effects on transitional, coastal and marine waters*'. In addition, the MPS states that UK Administrations share a common objective to '*contribute to sustainable development including the health and wellbeing of the community … by maintaining and developing a policy and regulatory system which provides modern, high quality management and treatment of surface and waste water*'.

Many activities conducted in the marine environment could be considered to contribute to the risk of contaminants entering the system through, for example, accidental spills or leakages of pollutants. '*During the construction, operation and decommissioning phases of development, there can be increased demand for water, discharges to water and adverse ecological effects resulting from physical modification to the water environment*' (MPS). This ranges from inputs associated with large-scale industrial plans, such as the assembly or removal of offshore infrastructure for energy generation, to individual recreational boating activities. Similarly, deliberate introductions to the marine environment may be necessary to facilitate an activity and, therefore, pose an inherent risk that needs to be managed. This could include urban wastewater and industrial discharges, ballast water discharges to assist navigation, potentially leading to the translocation of invasive non-native species, or the abstraction and subsequent release of seawater used in the cooling process at land-based power stations. In addition, the sea receives inputs of contaminants from land-based activities, including riverine inputs or through aerial deposition. The fate and behaviour of contaminants entering the marine environment depends on the physical properties of the contaminant and characteristics of the receiving environment. Some contaminants may persist in the marine environment for long periods and accumulate in sediments and / or biota.

Water quality is fundamental to the success, sustainability and enjoyment of numerous activities conducted in the marine environment and adverse conditions can impact on many related industries, for example fishing, tourism and recreation. Similarly, sediment quality is critical to the abundance, distribution and diversity of benthic habitats for which many of these activities depend.

4.1.2 Key issues for Marine Planning

- Population growth and associated infrastructure will put increased demand on the sewerage

network and local water companies with regard to the disposal of waste water. This will also contribute to urban creep which has the potential to alter the dynamics of a catchment leading, for example, to increased surface water run-off from built up areas;

- More frequent and intense storms, possibly as a result of climate change, could impact on water quality as a result of increased frequency and duration of operation of storm overflows and increased agricultural run-off;
- The updated River Basin Management Plans (RBMPs) are due to be published in December 2015 and will include an updated programme of measures;
- Changes in water quality have the potential to affect other human activities, for example tourism, recreation, fisheries and shellfisheries all rely on, and are influenced by, a healthy marine environment, which includes good water quality. Without this, these activities and industries could be impacted economically and socially;
- The development of industry such as nuclear power or port expansion will impact on coastal waters during their construction, operation or decommissioning phases. While this is an often unavoidable by-product of industrial development, the cumulative impact on the water environment must be considered and monitored;
- Climate change could lead to increased flooding and coastal erosion, which in turn could lead to increased sediment loading in estuaries and coastal areas. This could impact upon port and shipping activity as further dredging of sediment may be required (which has an economic impact) to enable them to continue their activities. Rises in sea level may result in changing tidal cydes impacting on existing discharge locations. Increased rainfall could lead to increased loads of nutrients.

4.1.3 Current Policy

There is a wide range of legislation establishing objectives and targets for marine water quality, sediment quality and the levels of contaminants in biota.

EC Water Framework Directive (WFD) (2000/60/EC)

The WFD establishes a framework for the management and protection of Europe's water resources. It is implemented in Wales through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. Under these Regulations, NRW is the Competent Authority for implementation of the Directive in Wales. The WFD applies to surface waters out to 1 nm seaward of the baseline for territorial waters and ground waters, divided into a number of discrete units termed 'water bodies'. Two subsequent amendments to the WFD (Directive 2008/105/EC and

Directive 2013/39/EU) have outlined Environmental Quality Standards (EQS) for a series of priority substances and priority hazardous substances.

The WFD aims to protect and, where necessary, improve the chemical and ecological status of water bodies across Europe in order that they achieve 'good status'[5] by 2015. This includes estuarine and coastal waters, for which Natural Resources Wales monitor progress against WFD objectives through the implementation of RBMPs. The following three basin districts are covered by RBMPs along the Welsh coastline (Natural Resources Wales 2014a):

- Dee River;
- Western Wales; and
- Severn River.

Figure 10 shows the location of the three RBMPs. The Western Wales RBMP incorporates a significant proportion of the Welsh coastline. All three RBMPs encompass major urban areas (e.g. Cardiff, Aberystwyth, Bangor, Wrexham), but land use is predominantly rural / agricultural in nature. A number of pressures on the water environment have been identified in these river basin districts. This includes discharges from sewage works, high population densities and transport networks, diffuse pollution (e.g. farming practices), industrial legacy from mining, physical modification (e.g. flood and coastal defence), growth and regeneration of infrastructure and difficulties in maintaining the public water supply. The three RBMPs set out a range of actions which will apply to many relevant sectors and organisations, such as those involved in agriculture and rural land management, angling, fisheries, mining and quarrying.

Figure 11 illustrates the water body ecological and chemical status within Welsh waters.

[5] Good status is assessed in relation to ecological status and chemical status. For good chemical status to be achieved, the relevant EQS for priority and priority hazardous substances must be complied with. For good ecological status to be achieved, a series of biological and physic-chemical criteria must be met. In circumstances where physical modifications have been made to water bodies to support sustainable human activities which preclude the achievement of good ecological status, an alternative objective of good ecological potential can be set which seeks to ensure that the ecology is as good as it can be given the modifications.

Figure 10 River Basin management plans for the Welsh waters

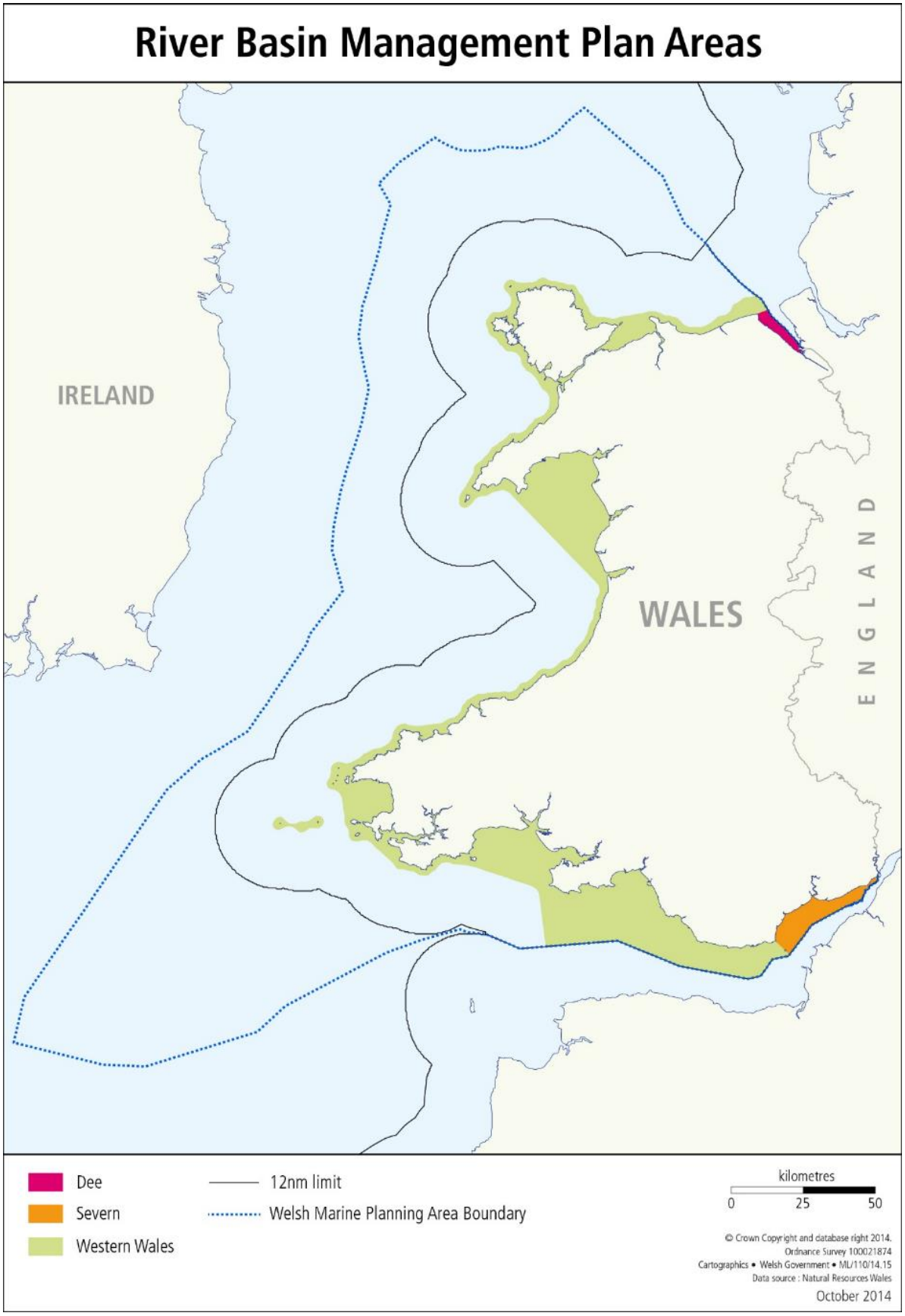
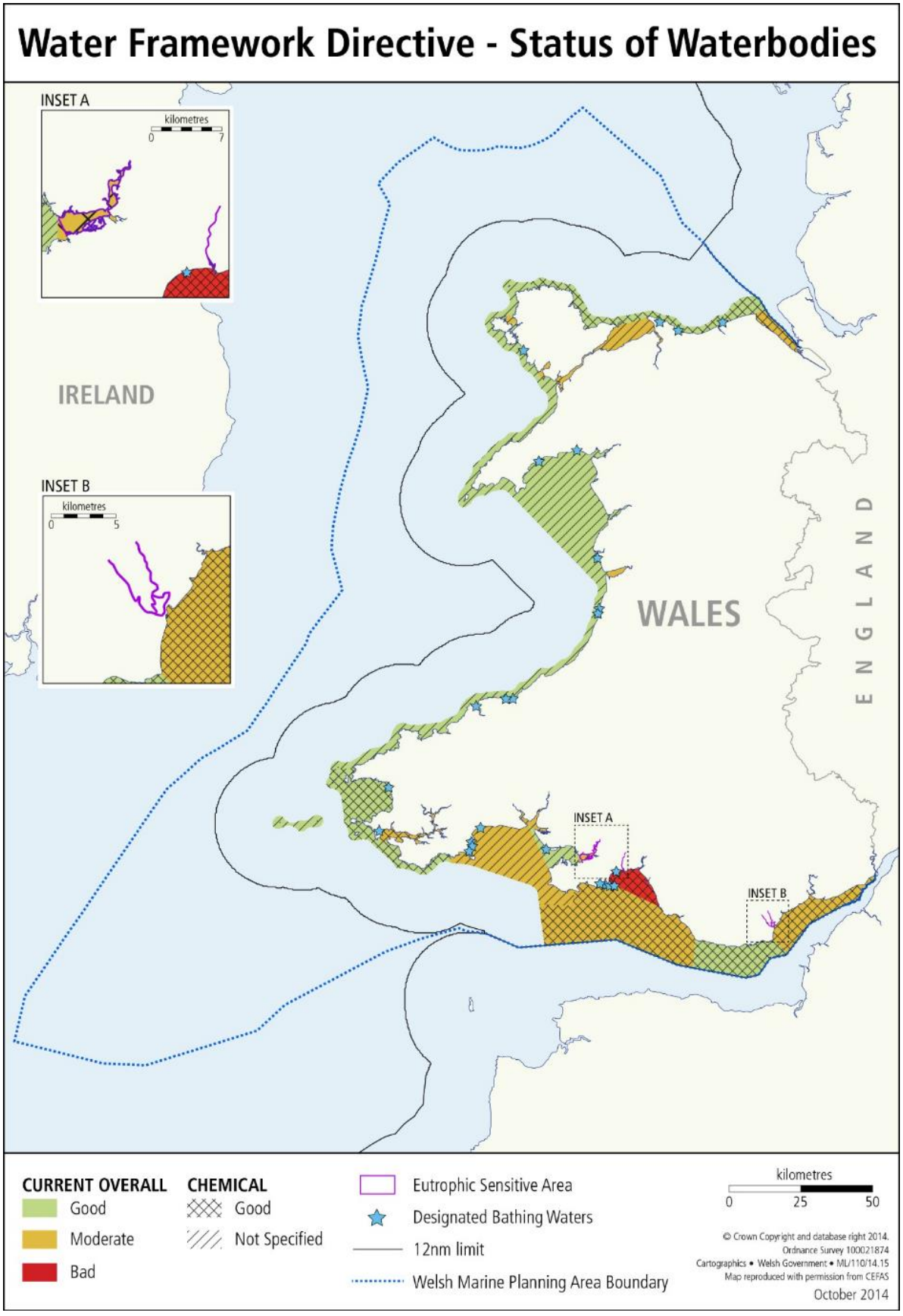


Figure 11 Water Framework Directive-Overall status of water bodies for the Welsh waters (2009 assessment)



Marine Strategy Framework Directive (MSFD).

The following four MSFD Descriptors are most applicable to water quality, sediment quality and nutrient concentration:

- Descriptor 5 - Eutrophication;
- Descriptor 8 - Concentrations of contaminants;
- Descriptor 9 - Contaminants in fish and other seafood; and
- Descriptor 10 - Marine litter.

Eutrophication, as defined by the Urban Waste Water Treatment Directive (91/271/EEC), concerns '*the enrichment of water by nutrients, especially compounds of nitrogen and / or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned*'. Inputs of fertilisers and other substances rich in nitrogen and / or phosphorus are the main cause of eutrophication, typically linked to agriculture and aquaculture activities, as well as the release of wastewater and treated sewage material. With regard to Descriptor 5, the key characteristic required to achieve GES is that human-induced eutrophication is minimised and all UK marine waters are considered non-problem areas. Specific targets include a downward trend in dissolved inorganic nitrogen (DIN) and phosphorous (DIP) concentration, resulting from decreasing anthropogenic nutrient input, to control nutrient levels in eutrophication problem areas.

Descriptor 8 has been developed to ensure that the presence of contaminants in the marine environment, and their potential biological effects, are within agreed limits. In order to achieve GES, contaminants, including synthetic compounds (e.g. pesticides), non-synthetic compounds (e.g. heavy metals) and other pollutants, must be at concentrations below acceptable levels and evidence should indicate that they are not likely to increase in the future. In particular, concentrations of substances identified within relevant legislation and international obligations must not exceed the concentration at which adverse effects are likely to occur. For example, the Water Framework Directive (WFD) applies Environmental Quality Standards (EQS), defined as 'the concentration of a particular pollutant or group of pollutants in water, sediment or biota which should not be exceeded in order to protect human health and the environment'. It is possible that EQS values for marine sediments will be developed in the future, although the practicality of defining such standards remains contentious.

Descriptor 9 is also linked to contaminant levels in the marine environment, although the key focus here is related to the assimilation of contaminants within fish and shellfish intended for human consumption. Achieving GES requires contaminant concentrations to remain below agreed regulatory limits and to show no signs that these levels are increasing or pose a threat to human health. Targets are linked to existing environmental legislation, such as the WFD, the Urban Waste Water Treatment Directive, the Shellfish Waters Directive and the revised Bathing Waters Directive, for which threshold concentrations for pollutants are defined.

Finally, Descriptor 10 describes issues related to marine litter, including visual disturbance, the potential to cause harm to marine wildlife through entanglement and ingestion, and through smothering of the seabed. To achieve GES, the amount of litter on coastlines and in the marine environment should be reduced and levels should not pose a significant direct (e.g. entanglement) or indirect (e.g. bioaccumulation of contaminants within the food chain) risk to coastal and marine environments. However, to date it has proved challenging to establish specific targets for acceptable quantities of marine litter and further research is ongoing.

EC Urban Waste Water Treatment Directive (UWWTD) (91/271/EEC)

The UWWTD aims to safeguard the environment from the potential adverse effects of sewage discharges, setting out levels of treatment on the basis of discharge volume and the sensitivity of waters in the receiving environment. In general, the UWWTD requires that, before a discharge can be made to the environment, collected wastewater is treated to at least secondary treatment standards (biological treatment process) for significant discharges. The UK is required to review environmental waters every four years to determine whether they are sensitive to the effects of sewage discharges. This is based on whether they are found to be eutrophic or where they may become eutrophic in the absence of forthcoming protective action. In addition, sensitive waters can be determined where they exceed or could exceed a specified concentration of nitrate or where discharges affecting them are subject to more than secondary treatment to comply with the standards of other Directives.

EC Nitrates Directive (91/676/EC)

The Nitrates Directive seeks to reduce nitrate water pollution from agricultural sources (i.e. run-off) and to prevent such pollution occurring in the future through the establishment of Nitrate Vulnerable Zones (NVZs). This involves engagement with farmers to ensure good practice with the

aim of reducing the input of substances high in nitrates (e.g. fertilisers) from polluting the environment.

EC Bathing Waters Directive (2006/7/EC)

The Bathing Waters Directive primarily aims to protect public health and the environment from pollution at bathing waters, whilst also striving to improve management practices of bathing waters. Bathing waters are classified based on a series of parameters, specific to coastal and transitional waters, including the concentration of intestinal *Enterococci* and *Escherichia coli*. The Directive and associated regulations specify the frequency of surveillance and monitoring, and the requirement for management measures to be put in place to prevent, reduce or eliminate pollution.

EC Shellfish Waters Directive (2006/113/EC)

The Shellfish Waters Directive was repealed at the end of 2013 and the same level of protection has to be provided by the WFD. The Directive involves the designation of waters requiring protection or improvement to support shellfish, to ensure they have a suitable water environment for growth. This is assessed through an assessment of the shellfish flesh quality in terms of levels of bacterial contamination as well as physical, chemical and water quality requirements which must either be complied with or endeavoured to achieve (e.g. dissolved oxygen, suspended solids and pH).

EU Habitats Directive (92/43/EEC) and Wild Birds Directive (79/409/EEC)

The Habitats and Wild Birds Directives aims to contribute to protecting biodiversity through the conservation of natural habitats, wild plants and animals. This includes the creation of a network of marine and terrestrial protected areas which support significant numbers of wild birds and their habitats or which support rare, endangered or vulnerable natural habitats and species of plants or animals other than birds. Where nutrients are identified as a threat to 'favourable conservation status', specific action may be taken.

Euratom Treaty (Council Directive 96/29/Euratom)

The Directive establishes basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation. Results from monitoring surveys are reported in annual Radioactivity in Food and the Environment (RIFE) report series.

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'OSPAR Convention') (Annex V)

The Convention extends the cooperation of the Contracting Parties from the original declaration signed in 1992 to cover all human activities that might adversely affect the marine environment of the North-East Atlantic, specifically to protect and conserve ecosystems and biological diversity. Water quality is fundamental to the functioning and survival of many species and habitats in the marine environment.

OSPAR Strategy to Combat Eutrophication

The Strategy addresses eutrophication in order to achieve and maintain a healthy marine environment where eutrophication does not occur, through the standardised identification of areas where nutrient inputs may cause pollution. The implementation of the Strategy takes place under the framework of many other international agreements.

Marine and Coastal Access Act (MCAA) 2009

The MCAA provides the legal mechanism to help ensure clean, healthy, safe, productive and biologically diverse oceans and seas by putting in place a system for improved management and protection of the marine and coastal environment. Marine licensing includes consideration of protection for the marine environment including water quality issues and takes account of discharges from licensable activities.

Environmental Permitting (England and Wales) Regulations 2010 (as amended)

The Regulations provide a shared framework for environmental permitting of various industrial, intensive farming, waste, water and groundwater discharge activities and radioactive substances regulation. Amongst other matters, the Regulations provide controls over water discharge activities, including discharge from land through a pipe into the sea of any trade effluent or sewage effluent.

4.1.4 Current Status

Water quality

Microbiological contaminants

In general, the microbiological quality of Welsh waters is good due to significant investment from water companies and increasing legislation to protect the marine environment.

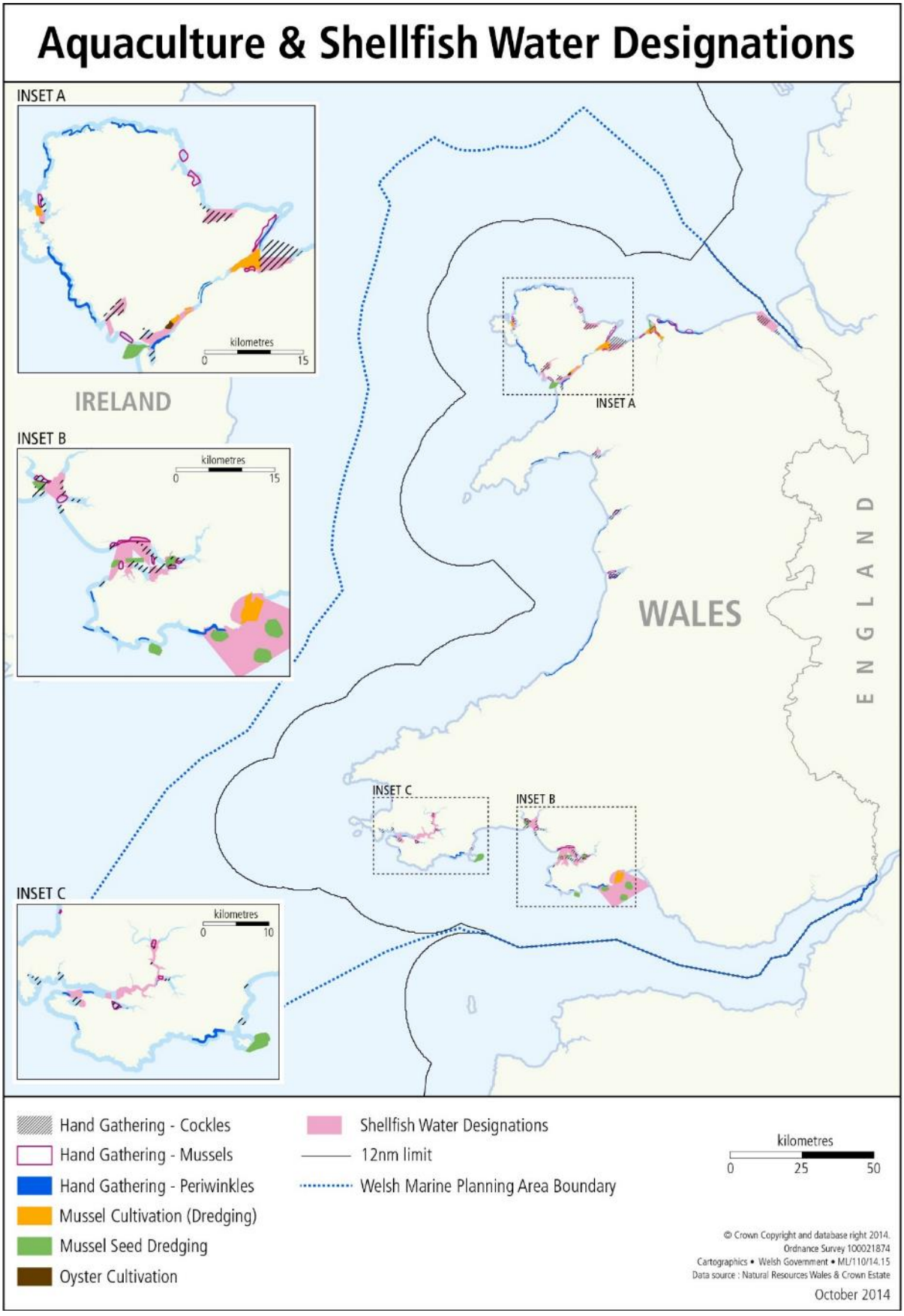
Figure 11 shows the location of designated bathing waters. The number of bathing waters in Wales has doubled over the last two decades, increasing from 50 in 1992 to 100 in 2012. During the 2013 bathing season, 99% of designated bathing waters tested in Wales passed the mandatory European standard (Aberdyfi failed), while 89% passed the tougher European guideline standard (Natural Resources Wales 2013a).

Improving coastal water quality is also reflected by an increasing number of monitored shellfisheries in England and Wales (Figure 12). In 2007, 40% of sampled shellfish waters in the UK met the guideline value under the EU Shellfish Waters Directive (2006/113/EC), albeit the percentage compliance with these guidelines in areas comprising Welsh waters was relatively low compared to the rest of the UK (UKMMAS 2010c). Annual variation in water quality has been reported in some regions due to adverse weather patterns, especially heavy rainfall, which can lead to increased frequency of storm overflows and higher levels of diffuse agricultural pollution.

Synthetic, non-synthetic and biological contaminants

Concentrations of metals in the marine environment are typically below EQS values around the UK, attributed to significant improvements in the treatment of substances prior to their release. Historical metal smelting in Avonmouth and south Wales led to high cadmium (Cd) concentrations in the Severn Estuary; however, concentrations have declined between 1995 (0.4 µg l^{-1}) and 2001 (0.09 µg l^{-1}) to levels below the EQS (Marine Environment Monitoring Group (MEMG) 2004). Elevated concentrations of nickel (Ni), mercury (Hg), zinc (Zn) and Cd, reported at the mouth of the Severn Estuary during the Severn Tidal Power assessment in 2010, related to increased run-off with proximity to industrial areas. Some other industrial areas have higher concentrations of several metals, including the Dee Estuary (UKMMAS 2010e). Charting Progress 2 reported that concentrations should continue to be monitored and necessary action taken to maintain levels well below the EQS values. Copper (Cu) concentrations in seawater are above EQS values in north Wales, primarily related to elevated metal concentrations in the Dee Estuary. There are also some Zn concentrations above EQS values in north Wales, again related to levels in the Dee Estuary, and also in areas of South Wales (UKMMAS 2010e). Limited assessment of organics, such as polycyclic aromatic hydrocarbons (PAHs) has indicated Welsh water bodies have, in general, good chemical status (Charting Progress 2). This is supported by the three River Basin Management Plans (RBMPs) which cover the Welsh coastline which suggest good chemical status in transitional (estuarine) and coastal water bodies (Natural Resources Wales 2014a); also see Current Policy section.

Figure 12 Aquaculture and Shellfisheries for the Welsh coast



Under the WFD, chemicals posing the greatest risk of harm to, or via, the aquatic environment across the EU are classed as priority substances (or priority hazardous substances). Those considered as of concern at a UK (and Welsh) national level are termed 'River Basin Specific Pollutants'. The Environmental Quality Standards Directive (EQSD) (2008/105/EC), also known as the Priority Substances Directive, set the first list of priority substances. This list and the standards have been revised as an amendment via the 2013 Priority Substances Directive. While the amended Directive has yet to be transposed, the UK intends that the standards it sets will apply for the purposes of the second cycle of river basin plans (Defra and Welsh Government 2014). In many cases these limit values are lower than the UK EQS values and their use may result in more exceedances of the EQS limit values.

In total, 34 estuaries and 24 coastal water bodies are captured within RBMPs. In terms of ecological status, based on the assessments carried out for the 2009 RBMPs, 25 had good ecological status (or potential), 32 had moderate ecological status (or potential) and one has bad ecological status. In relation to chemical status, based on the assessments undertaken for the 2009 RBMPs, 14 had good chemical status and 44 were considered not to require assessment.

Table 7 Summary of water quality potential for transitional (estuarine) and coastal water bodies within the Dee River, Western Wales and Severn River RBMPs based on the 2012 assessments.

Water Body ID (Name)	Current Ecological Status / Potential	Current Chemical Status	Current Overall Status / Potential	Predicted Overall Status/Potential for 2015 (Element(s) Predicted to Fail)	Justification for not achieving good status by 2015
Dee River RBMP (transitional)					
Dee (N. Wales)	Fail	Moderate	Moderate	Moderate (DIN, MMA)	Disproportionately expensive
Western Wales RBMP (transitional)					
Loughor	Bad	Good	Bad	Moderate (DIN)	Disproportionately expensive
Mawddach	Good	Fail	Moderate	Good	
Tawe	Moderate	-	Moderate	Good	
Alaw	Moderate	-	Moderate	Moderate*	Disproportionately expensive, technically infeasible
Afan	Good	-	Good	Good	
Clywd	Moderate	-	Moderate	Moderate (MMA)	Disproportionately expensive, technically infeasible
Ffraw	Good	-	Good	Moderate*	Disproportionately expensive, technically infeasible

Water Body ID (Name)	Current Ecological Status / Potential	Current Chemical Status	Current Overall Status / Potential	Predicted Overall Status/Potential for 2015 (Element(s) Predicted to Fail)	Justification for not achieving good status by 2015
Braint	Good	-	Good	Moderate*	Disproportionately expensive, technically infeasible
Milford Haven Inner	Moderate	Fail	Moderate	Moderate (DIN)*	Disproportionately expensive
Gwaun	Good	-	Good	Moderate*	Disproportionately expensive, technically infeasible
Glaslyn	Good	Good	Good	Good	
Teifi	Moderate	Fail	Moderate	Moderate (Ma)*	Disproportionately expensive
Cefni	Moderate	Good	Moderate	Moderate (MMA)	Technically infeasible
Solfach	Good	-	Good	Moderate*	Disproportionately expensive, technically infeasible
Ystwyth / Rheidol	Moderate	-	Moderate	Moderate (MMA)	Disproportionately expensive, technically infeasible
Tywi and Cywyn and Gwendraeth	Bad	Good	Bad	Moderate (Fish, DIN)*	Disproportionately expensive
Ogmore	Moderate	Good	Moderate	Good	
Neath	Good	Good	Good	Good	
Conwy	Moderate	Fail	Moderate	Moderate (MMA)	Technically infeasible
Nyfer	Moderate	-	Moderate	Moderate (DIN)*	Disproportionately expensive
Dysynni	Moderate	Fail	Moderate	Moderate (MMA)	Disproportionately expensive, technically infeasible
Erch	Moderate	-	Moderate	Good	Disproportionately expensive, technically infeasible
Dwyfor	Good	-	Good	Moderate*	Disproportionately expensive, technically infeasible
Foryd Bay	Good	Good	Good	Good	
Atro	Good	-	Good	Moderate*	Disproportionately expensive, technically infeasible
Dyfi and Leri	Moderate	Fail	Moderate	Moderate (MMA)	Disproportionately expensive
Seiont	Good	-	Good	Moderate*	Disproportionately expensive, technically infeasible
Western Wales RBMP (coastal)					
Holyhead Strait	Moderate	Good	Moderate	Good	
North Wales	Good	Good	Good	Good	
Pembrokeshire South	Good	Good	Good	Good	

Water Body ID (Name)	Current Ecological Status / Potential	Current Chemical Status	Current Overall Status / Potential	Predicted Overall Status/Potential for 2015 (Element(s) Predicted to Fail)	Justification for not achieving good status by 2015
Cardigan Bay Central	Good	Good	Good	Good	
Tremadog Bay	Good	Good	Good	Good	
Bristol Channel Inner North	Moderate	Fail	Moderate	Good	
Caernarfon Bay North	Good	Good	Good	Good	
Milford Haven Outer	Moderate	Good	Moderate	Moderate (DIN)*	Disproportionately expensive
Bristol Channel Outer North	Good	Good	Good	Moderate (DIN)*	Disproportionately expensive
Carmarthen Bay	Moderate	Good	Moderate	Moderate (DIN)*	Disproportionately expensive
Cardigan Bay South	Good	Good	Good	Good	
Caernarfon Bay South	Moderate	Good	Moderate	Good	
Conwy Bay	Moderate	Good	Moderate	Moderate (MMA)	Disproportionately expensive
Cemlyn Lagoon	Good	-	Good	Good	
Grassholm Island and The Smalls	Good	-	Good	Good	
Menai Strait	Moderate	Good	Moderate	Moderate (MMA)	Disproportionately expensive
Pickleridge Lagoon	Moderate	-	Moderate	Moderate*	Disproportionately expensive, technically infeasible
Cymyran Bay	Good	-	Good	Good	
Cardigan Bay North	Good	Good	Good	Good	
Holyhead Bay	Moderate	Good	Moderate	Moderate (MMA)	Technically infeasible
Swansea Bay	Moderate	Good	Moderate	Bad (Phyto, DIN, MMA)*	Disproportionately expensive, technically infeasible
Anglesey North	Good	Good	Good	Good	
The Skerries	Good	-	Good	Good	
Loughor Outer	High	Good	High	Good	
Severn River RBMP (transitional)					
Severn Lower	Moderate	Fail	Moderate	Moderate (Invert, DIN, MMA)*	Disproportionately expensive, technically infeasible
Severn Middle	Moderate	-	Moderate	Moderate (DIN, MMA)*	Disproportionately expensive, technically infeasible
Severn Upper	Moderate	-	Moderate	Moderate (MMA)	Technically infeasible
Usk	Moderate	Good	Moderate	Moderate (MMA)	Technically infeasible
Wye	Moderate	Good	Moderate	Moderate (DIN)*	Disproportionately expensive

Water Body ID (Name)	Current Ecological Status / Potential	Current Chemical Status	Current Overall Status / Potential	Predicted Overall Status/Potential for 2015 (Element(s) Predicted to Fail)	Justification for not achieving good status by 2015
Bristol Avon	Good	-	Good	Good	
* Uncertain that the water body does not meet the objective of good status. DIN – Dissolved Inorganic Nitrogen; Ma – Macroalgae; MMA – Mitigation Measures Assessment; Phyto – Phytoplankton; Invert - Invertebrates.					

In summary, no transitional or coastal water bodies within the three RBMP areas fail the assessment of chemical status, based on priority hazardous substances defined in the WFD, although these have been amended in the EU Directive 2013/39/EU. However, in some instances, ecological status / potential has not been reported as good and it is likely that good status / potential will not be achieved by the end of the current cycle of plans (i.e. 2009 to 2015), typically due to technical feasibility, natural conditions or disproportionate costs.

Algal toxins associated with paralytic shellfish poisoning (PSP), lipophilic toxins (LTs) (including diarrhetic shellfish poisoning (DSP) and amnesic shellfish poisoning (ASP)) can accumulate in shellfish which can subsequently pose a risk to human health. Monitoring of Welsh shellfish waters is in place to assess the levels of these toxins and associated phytoplankton. This is undertaken by Cefas on behalf of the Food Standards Agency (FSA) and results are reported annually (Cefas 2014a). The concentration of toxins in shellfish flesh is subject to regulatory limits. The concentration of potentially toxic phytoplankton has trigger levels, which if exceeded instigates additional flesh and water sampling.

PSP summary:

- Alexandrium species (trigger levels – presence) have been detected in a number of classified shellfish production areas in both north and south Wales.
- PSP toxins have been detected in the Milford Haven production area on several occasions (2001, 2010 & 2011) and in 2011 exceeded the statutory maximum permitted level resulting in temporary closure of the shellfish beds.

Lipophilic toxins summary

- Dinophysis species (trigger level - 100 cells/L) have been detected above the trigger level in a number of classified production areas in both north and south Wales.
- Prorocentrum lima (trigger level - 100 cells/L) have been detected above the trigger level in two areas Burry Inlet (2006) and Menai Straits West (2012 & 2013)
- Lipophilic toxins have been detected above the regulatory limit in one production area (Swansea Bay, 2011) (since the introduction of new methods of analysis in 2011). This results in the temporary closure of the shellfish beds

ASP summary

- Pseudo-nitzschia species (trigger level - 150,000 cells/L) are ubiquitous at low levels around the coastline for much of the year. The trigger level has only been exceeded in 4 areas (Dee, Colwyn Bay, Burry Inlet and Three Rivers)
- ASP toxins have not exceeded the statutory maximum permitted level in Welsh waters. Low levels of ASP toxins have been detected in a number of classified production areas in both north and south Wales.

Nutrient concentrations

A review of nutrient inputs to estuaries showed relatively high loads of total oxidised nitrogen (TOxN) to the Severn and Mersey, whilst loads to west Wales were particularly low (Nedwell *et al.*, 2002; cited in Marine Environment Monitoring Group (MEMG) (2004)). Problem areas regarding eutrophication are relatively uncommon in UK waters, particularly along the Welsh coastline. Whilst there are periods when nutrient concentrations are elevated, due to agricultural and urban run-off, eutrophic conditions do not always develop due to the absence of other contributory factors such as turbidity and sun light. Two areas along the southern Welsh coastline have been identified as problem areas, specifically the Tawe and Loughor Estuaries as shown in Figure 11 (OSPAR 2009a). However, measures are in place to address these problem areas including the improvement of sewage collection and waste water treatment systems which will reduce the potential for eutrophication. In circumstances whereby transitional (estuarine) or coastal water bodies are not considered to have good ecological status or potential as described in the three RBMPs covering the Welsh coastline, inorganic nitrogen levels concentrations above UK criteria are frequently the causal factor (Natural Resources Wales 2014a); however in the majority of cases these do not lead to an excessive growth of algae or an undesirable balance of organisms.

Dissolved oxygen

Reductions in dissolved oxygen concentrations within the water column can occur as a result of increased biological consumption, such as in the event of eutrophication, as well as other natural processes (e.g. chemical oxygen demand or persistent thermal stratification which restricts mixing). Such effects have been well documented in a number of UK estuaries in the past, although investment in waste water treatment over the past four decades has substantially addressed the issue. A review of Welsh RBMPs indicates that no estuaries along the Welsh coast have been identified as problem areas for dissolved oxygen.

Radioactivity

Discharges of radioactive material are strictly controlled and concentrations observed in the UK are reported annually (Radioactivity in Food and the Environment (RIFE) report series). Caesium-137 (^{137}Cs) concentrations in marine sediments near the Wylfa nuclear power station between 2003 and 2012 were low (Environment Agency 2013), especially in comparison to other nuclear facilities located around the British Isles. Concentrations of tritium (^{3}H) and carbon-14 (^{14}C) in fish and molluscs near a radiopharmaceutical plant in Cardiff are decreasing, although tritium levels remain higher than elsewhere in coastal waters. However, increased concentrations of plutonium-239/240 (^{239}Pu and ^{240}Pu) in certain areas of the Irish Sea suggest redistribution of historically contaminated sediments. Furthermore, data for artificial radionuclides measured in the Irish Sea are thought to reflect the distant effects of discharges from the Sellafield nuclear reprocessing plant (Cumbria, north-west England) and, in general, elevated concentrations of radioactivity are present in the Irish Sea compared with other UK waters (UKMMAS 2010c).

The Welsh Government continues to follow and engage in the Managing Radioactive Waste Safely programme which aims to secure the long term safety of radioactive wastes, to ensure the implementation of a framework appropriate to the needs of Wales and to ensure that the interests of Wales are taken into account in the development of policies in this area (Environment Agency 2013).

Marine litter

The visual attraction of beaches can be significantly impacted by marine litter and it can be harmful to both humans and wildlife. In turn, this can have substantial impacts on local tourism and recreational activities, as well as fishermen and seafarers as a result of damaged gear and propellers. An OSPAR (2009b) report on marine litter in the North-East Atlantic Region described the number of litter items collected from a survey of 38 beaches in Wales. The results indicated that on average

2,655 items were collected per km of beach and notably higher than the UK average (2,054 per km). In addition, a very high proportion of gannet nests on Grassholm Island (south-west Wales) contain plastic, which can cause young birds to become entangled (Votier et al. 2011).

A review by Cole et al (2011) describes the growing problem of microplastic contamination since the 1940s. The review describes how microplastics are both abundant and widespread within the marine environment, found in their highest concentrations along coastlines and within mid-ocean gyres. Ingestion of microplastics has been demonstrated in a range of marine organisms, a process which may facilitate the transfer of chemical additives or pollutants to biota.

Monitoring of coastal and offshore litter density undertaken between 2003 and 2008 (UKMMAS 2010e) included stations in Welsh waters (Carmarthen Bay, North, South; Inner and Outer Cardigan Bay; Liverpool Bay). The significantly higher densities of litter found at Carmarthen Bay, North Cardigan Bay and Celtic Deep (UKMMAS 2010e) would suggest that these are areas of accumulation, i.e. litter sinks (polythene, rope, polypropylene twine and hard plastics were the most common forms of litter found).

Sediment quality

Many trace metals are essential for biological processes, although excessive concentrations can lead to detrimental impacts (i.e. they become toxic). Metal concentrations (compared to Aluminium as a reference) in English and Welsh coastal sediments tend to be elevated compared with the rest of the UK when assessed in relation to OSPAR Background Reference Concentrations (BRCs) and Ecotoxicological Assessment Criteria (EACs) (Marine Environment Monitoring Group (MEMG) 2005). This is particularly the case in heavily industrialised estuaries such as the Severn and Dee, with high concentrations reported for mercury, lead, zinc, arsenic and nickel (Environment Agency 2013). A range of chlorobiphenyls are present in sediments in the Severn and Dee estuaries and high concentrations of PAHs have been reported for the Bristol Channel when compared to OSPAR EACs (Marine Environment Monitoring Group (MEMG) 2004).

Contaminants in Biota

Measurements of chlorobiphenyls in mussel tissue (*Mytilus edulis*) and fish liver (plaice, dab, whiting and flounder) were assessed against OSPAR BACs and EACs and reported in Charting Progress 2, suggesting exceedances in EACs within the Severn Estuary and northeast Wales (i.e. Dee Estuary). In addition, concentrations of one particular chlorobiphenyl (CB118) in fish liver were reported above the EAC in Cardigan Bay. The highest UK concentrations for most brominated diphenyl ether

congeners in fish were reported in the Irish Sea, amongst many other UK regions, associated with discharges from urban areas and/or industry. Polycyclic aromatic hydrocarbon concentrations were not considered to represent a major problem to shellfish in Welsh waters (UKMMAS 2010c).

4.1.5 The future

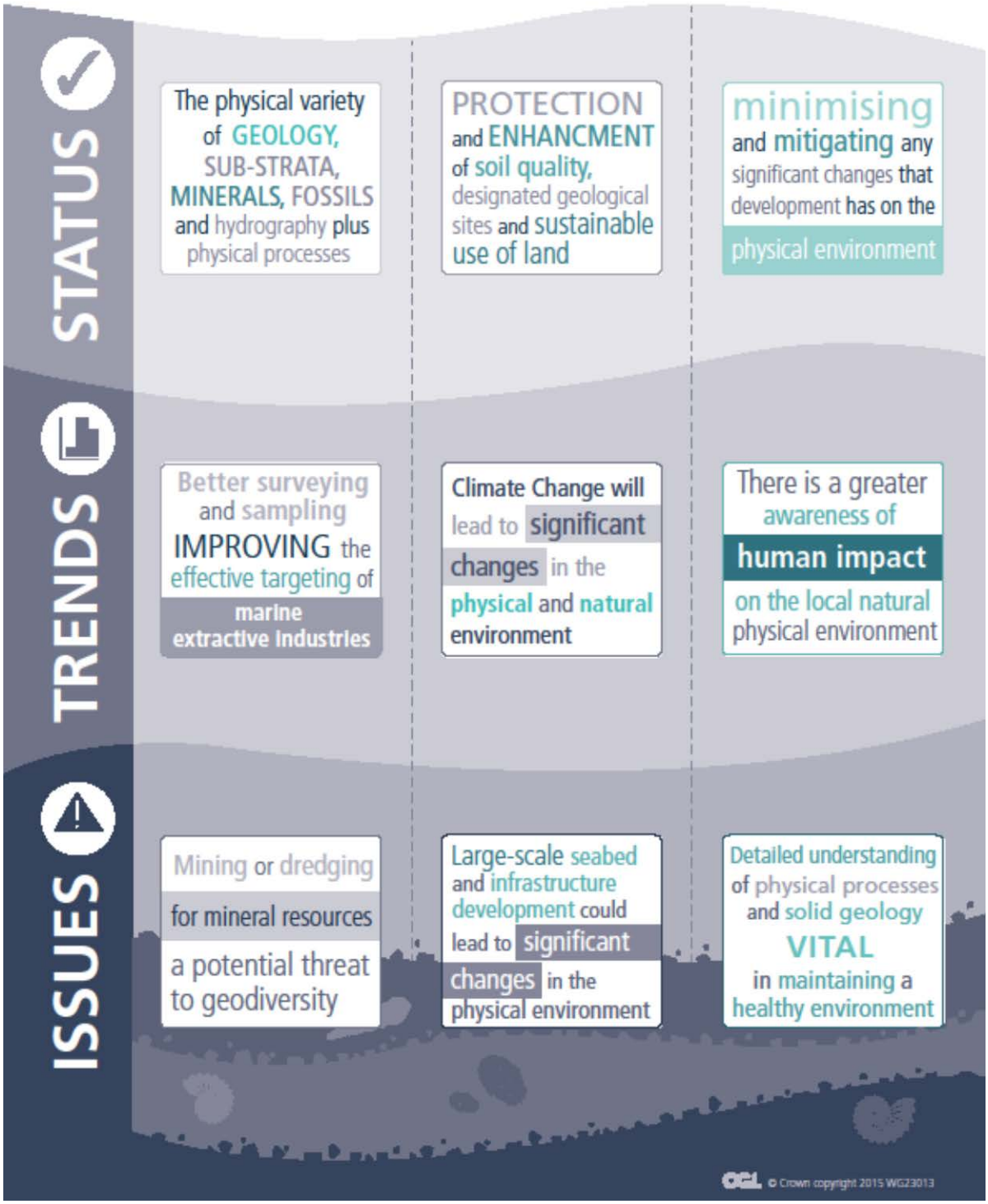
As outlined above, there are numerous key legislative drivers aiming to improve water quality and waste water management which will affect Welsh waters. The WFD allows for achievement of objectives through successive River Basin Management Plans to 2027 and beyond. Objectives in some water bodies will be delayed on the basis of the measures being technically infeasible or disproportionately costly. In fact, a cause of some failures has yet to be established so measures have yet to be identified. Furthermore, objectives may be delayed on the basis of the time to recover to natural conditions after the measures have been put in place.

RBMPs provide classification of water quality, hydromorphology and biological elements and measures are planned or in place to improve status throughout the next cycle (2015-2021) and these will need to be considered when managing, monitoring and improving the water quality of coastal areas. For marine areas, the RBMPs will need to be taken into consideration as an approach to the management and improvement of the water quality status.

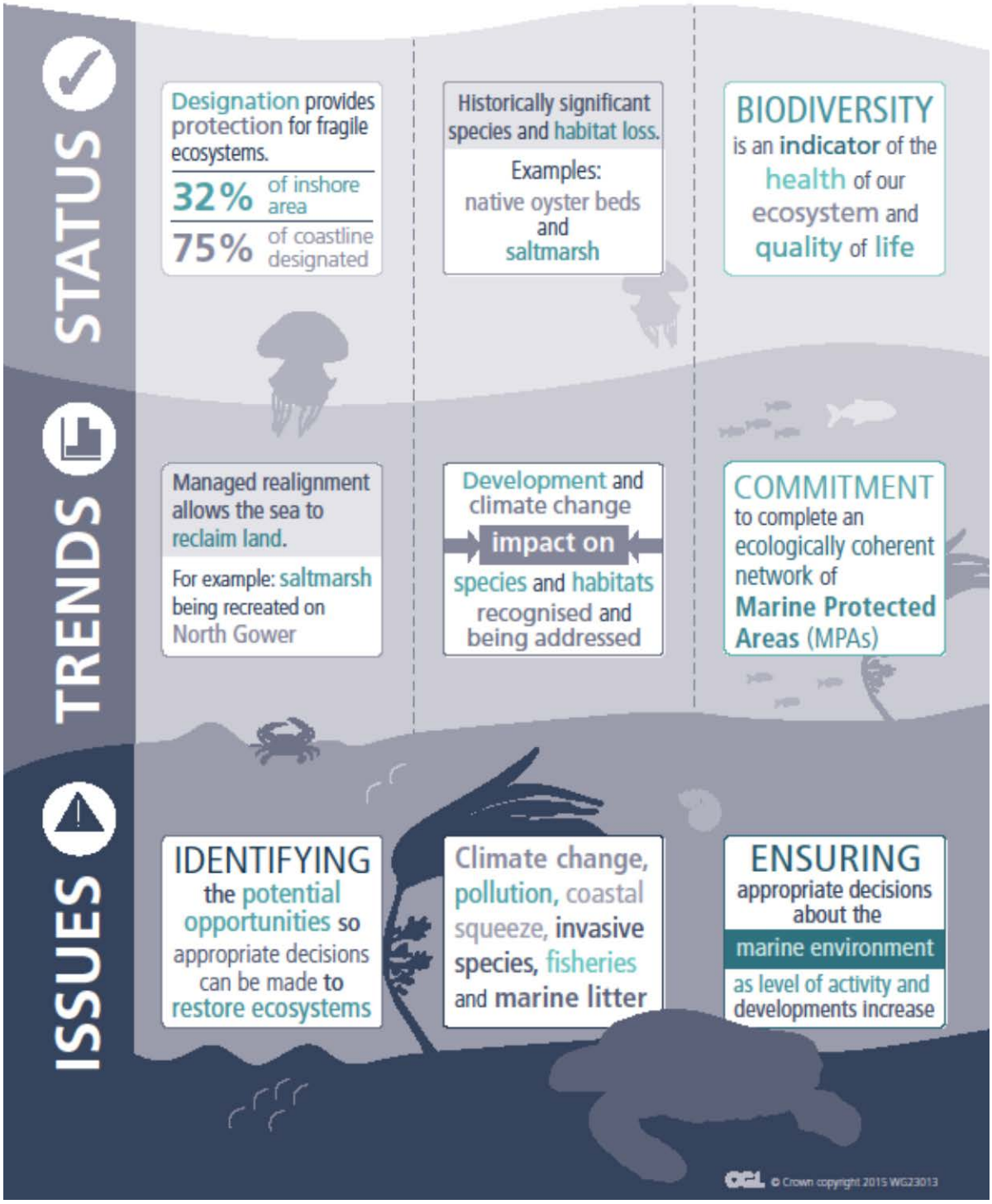
Increasing waste water pollution events in the future may arise due to more frequent and intense storm events linked to climate change, resulting in an increased frequency of potential storm overflows. Similarly, population growth will put added demand on sewage networks and water companies to dispose of waste water. With regards to agriculture, the Environment Agency (2009) anticipates that the potential impact of climate change on increased water demand for irrigation will be high, possibly by the 2020s. Increased abstraction of water for agriculture could put greater strain on water resources and could elevate the risk of nutrient run-off entering the marine environment as well as reducing the dilution capacity of rivers where discharges are made.

Sediment quality along the Welsh coast is likely to continue to improve in response to reductions in pollutant loadings from discharges over the past few decades. Historically buried pollutants may become exposed in the event of disturbance from human activities or natural processes, although risks from human activities can generally be controlled through the marine licensing system. The risk of eutrophication is unlikely to increase in the future as water quality improves and the anthropogenic input of nutrients decreases.

GEODIVERSITY



NATURE CONSERVATION and BIODIVERSITY



4.2 Geodiversity, Biodiversity and Nature Conservation,

4.2.1 Overview and background

Biodiversity and geodiversity are fundamental for a healthy marine environment - they are indicators of the health of our ecosystem and quality of life. Biodiversity describes the diversity of life and includes all species of plants and animals, the genetic variety amongst them and the complex ecosystems of which they are part. Geodiversity is the variety of rocks, minerals, fossils and structures together with the physical processes that result in their formation. The UK administrations are committed to completing an ecologically coherent network of marine protected areas (MPAs) for the protection of biodiversity and geodiversity as part of a broad based approach to nature conservation.

Geodiversity

The UK MPS (HM Government 2011) highlights the UK vision for '*clean, healthy, safe, productive and biologically diverse oceans and seas'*. Whilst the physical environment is not explicitly listed in the MPS, the physical environment is closely linked with other topics, e.g. 'ecological and chemical water quality and resources' and 'coastal change and flooding'.

The physical environment is largely defined by its geology and substrata (particularly seabed sediments, seabed features and bathymetry) but also hydrography (i.e. tides, currents and waves).

Future developments and other activities along the Welsh coast, and further offshore, may have an impact on estuarine and coastal waters with respect to physical modifications to the environment. These physical modifications could potentially have an adverse effect on ecological and chemical water quality, habitats and geodiversity along the coasts and within estuarine environments, localised or widespread coastal erosion/accretion (including changes to seabed features, e.g. sandbanks) and flood risk.

In considering future plans, the MPS says that authorities should seek to achieve sustainable development within the marine environment through minimising and mitigating any significant changes that specific developments and activities will have on the physical environment (coastal processes).

Marine ecology and biodiversity

Wales has a rich marine environment, home to a variety of habitats and species (CCW 2011). Marine habitats and species provide a range of ecosystem services and benefits of significant value to UK society. The quality of the marine environment has a direct effect on the way we benefit from it - as a source of food, energy and building materials, and as a place where we live, work and play.

As set out in the UK MPS the UK aims to ensure:

- A halting and, if possible, a reversal of biodiversity loss with species and habitats operating as a part of healthy, functioning ecosystems; and
- The general acceptance of biodiversity's essential role in enhancing the quality of life, with its conservation becoming a natural consideration in all relevant public, private and non-governmental decisions and policies (HM Government 2011).

The MPS requires that appropriate weight is attached to designated sites and protected species, and also to habitats and species of principal importance for the conservation of biodiversity within and beyond the boundaries of Marine Protected Areas (MPAs). Marine planning has a role in delivering the requirements of the MPS, and in supporting the coherence of the MPA network.

The MSFD also includes several key objectives and requirements for achieving good environmental status (GES) in relation to marine ecology and biodiversity.

Marine Protected Areas

One of the tools that can be used to support the sustainable use and protection and conservation of marine biological diversity and its ecosystems is the implementation of MPAs. The UK administrations are committed to completing an ecologically coherent network of MPAs as part of a broad based approach to nature conservation (HM Government 2011). The network will be a key tool in contributing towards achieving good environmental status under the MSFD.

OSPAR is working towards establishing an ecologically coherent network of well-managed MPAs in the North-East Atlantic:

- to protect, conserve and restore species, habitats and ecological processes which have been adversely affected by human activities;
- to prevent degradation of, and damage to, species, habitats and ecological processes, following the precautionary principle;

- to protect and conserve areas that best represent the range of species, habitats and ecological processes in the maritime area.

Wales's contribution towards the wider network will be made up of European Marine Sites (Special Areas of Conservation (SACs) and Special Protection Areas (SPAs)), intertidal Sites of Special Scientific Interest, marine elements of Ramsar sites, Marine Nature Reserves plus any new Marine Conservation Zones (MCZs) that may be designated in the future. The current suite of 125 MPAs in Welsh inshore waters covers 75% of the coastline and 35% of territorial seas.

Special Area of Conservation (SACs)

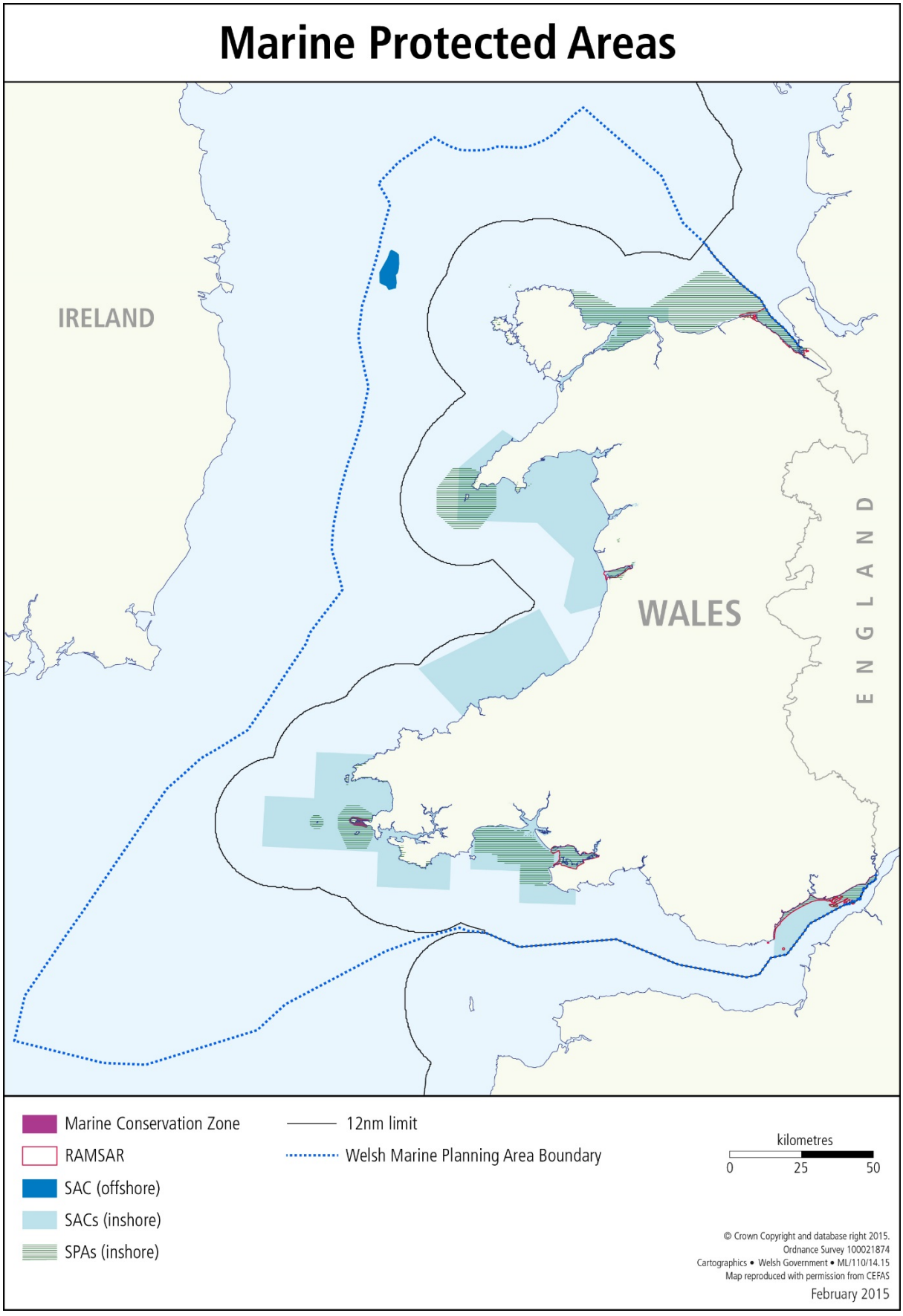
SACs are protected sites under the EC Habitats Directive 92/43/EEC (as amended). Article 3 of the Habitats Directive requires the establishment of a European network of important high-quality conservation sites that will make a significant contribution to conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive. Annex 1 marine habitats are shown in Figure 13.

There are eleven SACs associated with Welsh marine waters, including two cross border sites with England (the Severn Estuary and the Dee Estuary). These sites provide protection for a range of plants, animals and habitats that are considered rare, special or threatened within Europe (Figure 13).

The full list of Welsh (and adjacent) marine SACs is:

- Y Fenai a Bae Conwy / Menai Strait and Conwy Bay
- Dee Estuary / Aber Dyfrdwy
- Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau
- Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd
- Pembrokeshire Marine / Sir Benfro Forol
- Cardigan Bay / Bae Ceredigion
- Môr Hafren / Severn Estuary
- Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh
- Bae Cemlyn / Cemlyn Bay
- Cynffig / Kenfig
- Arfordir Calchfaen de Orllewin Cymru / Limestone Coast of South West Wales.

Figure 13 Map of Marine Protected Areas in Welsh waters



Special Protection Areas (SPAs)

SPAs are protected in accordance with Article 4 of EC Directive 2009/147/EC on the conservation of wild birds. They are classified for rare and vulnerable birds (as listed on Annex I of the Directive), and for regularly occurring migratory species.

There are six SPAs within Welsh waters that are either estuarine or truly marine (Figure 13). These include three cross border sites with England (the Severn Estuary, the Dee Estuary and Liverpool Bay).

The full list of Welsh (and adjacent) marine SPAs is:

- Bae Caerfyrddin/ Carmarthen Bay
- Burry Inlet
- Castlemartin Coast
- Craig yr Aderyn (Bird`s Rock)
- Dyfi Estuary / Aber Dyfi
- Glannau Aberdaron and Ynys Enlli/ Aberdaron Coast and Bardsey Island
- Glannau Ynys Gybi/ Holy Island Coast
- Grassholm
- Liverpool Bay / Bae Lerpwl
- Mynydd Cilan, Trwyn y Wylfa ac Ynysoedd Sant Tudwal
- Ramsey and St David`s Peninsula Coast
- Severn Estuary
- Skokholm and Skomer
- The Dee Estuary
- Traeth Lafan/ Lavan Sands, Conway Bay
- Ynys Feurig, Cemlyn Bay and The Skerries
- Ynys Seiriol/ Puffin Island

The Welsh Government is working on the seaward extension of three seabird colonies at Grasshom SPA, Skokholm and Skomer SPA and the Aberdaron Coast & Bardsey Island SPA. The seaward extensions will give protection to the marine waters adjacent to the colonies used for preening, bathing, displaying and other maintenance behaviour. The need for wholly marine SPAs, in addition to colony extensions, is also being considered.

Ramsar

Ramsar sites (see Figure 13) are created to protect 'Wetlands of International Importance' and are listed under the 'Convention of Wetlands of International Importance' which was adopted in the Iranian city of Ramsar in 1971 and came into force in 1975. Welsh Ramsar sites protect essential habitats and species, including migratory birds, for the conservation and wise use of wetlands and their resources. There are four Ramsar sites in Wales that have a marine component. In all cases these sites coincide with a SAC and/or SPA designation:

- the Severn Estuary
- the Burry Inlet
- Cors Fochno and Dyfi
- the Dee Estuary.

Marine Nature Reserves (MNR)

MNRs may be designated under Section 36 of the Wildlife and Countryside Act 1981. They are a means of conserving sea habitats, wildlife and other features along the shore and on the seabed. The features of MNRs may be protected through byelaws. The only MNR in Wales was Skomer but this has now been designated as a Marine Conservation Zone (see below).

Sites of Special Scientific Interest (SSSI)

SSSIs are a national suite of sites providing protection for species, habitats and geological or physiographical features of importance within the UK. SSSIs protect important features such as saltmarsh, reefs and muddy gravels. They also protect geological features such as coastal geomorphology, exposed rock formations and fossils in the marine or intertidal area. There are 103 SSSIs in Wales with marine components. They cover 650.4 km^2 of intertidal and marine areas and protect a wide variety of habitats, such as honeycomb worm reefs and seagrass beds. Where geological and geomorphological features are protected within a SSSI, these are selected under the Geological Conservation Review, which is a GB-wide review of our geological heritage.

Marine Conservation Zones (MCZs)

MCZs can be designated under the MCAA for conserving the diversity of UK nationally rare or threatened habitats and / or species and those places containing habitats and / or species that are representative of the biodiversity in the seas around England and Wales. In 2014, the Welsh Government under Part 5 of MCAA, designated Skomer as the first Welsh MCZ. Further work is on-going to identify further MCZs in Wales.

Geological Conservation

Geological Conservation is part of the responsibility of Natural Resources Wales and its aim is to identify those sites of national and international importance needed to show all the key scientific elements of the heritage of Britain. These sites can display features such as sediments, rocks, fossils and features of the landscape that make a special contribution to our understanding and appreciation of Earth science and the geological history of Britain. The sites identified as being important for conservation are generally protected as SSSIs.

In 1977 the Geological Conservation Review (GCR) was launched which was designed to identify such sites and the results of the review are being published in a series of volumes and also a Geological Conservation Review Database developed by JNCC, which contains basic site information for the 3000 GCR sites already selected together with some fuller reports (as published in GCR books) that have been converted to digital forms suitable for provision via the GCR database.

Geological conservation is not only important for understanding the earth history of Britain but the geology can also influence the physical environment and biological community due to the hardness, consistency and mobility of the bedrock on which the communities are found along with other physical characteristics such as depth, wave or current and disturbance regime (Copeland et al. 2013).

Burnett et al (1998) recognized that, generally, landscapes of high geomorphological heterogeneity have probably supported diverse biotic communities in the past and will do so in the future. They argue that protection of regions with unique geomorphological properties is a desirable long-term conservation goal because these regions will always support unique biota. This is supported by Nichols et al (1998) who state that as the landscape is intricately linked at this scale with biotic and abiotic diversity, then conservation of geomorphological heterogeneity could be an effective strategy or conserving biodiversity.

4.2.2 Key issues for Marine Planning

Geodiversity

Future large-scale seabed and infrastructure development, e.g. the potential Severn Tidal Barrage, could lead to significant changes in the physical environment (coastal processes) both locally and further afield (it is also important to consider the cumulative effect of multiple smaller projects). Such changes may have an adverse impact on other receptors, i.e. marine ecology.

In the long-term, climate change could have a dramatic impact upon the physical environment. In doing so, there is potential for increased coastal erosion and the loss of intertidal habitats (e.g. within Carmarthen Bay and Swansea Bay). The potential changes to the physical environment that may result from future seabed development, infrastructure development and climate change are overarching and could lead to significant impacts upon various resources and sectors (e.g. marine ecology, flood risk, tourism and recreation). The MPS says that future marine planning should aim to mitigate the effects of developments and climate change in areas at risk whilst also recognising, and being in a position to prosper from, the benefits that could arise.

Detailed understanding of the natural physical environment (coastal processes and solid geology) that are the basis of marine natural resources around the Welsh coastline is vital in maintaining a healthy environment. As such, there is a longer-term requirement to develop more detailed baseline information on prevailing environmental conditions (e.g. the Wales Coastal Monitoring Centre holds data for coastal defence purposes).

Changes in the physical environment as a result of human developments (at a local or sub-regional scale) need to be set against the increasing evidence of wider regional scale shifts as a result of climate change. Future developments should be encouraged to take account of the potential impacts of climate change over their estimated lifetime (MPS), i.e. designing more robust structures. Work on beach nourishment potential in Wales reviewed the risks and the potential opportunities that may arise from responding to the challenges of climate change along the coast (CCW 2012) and this merits further consideration through marine planning.

Marine ecology and biodiversity

Historically, the marine environment around Wales has suffered significant habitat loss, with key examples being coastal habitat (particularly saltmarsh) and subtidal native oyster beds (Airold and Beck 2007; Mossman et al. 2013). A key issue is to understand opportunities to restore or facilitate the recovery of these ecosystems, as well as to identify the wider social and economic benefits that such projects could provide for Wales.

It can be anticipated that the level of activities and developments in the marine environment will increase over the next 20 years, with potential negative impacts for marine ecology and biodiversity. A key issue is defining the key evidence gaps that need to be filled in order to ensure appropriate decisions can be made about the exploitation of the marine environment in such a way that

minimises impacts on biodiversity and considers opportunities for environmental enhancements or benefits within projects.

Marine ecology and biodiversity features face pressures from a range of sources including climate change, as discussed in section 4.2.5 on future trends. The consequences of the feedback relationships with the wider ecosystem as a result of climate change are not clear (UKMMAS 2010b). However, potential shifts in distribution and composition of habitats and species will have profound consequences for the achievement of stated site level or feature based conservation objectives and for other anthropogenic activities such as commercial fisheries. Developments in the marine environment may also impact on marine ecology and biodiversity features not only through direct loss of habitat but also indirectly through, for example, noise and visual disturbances. The cumulative impact of pressures is a significant concern and may affect the long-term viability of some species and habitats (HM Government 2012).

Marine planning will be a key tool for ensuring that the targets and measures to be determined by the UK for the MSFD can be implemented. As a general principle, development should minimise impacts upon marine ecology, biodiversity and geological conservation interests (including geological and morphological features), including through location, reduction, mitigation and consideration of reasonable alternatives. Where significant harm cannot be avoided, and there is overriding public interest for a development to continue, the EU Habitats Directive requires the assessment of alternatives and the investigation of appropriate compensatory measures. Particular requirements apply in relation to developments affecting designated sites.

Marine Protected Areas (MPAs)

The key issues for the MPA Network relate both to the completion of an ecologically coherent network and to delivering effective management of that network. Wales benefits from an extensive suite of MPAs. However, there are gaps in our knowledge of the extent and distribution, as well as population quality, i.e. dynamics, resilience, health, of marine habitats and species in Welsh waters. This is an issue for assessing the completeness of the network.

The reports under Article 17 of the Habitats Directive for Annex I and II species and habitats indicated that whilst certain MPA features, such as Bottlenose Dolphin and Grey Seal, are in Favourable Conservation Status at a UK level a number of features are not. Features not in Favourable Conservation Status include estuaries, mudflats and sandflats and large shallow inlets

and bays. Natural Resources Wales is currently undertaking an analysis of the condition of a number of individual marine SACs to get a clearer understanding of the situation within Wales.

A Special Sites Database, developed by Natural Resources Wales, has identified a number of key activities understood to be impacting, or potentially impacting, MPAs. These issues include pollution, coastal squeeze, invasive species, fisheries, recreational activities and marine litter. These issues will be the subject of thematic plans arising from the currently-running Life+ Natura 2000 project which is working towards bringing all designated habitats and species on Natura 2000 sites in Wales into favourable condition. This includes identifying pressures that affect the well-being of the designated habitats and species and determining all actions which are needed to address them. The project will produce Prioritised Improvement Plans for all Natura 2000 sites in Wales and an agreed, strategic, programme investigating issues and risks to Natura habitats and species and the value of existing and new management mechanisms.

A remaining issue for MPA management is the lack of detailed information on the extent of activities that occur within the network and how they impact the features of interest. Improved information would support more robust decision-making regarding the use of the MPA network and thus enable better management.

In some cases, lack of appropriate evidence may act as a barrier to the use of marine natural resources in MPAs. Marine planning provides the opportunity to help focus evidence priorities to ensure appropriate decisions can be taken at a strategic level on the use of marine resources. However, EU Member States are required (under Article 17 of the Directive) to report on the implementation of the EU Habitats Directive. The site level reports for Wales and the Biomôr Reports published by the National Museum of Wales (http://www.nhbs.com/series/46655/biomor-reports) contain relevant evidence.

4.2.3 Current Policy

The following section summarises the most relevant UK and Welsh national and European policy and legislation in establishing targets for geodiversity, marine ecology and biodiversity and importantly, providing guidance to undertaking environmental assessments. Both the National Ecosystem Assessment (NEA) (UK National Ecosystem Assessment 2011) and Environment Bill White Paper (Welsh Government 2013b) set out the importance of a healthy, properly functioning natural

environment as the foundation of sustained economic growth, prospering communities and personal well-being.

EU Wild Birds Directive (2009/147/EC), Habitats Directive (92/43/EEC) and Ramsar

At European Union (EU) and international level the most relevant requirements include the EU Birds Directive (2009/147/EC) and the EU Habitats Directive (92/43/EEC), as well as the 1972 Ramsar Convention on Wetlands of International Importance. These have been transposed into UK legislation through various Acts and Regulations, to establish and manage Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites. European Protected Species are species of plants and animals (other than birds) strictly protected by law from deliberate disturbance, injury and killing throughout the European Union. They are listed in Annex IV of the European Habitats Directive, and transposed into UK law by the Conservation of Habitats and Species Regulations 2010.

Environmental Impact Assessment (EIA) Directive

The basic framework for the environmental impact assessment process is provided by European Directive 85/337/EEC and its amendments in 1997, 2003 and 2009. In 2011, the EIA Directive was 'consolidated' into Directive 2011/92/EU and has recently been revised in 2014 (2014/52/EC) and is to be transposed into law by May 2017 to reflect changes to technical, legal and policy context. The aims of the EIA Directive is to protect the environment and the quality of life by ensuring that projects, which are likely to have significant environmental effects by virtue of their nature, size or location, are subject to an EIA before consent by local and / or national authorities is granted.

Strategic Environmental Assessment (SEA) Directive

The basic framework for the SEA process is provided by European Directive 2001/42/EC on 'the assessment of certain plans and programmes on the environment'. This Directive has been brought into effect in Wales by the Environmental Assessment of Plans and Programmes (Wales) Regulations 2004 and by corresponding Regulations in Scotland, Northern Ireland and the UK (including England). The SEA Directive states that its objective is '*to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development*'. Though usually referred to as the SEA Directive, it does not use the term 'strategic environmental assessment (SEA)', rather, it requires an 'environmental assessment' of certain plans and programmes.

EC Water Framework Directive (WFD)

The WFD (2000/60/EC) establishes a framework for the management and protection of Europe's water resources and applies to waters out to 1nm from which the territorial waters are drawn. It is implemented in Wales through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. Under these Regulations, NRW is the Competent Authority for implementation of the Directive in Wales. The WFD was adopted in 2000, aiming to protect and, where necessary, improve the ecological and chemical status of water bodies across Europe in order that they achieve a headline objective of 'good status' by 2015, subject to time limited derogations.

The ecological and chemical status of surface waters are assessed according to the following criteria:

- Biological quality – such as aquatic flora, benthic invertebrates and fish, together with a range of supporting physic-chemical parameters;
- Hydromorphological quality – morphological conditions (e.g. intertidal zone structure) and tidal regime (currents, wave exposure and freshwater flow); and
- Chemical quality that refers to environmental quality standards for selected priority and priority hazardous substances.

NRW monitors progress against WFD objectives through the implementation of River Basin Management Plans (RBMPs). This information is considered beneficial for marine planning in Wales in order to determine whether a marine activity (e.g. dredging, disposal or construction) could have an adverse impact on the ecological (including coastal processes) or chemical status on adjacent water bodies.

Marine Strategy Framework Directive (MSFD)

The primary aim of the MSFD is for Member States to put in place measures which aim to achieve GES in their marine waters by 2020, incorporating a series of descriptors that are used to determine this status. In order to achieve GES, it is required that '*all new developments continue to comply with the existing regulatory regime, and guidance to be followed to ensure that regulatory assessments are undertaken in a way that ensures the appropriate consideration of any potential cumulative and in-combination environmental effects at the most appropriate spatial scales so that GES is not compromised*'.

Whilst there is potential for large-scale projects to cause impacts due to changes in hydrographical conditions (Descriptor 7), these impacts are currently managed through the marine licensing and

consents process in line with the requirements of the EIA Directive, the WFD, and the Habitats Directive. The MSFD also includes several key objectives in relation to marine biodiversity, with measures for achieving Good Environmental Status (GES) including spatial measures for biodiversity protection. MSFD aims to protect the marine resources upon which economic and social activities depend, and to establish a framework within which EU member states take measures to achieve GES for the marine environment by 2020. The characteristics of GES have been defined by the UK by reference to 11 descriptors and a set of indicators and targets for guiding progress towards GES. Descriptor 1 (biodiversity), descriptor 2 (non-indigenous species), descriptor 3 (fish), descriptor 4 (food webs), descriptor 6 (sea-floor integrity), descriptor 10 (marine litter) and descriptor 11 (introduction of energy including underwater noise) are particularly relevant to the health of the marine environment, protection of biodiversity, sustainability and productivity of marine ecosystems and the goods and services they provide (HM Government 2012). The Directive is transposed into UK law via the Marine Strategy Regulations 2010.

Oslo and Paris Convention 1992

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention) included the establishment of a list of threatened and / or declining species and habitats. This list provides an overview of the biodiversity in need of protection in the North-East Atlantic and is being used by the OSPAR Commission to guide the setting of priorities for further work on the conservation and protection of marine biodiversity under the OSPAR Convention. OSPAR are working towards establishing an ecologically coherent network of well-managed MPAs in the North-East Atlantic.

Convention on Biological Diversity

The UK Biodiversity Action Plan (UK BAP) published in 1994, is the UK Government's response to the Convention on Biological Diversity (CBD). The CBD calls for the development and enforcement of national strategies and associated action plans to identify, conserve and protect existing biological diversity, and to enhance it wherever possible. In 2010, parties to the CBD renewed their commitment to halt the alarming global declines of biodiversity and to ensure that by 2020 our natural environment is resilient and can continue to provide the ecosystem services that are essential for life. The 2020 Biodiversity Strategy highlights the need to protect, value and appropriately restore, biodiversity for its intrinsic value and essential contribution to human wellbeing and economic prosperity. The Welsh Government is currently developing a Nature Recovery Plan to support the delivery of the 2020 Biodiversity Strategy in Wales.

The Section 42 (S42) list of the species and habitats of principal importance in Wales is a requirement of the Natural Environment and Rural Communities Act 2006 (NERC Act) (HM Government 2006). The S42 list is a key reference for all statutory and non-statutory bodies involved in operations that affect biodiversity in Wales. The S42 list will be used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the NERC Act '*to have regard*' to the conservation of biodiversity in all their activities.

The S42 list (Wales Biodiversity Partnership 2014) contains 504 of the UK priority species which occur in Wales and a further 53 species recognised as Welsh priorities, to make up a list of 557 species of principal importance to Wales with an additional 4 groups / assemblages of species (more information can be found at http://www.biodiversitywales.org.uk/49/en-GB/Section-42-Lists).

Of the UK's 65 priority habitats, 51 occur in Wales (including terrestrial, freshwater, coastal and marine habitats). An additional 3 marine habitats not on the UK list but identified as a priority in Wales are included on the S42 list, making a total of 54 priority habitats in Wales. Many of these align with the OSPAR lists mentioned above, but many are of national interest.

Marine and Coastal Access Act (MCAA) 2009

The MCAA provides an important legal framework to help ensure clean, healthy, safe, productive and biologically diverse oceans and seas by putting in place a system for improved management and protection of the marine and coastal environment. The Act makes provision for Marine Conservation Zones, marine licensing, fisheries management powers and marine planning.

Marine licensing considers the impact of an activity in the marine environment (e.g. dredging, disposal and construction) on the physical environment; more commonly defined as coastal processes (i.e. hydrodynamic and sediment regimes).

Invasive non-native species

Draft EU legislation to prevent the introduction or halt the spread of 'invasive alien species' of plants, animals and insects that cause ecological and economic damage was agreed in March 2014 (European Parliament 2014). An inquiry into invasive non-native species (INNS) has investigated how the problem is being addressed in Wales including data availability, actions taken to date and consideration of the EU proposal for a new Directive on INNS (National Assembly for Wales 2014).

Descriptor 2 of the MSFD requires that non-indigenous species introduced by human activities are at levels that do adversely alter ecosystems, based on the criteria:

- Abundance and state characterisation of non-indigenous species, in particular invasive species (to be achieved by a reduction in the risk of introduction and spread of non-native species through improved management of the main pathways and vectors); and
- Environmental impact of invasive non-indigenous species (to be achieved by species specific management plans for high risk invasive non-indigenous species identified as already present or likely to be introduced into the UK).

The Great Britain Invasive Non-native Species Framework Strategy was launched in 2008 and is intended to provide a strategic framework within which the actions of government departments, their related bodies and key stakeholders can be better co-ordinated. The Wales Biodiversity Partnership's Invasive Non-native Species Group has the aim of co-ordinating responses and policies to minimise risk and reduce negative impacts caused by INNS. The Convention Biodiversity Aichi Target 9 states that by 2020 invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Technical Advice Note 5, Nature Conservation and Planning (2009)

The Technical Advice Note 5 (TAN5) provides advice about how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation. In particular it provides advice to the local planning authorities on the key principles of positive planning for nature conservation, considering nature conservation in development management procedures and how development can affect protected internationally and nationally designated sites and habitats as well as priority habitats and species.

In addition to the statutory protected sites, there is also a network of RIGS (Regionally Important Geodiveristy Sites) which are non-statutory sites and are a planning consideration referred to in Welsh Government Technical Advice Note 5.

4.2.4 Current Status

Geodiversity

Conservation of nationally and internationally important geodiversity sites are underpinned by the Geological Conservation Review (GCR) which provides the scientific evidence base for geological and

geomorphological SSSI (Ellis et al. 1996). The GCR is a GB-wide review of the scientifically important geological and geomorphological sites in Britain with the intention to select for conservation those which match at least one of three types. The three distinct, but complimentary, types of site selected for the GCR are:

- internationally important;
- scientifically important for rare or exceptional features;
- nationally important because they are representative of an Earth science feature or process that is fundamental to understanding Britain's Earth history.

The UK Geodiversity Action Plan (UKGAP) provides the framework for planning and recording the delivery of geoconservation across the UK. The UKGAP establishes a shared understanding of what is happening and what needs to happen to promote and conserve geodiversity.

Geology and Substrata: Solid Geology

Solid geology is defined here as rocks formed before the start of the Quaternary Period (1.6 million years BP). Across the offshore marine plan area, these rocks are largely concealed by Quaternary and seabed sediments. Sedimentary basins containing thick sequences of Mesozoic sediments surround the Welsh coast, but only at Mochras (where they are covered by Quaternary sediments) do these sediments extend inshore (Tappin et al. 1994). Elsewhere along the coast, Precambrian and Palaeozoic rocks which are exposed at the sea bed extend for a few tens of kilometres offshore. To the west of the Pembrokeshire coast, in the offshore marine plan area, the St George's Channel Basin contains Mesozoic sediments that are over 5 km in thickness and include a thick Permo-Triassic salt unit. Locally, this salt has intruded into the overlying sediments to form an elongated salt wall some 20 km long and about a kilometre wide. The Cardigan Bay and Bristol Channel basins were formed over a long period of time by subsidence of the crust and infilling by sediment eroded off the adjacent basement rocks (mainland Wales). Major fault movement during the early Paleogene Period led to the formation of the Welsh uplands and subsidence in localised basins such as Tremadog Bay (Evans 1995).

Geology and Substrata: Quaternary Geology

Across the offshore marine plan area, Quaternary sediments comprising glacial tills, glacio-marine sediments and inter-glacial deposits are concentrated in the 25 to 80 km wide St George's Channel and Celtic Deep troughs, with thicknesses of up to 300 m. These troughs are flanked to the east (inshore) by the Lundy and Welsh platforms, which are low-relief shelves of variable width.

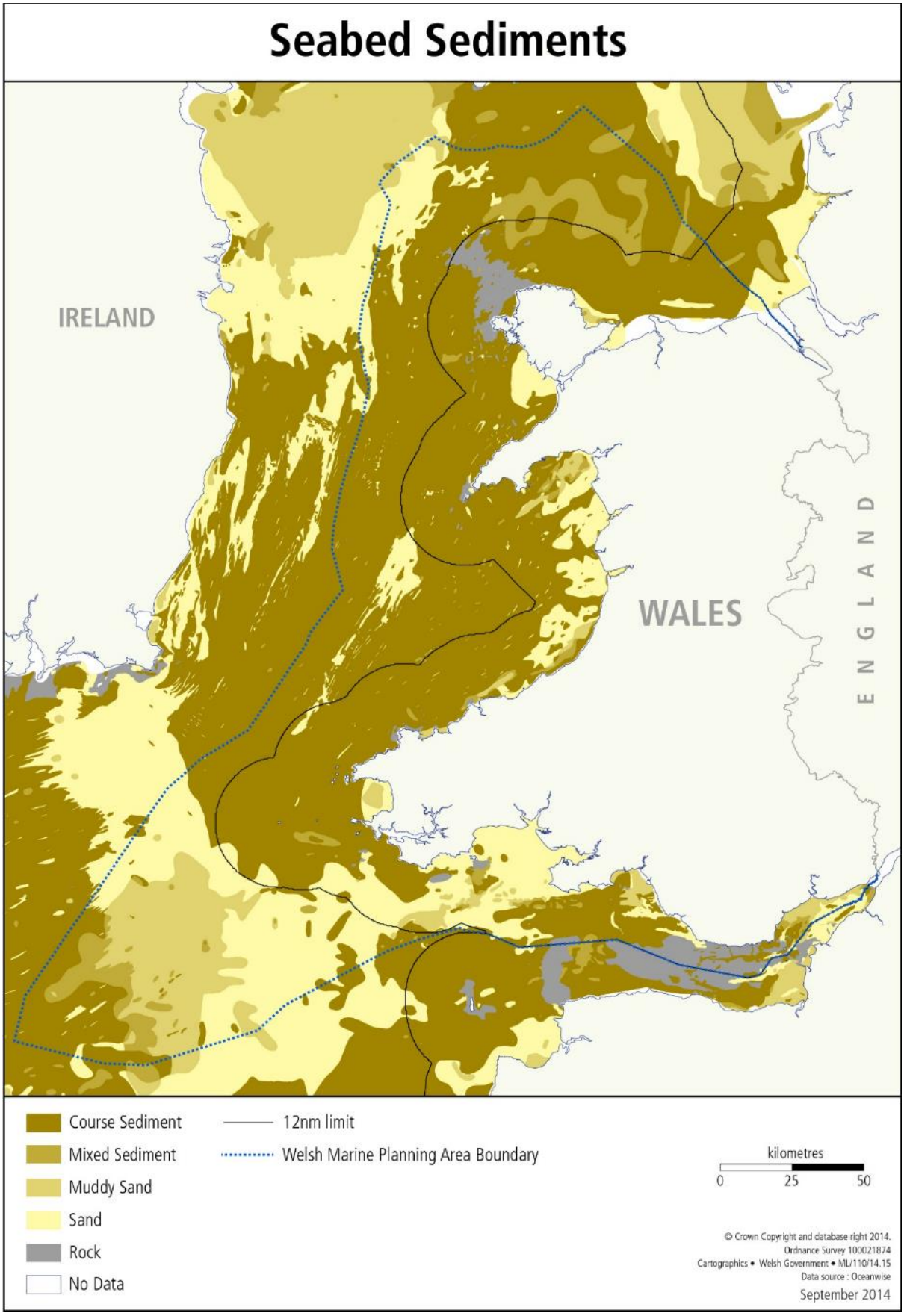
Quaternary sediments on the platforms are generally less than 50 m thick, and are absent off many headlands and across considerable areas of the Bristol Channel and its approaches (Tappin et al. 1994). The spatial extent of glacial till (Irish Sea Till) across the marine plan areas is considerable, typically exceeding 10 m in thickness across much of Cardigan Bay. The till was produced in part by ice eroding the extensive areas of Triassic rocks underlying St George's Channel to the north and west, thereby producing a brownish-red deposit till (Tappin et al. 1994). In the centre of the main channel west of Anglesey, the till is overlain by a thick succession of sands and muds (Jackson et al. 1995). The presence of raised beaches along the south and west coasts of Wales tend to indicate that sea levels were higher than at present during parts of the Pleistocene (Evans 1995).

Geology and Substrata: Holocene Seabed Sediments

Seabed sediments are defined here as the unconsolidated sediments on the seabed that have been laid down since the early Holocene (~10,000 years BP). The present distribution of seabed sediments (and features) across the marine plan areas is a reflection of the past and present sediment supply, sedimentary characteristics, and the contemporary actions of tides, waves, wind and storm surges in the region. As such, this distribution varies considerably along the Welsh coastline and between the inshore and offshore environments, as shown in Figure 14.

In the Bristol Channel, where tidal currents are particularly strong, the seabed sediments typically become coarser grained and thinner (in depth) towards the east. Along the centre of the channel, south of Gower, extensive areas of the seabed are only covered by a thin veneer of gravel, whilst further to the east the bedrock is exposed at the seabed (BGS 1986). Outside of these strong tidal currents, e.g. within Swansea Bay and Carmarthen Bay, thicker sequences of fine grained sediments (i.e. muds and fine sands) have accumulated (BGS 1983; 1986). Outside of the Bristol Channel along the Pembrokeshire coast, sediment deposits are generally thin and coarse grained (BGS 1983). Heading north along the Wales coastline to Cardigan Bay, the majority of the outer seabed sediments are gravelly (BGS 1983), formed by the winnowing of finer material from a substrate of glacial till. In contrast, tidal currents have moved finer sediments inshore, where thick deposits of sand and, in Tremadog Bay, muds have accumulated (BGS 1988). Further to the north around Anglesey, a similar sediment distribution pattern is observed, with generally gravelly sediments offshore and thicker sand deposits within Caernarfon Bay and Conwy Bay. To the north-west of Anglesey, however, bedrock is extensively exposed at the seabed (BGS 1990) due to the presence of strong tidal currents.

Figure 14 Seabed sediments for the Welsh waters



Geology and Substrata: Seabed Features

Across the inshore and offshore marine plan areas, a wide variety of active bedforms can be found in areas of both low and high sediment supply. Within regions of low sediment supply, Stride (1982) describes the presence of active bedforms as ranging from furrows and waves in gravel, through isolated, uncommon sand ribbons and sand streaks parallel to the tidal current, into transverse, horned, barchans-type, large sand waves, passing into extensive sand patches with small sand waves (megaripples). These low sediment supply active bedforms are typically found in the eastern St George's Channel (north and south of bedload parting) and westwards along the southern side of the Bristol Channel (Tappin et al. 1994). In contrast, active bedforms found within areas of high (abundant) sediment supply typically comprise sand ribbons and elongated patches across gravel beds, changing down-path to a continuous cover of sand moulded into transverse sand waves, and tidal sand ridges almost parallel to the current. These bedforms tend to occur in Cardigan Bay (BGS 1988), within the Bristol Channel (BGS 1986), and south-westwards past Lundy Island (BGS 1983). A number of sandbank systems are also present within the inner marine plan area, particularly within Bristol Channel, e.g. Scarweather Sands (adjacent to Swansea Bay).

Whilst active bedforms are attributed to present-day sedimentary processes, there are also a variety of relict bedforms found across the inshore and offshore marine plan areas, e.g. the drumlin field off north-Anglesey. Within Cardigan Bay, a number of Sarnau (low ridges) occur perpendicular to the coastline; it has been suggested that these ridges are median moraines which were truncated seawards by Irish Sea ice moving south-eastwards, these very important features are not seen elsewhere in the UK. Further offshore, infilled anastomosing nets of channels up to 200 m wide and a few kilometres long have been observed along St George's Channel, believed to have been formed by braided rivers on subaerial sandur (Tappin et al. 1994).

Geology and Substrata: Bathymetry

The bathymetry of the Welsh Marine Planning Area is shown in Figure 15. The dominant bathymetric feature in the offshore marine plan area is the wide trough running along the length of St George's Channel between Wales and Ireland, which has a maximum depth in excess of 100 m. Along the northern coast of the inshore marine plan area, water depths reach 20 m within a few kilometres off the north Anglesey coast, with the bathymetric contour continuing approximately parallel to the shore towards the Great Orme (UKHO Chart 1977); with shallower waters in Conwy Bay to the south. The Anglesey platform is relatively flat with some variation immediately northwest of Anglesey where bold outcrops expose hummocky basement rocks of Lower Palaeozoic age

forming a relatively rugged topography of peaks and troughs with an amplitude of less than 20 m (James and Brown 2001). Along the western coast of Wales, Caernarfon Bay is shallow (i.e. typically less than 20 m), however the zone of deeper water (greater than approximately 40 m) extends to within about 15 km of the north-west corner of Anglesey (UKHO Chart 1970). Further to the south, Cardigan Bay is a relatively shallow embayment with a 60 m bathymetric contour which runs across the embayment from approximately Bardsey Island to St David's Head. In the northern part of the bay, the bathymetry is dominated inshore by the shore-perpendicular ridges (Sarnau), i.e. Sarn Badrig, the crests of which are intertidal (UKHO Chart 1971). The southern part of the bay is much deeper, whereby the 20 m bathymetric contour lies within a few kilometres of the coast (UKHO Chart 1972). Within the Bristol Channel, depths shallow in an easterly direction from approximately 60 m at the entrance to less than 20 m at Barry; with the deeper water typically running centrally along the channel. Along the south coast of Wales, Carmarthen Bay and Swansea Bay are typically shallower than 20 m (UKHO Chart 1123), and are characterised by expansive intertidal areas.

Hydrography: Tidal Levels

Tidal ranges on spring tides are generally high along the Welsh coast, but vary significantly from less than 4 m within Cardigan Bay to approximately 12 m at Avonmouth (in the Bristol Channel). The mean spring tidal ranges for the inshore and offshore marine plan areas, as determined by the Marine Renewables Atlas (ABPmer 2008), are shown spatially in Figure 16.

In addition to the astronomic tide, a variety of non-tidal influences may also have an effect on water levels. For example, atmospheric pressure variations can also raise or depress the water surface to generate positive or negative tidal surges, respectively. Surges can cause water levels to fluctuate considerably above or below the predicted astronomical tidal level, in which positive surges may have implications for coastal erosion, sea defence integrity and coastal flooding.

Figure 15 Bathymetry of Welsh waters

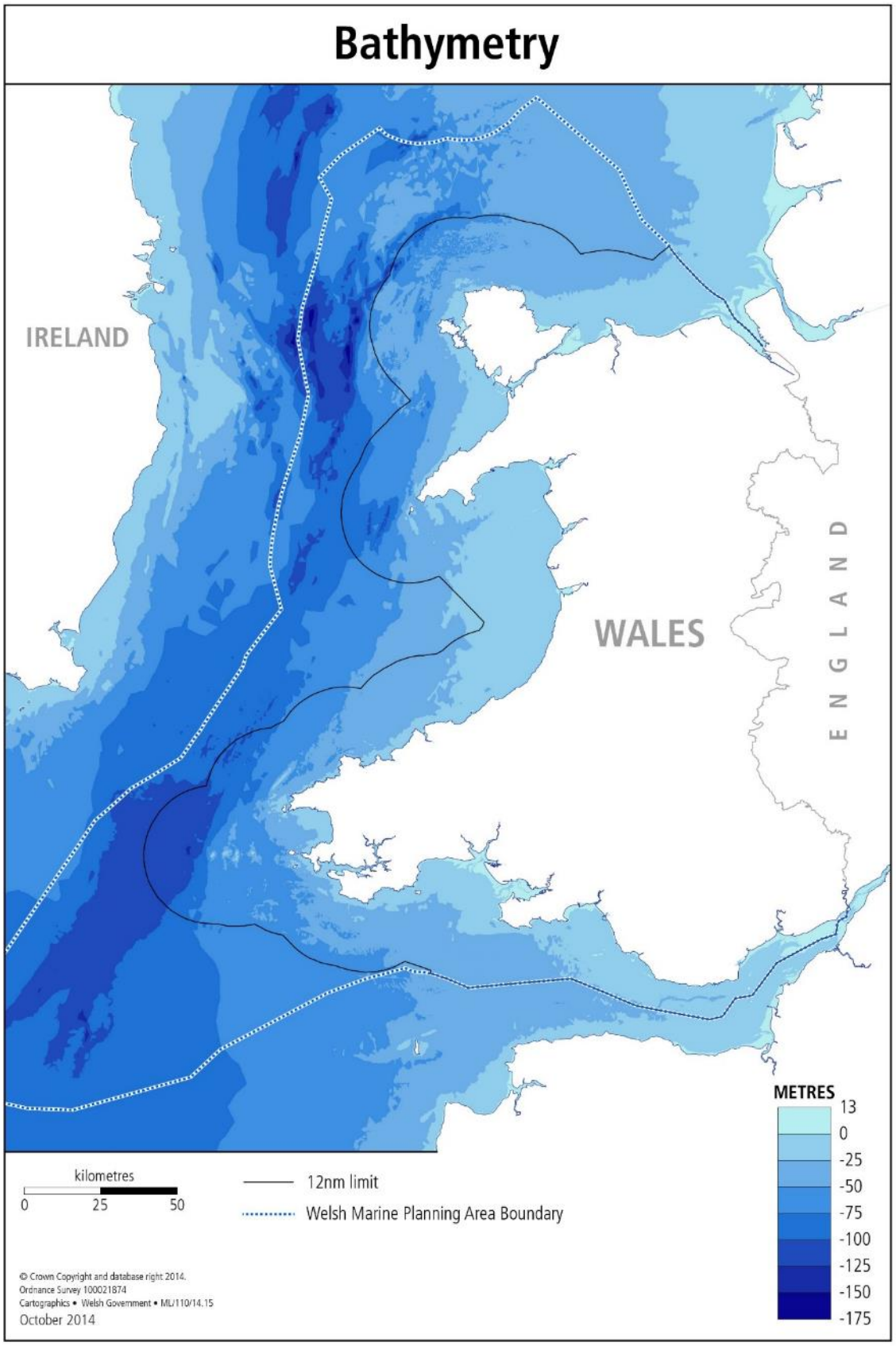
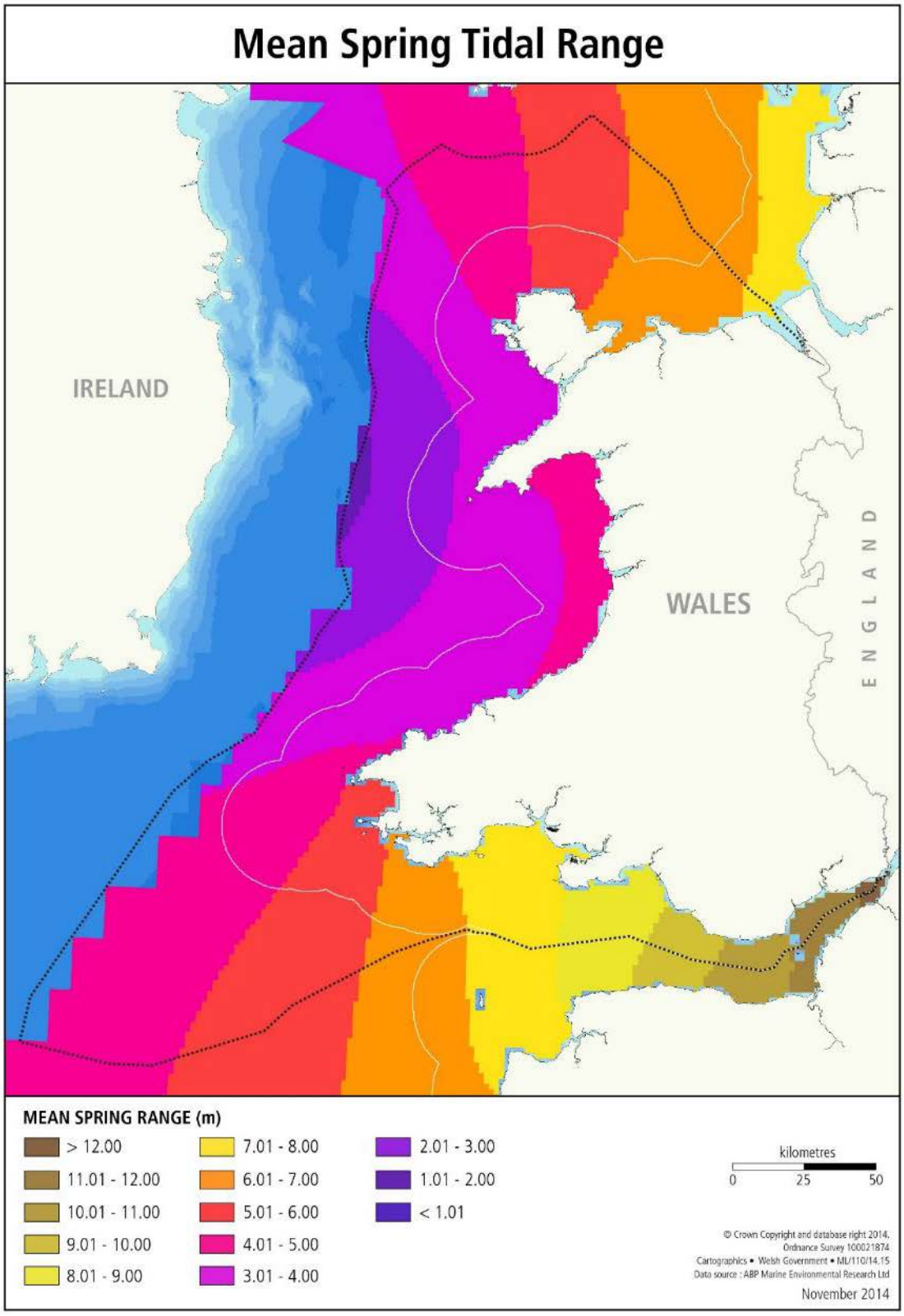


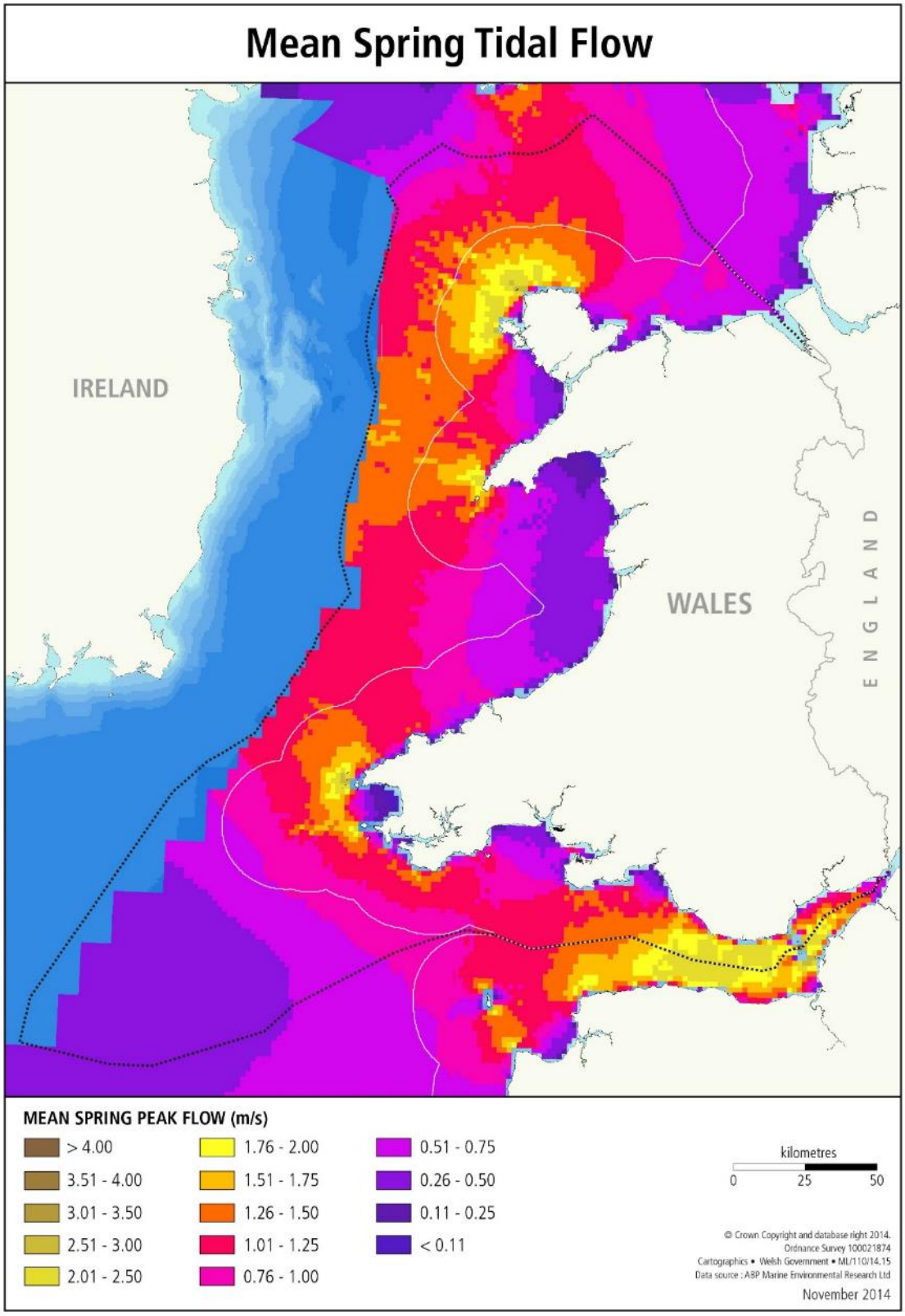
Figure 16 Mean Spring Tidal Range for Welsh waters



Hydrography: Tidal Currents

During mean spring tides, tidal currents across the marine plan areas peak at more than 2 m/s (4 knots) around the northwest corner of Anglesey and the outer (western) section of Lleyn Peninsula, off the Pembrokeshire headlands (i.e. St David's Head and St Ann's Head) and along the Bristol Channel (ABPmer 2008), see Figure 17. In general, however, tidal currents tend to decrease in an easterly direction from St George's Channel towards the coast, with peak mean spring tide values decreasing to less than 1.0 m/s (2 knots) along the north coast of Wales and 0.5 m/s (1 knot) along the west coast within both Caernarfon Bay and Cardigan Bay. Elsewhere along the coast, nearshore tidal currents can be extremely variable, with swift-flowing currents evident between narrow inter-island channels, for example in the Menai Strait and off Skomer, where the tides are constrained. Within Bristol Channel, the greatest tidal currents (exceeding 2 m/s) are typically found within the main channel between Swansea Bay and Newport (Severn Estuary). In contrast, peak tidal currents within Carmarthen Bay and Swansea Bay are considerably less, with values typically no greater than 1.0 m/s (2 knots) and decreasing further towards the shore.

Figure 17 Mean Spring Tidal Flow for Welsh waters



Hydrography: Waves

The wave climate varies considerably across the marine plan areas due to the differing coastal orientation and the substantial changes between the offshore and inshore water depths. In deep water the wind dominates the character of the waves. However, as waves travel into shallower, nearshore waters they are affected by refraction, shoaling and diffraction due to depth variations (particularly within the embayments along the western and southern coast of Wales). Much of the Welsh coastline is open to the prevailing south-westerly winds, and locally, where deep water approaches the coast, it is subject to severe wave attack. Waves, therefore, make an important contribution to coastal evolution and are the primary driver for longshore sediment transport.

Along the northern coast of the inshore marine plan area between Anglesey and the Dee Estuary, the dominant wave direction is predominantly from the north-west. The Marine Renewables Atlas (ABPmer 2008) describes the annual mean significant wave height as typically being less than 1.0 m. Along the western coast between Anglesey and Bardsey Island, the dominant wave direction is predominantly from the south-west, with the annual mean significant wave height typically increasing from around 1.3 m in the north-west corner of Anglesey to approximately 1.45 m at Bardsey Island. Further southwards, between Bardsey Island and St David's Head, the predominant wave direction varies significantly from the north to south due to the changing coastal orientation associated with the large-scale bay form of Cardigan Bay. Waves are predominantly from the south-west to west between the Afon Glaslyn and Bardsey Island, whilst between the Afon Glaslyn and St David's Head waves are predominantly from the west. The mean significant wave height also varies considerably along this stretch of coast, increasing from less than 1.0 m in the northern corner of Cardigan Bay to approximately 1.7 m at St David's Head. Around the Pembrokeshire coastline (between St David's Head and St Govan's Head), wave activity is predominantly from the south and southwest with a long Atlantic fetch. Where the nearshore bathymetry is relatively steep, i.e. around St Govan's Head, large waves are able to approach the coast. At this location, the Marine Renewables Atlas (ABPmer 2008) describes the annual mean significant wave height as being up to 1.8 m. Heading into the Bristol Channel, the dominant wave direction is initially from the south-west before rotating more westerly further along the channel (i.e. beyond Swansea Bay). Wave refraction is seen to take place inshore along the coastline, resulting in a southerly wave direction in both Carmarthen Bay and Swansea Bay. The annual mean significant wave height tends to decrease in an easterly direction as the coastline becomes less exposed, with a value of approximately 1.0 m at Nash Point (and less than 1.0 m further eastwards).

Coastline and Estuaries

Wales's coastline is comprised of limestone cliffs in the south (e.g. the carboniferous limestone of the Gower), cliffs of Precambrian and volcanic rocks (e.g. Pembrokeshire) and low-laying dunes and alluvium (e.g. Cardigan Bay). Two major estuaries lay at the Wales – England border (the Dee Estuary in the north and the Severn Estuary in the south). Other estuaries characterising the Welsh coastline include Glaslyn, Mawddach, Dyfi, Afon Alaw, Milford Haven and Daugleddau and Loughor (Burry Inlet). Another important feature is the Broadwater saltwater lagoon (formed from the silted estuary of the Dysynni River). Further description of the pressures on the coastline and estuaries of Wales (e.g. increased erosion) are provided in Sections 3.7 (Climate Change) and 3.8 (Coastal Change and Flooding).

Marine ecology and biodiversity

The natural features, species and habitats within the Welsh marine plan areas are particularly diverse in nature, with some aspects being nationally and international important and rare. The locations of some of the Annex 1 habitats that are protected under the Habitats Directive (see Section 4.2.3 -Current Policy) are shown in Figure 18. Further details on MPAs and features of conservation importance can be found in Section 4.2.

Marine Habitats

Wales has a particularly high biological diversity as a result of the variety of habitats present. Depths in the east of the region are mostly less than 50 m but reach 100 m in western areas. The water is strongly influenced by coastal processes, with influxes of water from the Celtic Sea and north from the continental shelf current. Overall, mean water flow is northward; a large tidal range and strong tidal currents mean most of the water is mixed although some seasonal stratification occurs in deeper areas (UKMMAS 2010b). The diverse array of tidal influence and tidal range also influence biological diversity. The diversity of habitats and species is also influenced by the location of the UK straddling a marine biogeographic boundary, where cooler (boreal) water from the north meets warmer (lusitanian) water from the south. This means that, particularly in the south west region of the UK (including South Wales), there is overlap between species associated with warmer Mediterranean waters and those associated with cooler water from the north (UKMMAS 2010b).

As previously described in the geodiversity section the underlying geology ranges from subtidal sandbanks to areas of mixed sediment sand and rocky reef. The distribution of subtidal marine habitats is shown in Figure 19. JNCC has a webpage which summarises the main seabed habitats

datasets that the organisation maintains at http://jncc.defra.gov.uk/seabedhabitatmapdata and also has a database application 'Marine Recorder' used to store marine benthic sample data such as species, physical attributes and biotopes. The latest publically available snapshot of the data is available to download at: http://jncc.defra.gov.uk/page-1599. Large expanses of shallow subtidal sediments occur throughout the Welsh marine plan areas. Sands, gravels and mixed sediments are most common, but muds do accumulate locally (UKMMAS 2010b). Large expanses of subtidal rock are relatively uncommon in Welsh waters due to the widespread deposition of subtidal sediments. In Wales this habitat is mainly a coastal fringing habitat although there are significant offshore reefs and glacial rocky deposits (e.g. the area north of Anglesey and the Sarns in west Wales). Biogenic reefs, where the habitat is created by the animals themselves, are present within Welsh waters including blue mussel *Mytilus edulis* and horse mussel *Modiolus modiolus* beds as well as ross worm *Sabellaria spinulosa* and honeycomb worm *Sabellaria alveolata*. Historically however, extensive beds of native oyster existed across Welsh Seas in the last century which have been lost with the exception of some small remaining areas in Milford Haven.

Shelf subtidal habitats (those sedimentary habitats from the wave base depth outward to 200 m depth (UK National Ecosystem Assessment 2011) are rare within the Welsh marine plan areas due to the relatively shallow nature of the sea floor with a narrow band of gravels and mixed sediments being found along the western boundary of the Welsh marine plan areas (UKMMAS 2010b). Impacts on subtidal habitats are mainly as a result of removal or damage through demersal fishing activities. Pollution and introduction of invasive non-native species are also considered as concerns (UKMMAS 2010b).

Figure 18 Marine Annex 1 Habitats in Welsh waters

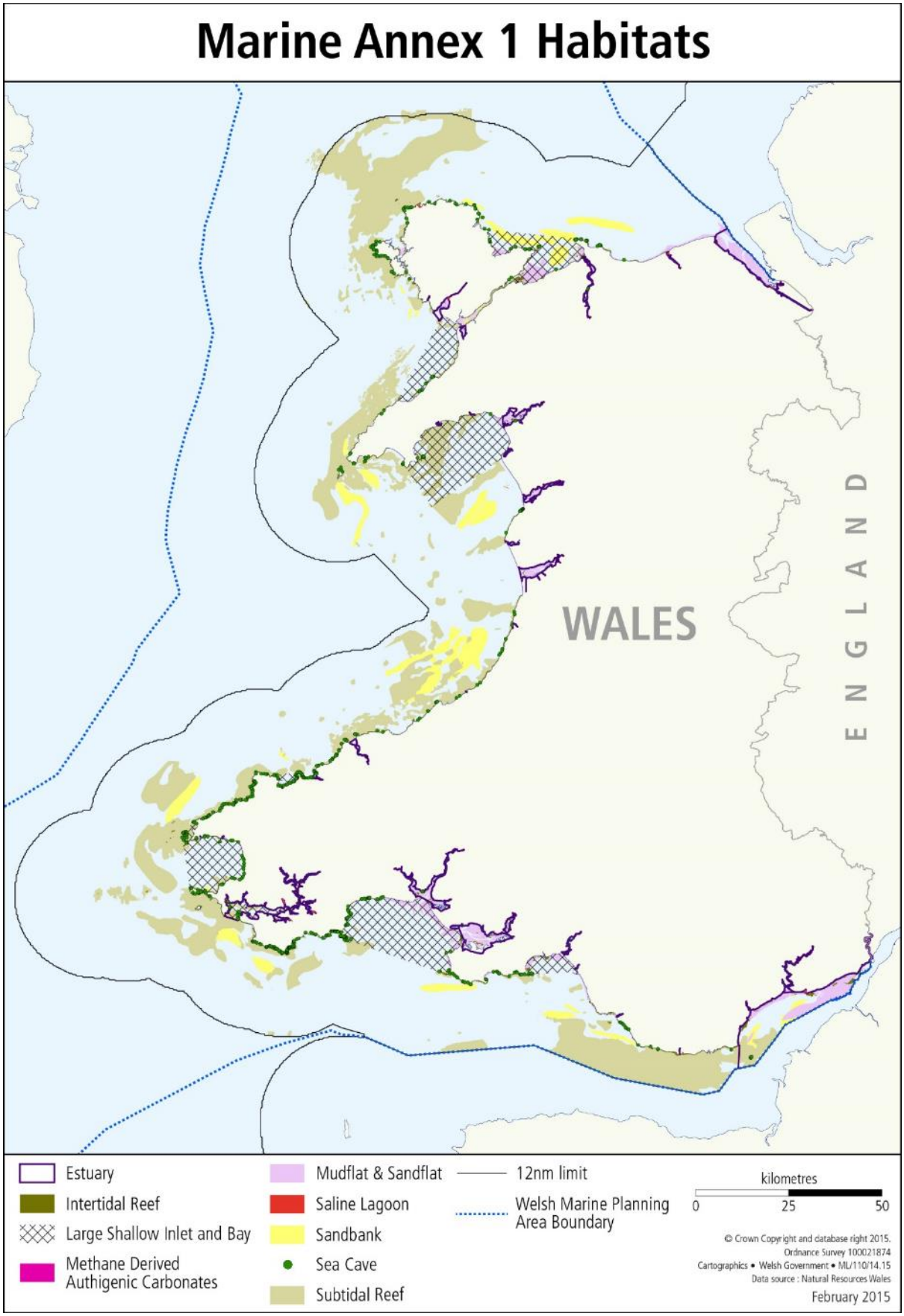
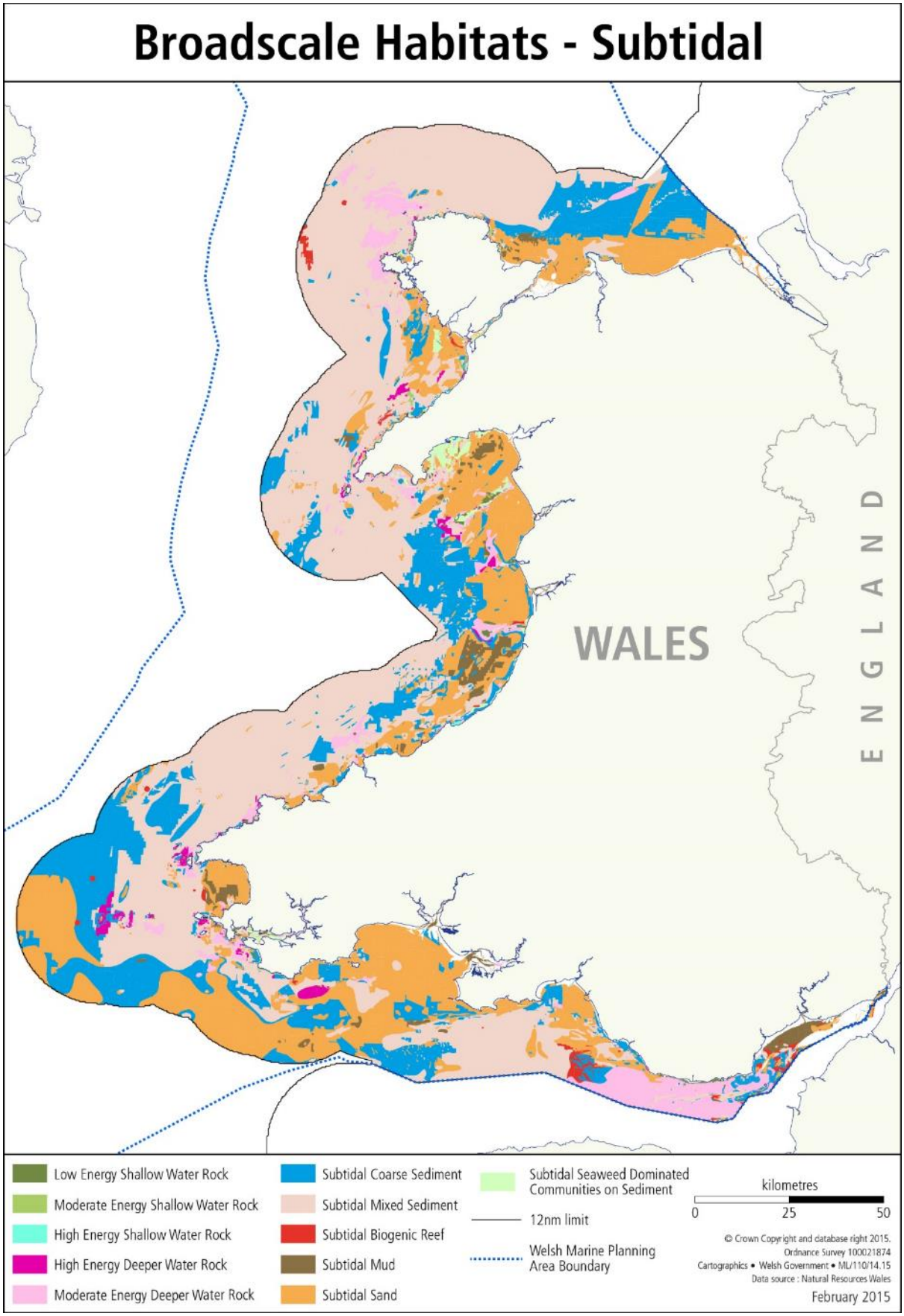


Figure 19 Map of Seabed Habitats for the Welsh coast



The many estuaries and headlands along the Welsh coastline significantly increase the length of the coastline and the opportunities for land-sea interactions, as well as introducing their own unique features to the overall nature of the Welsh marine plan inshore area. There is a wide range of different intertidal habitat types along the Welsh coastline ranging from sheltered to exposed rocky shore and a range of soft sediment shores. Muddy sediments, including mudflats exposed at low tide, are particularly prevalent in estuaries such as the Severn. Saltmarshes are also prevalent around the Welsh coastline (UKMMAS 2010b). Saltmarsh and intertidal sediment habitats have been heavily impacted by historical land claim, coastal defence and marine construction. Intertidal habitats adjacent to urban areas are very sensitive to coastal squeeze, where habitats have decreasing space between rigid coastal structures and rising sea level or coastal erosion (UKMMAS 2010b). Intertidal rocky habitats are widespread throughout most of Wales (UKMMAS 2010b). Patches of intertidal biogenic reefs, such as those built by the honeycomb worm *Sabellaria alveolata* are relatively common in Wales and have recently re-established on the North Wales coast after a long absence, possibly partly in response to warmer waters as a result of climate change. Biogenic reefs are important for stabilising marine sediments and providing habitat for other organisms. Man-made hard surfaces, such as coastal defences and harbour infrastructure, are also colonised by species found on rocky habitats (UKMMAS 2010b). It is possible that the associated infrastructure for the ongoing development of offshore renewable energy facilities (foundations, rock armour, piles, cables etc.) may increase the prevalence of rock habitat species (possibly at the expense of species associated with soft sediment habitats).

As part of the Defra MB0102 project, Earth Observations (EO) of oceanic fronts were used as a proxy for pelagic diversity (Brown et al. 2012). This applied the long time-series of sea surface temperatures from EO data to map frequently occurring thermal fronts within UK waters. Unlike most terrestrial and benthic systems, the pelagic ecosystem is not restricted by biotope boundaries such as reef edge or change in substrate, and is mobile (i.e. constantly changing). This variability is shown at a variety of spatial (area) and temporal (time frame) scales ranging from species fluctuations resulting from short-term changes (including weather) to seasonal cycles, inter-annual and long-term change (such as climate change). To show this variability, front maps were presented seasonally, with indications of both spatial and temporal variability (Miller et al. 2010).

Figure 20 Ocean front seasonal metrics for sample Irish Sea region: top – frequent fronts; middle – interannual variability; bottom – data quantity (from Miller et al. 2010).

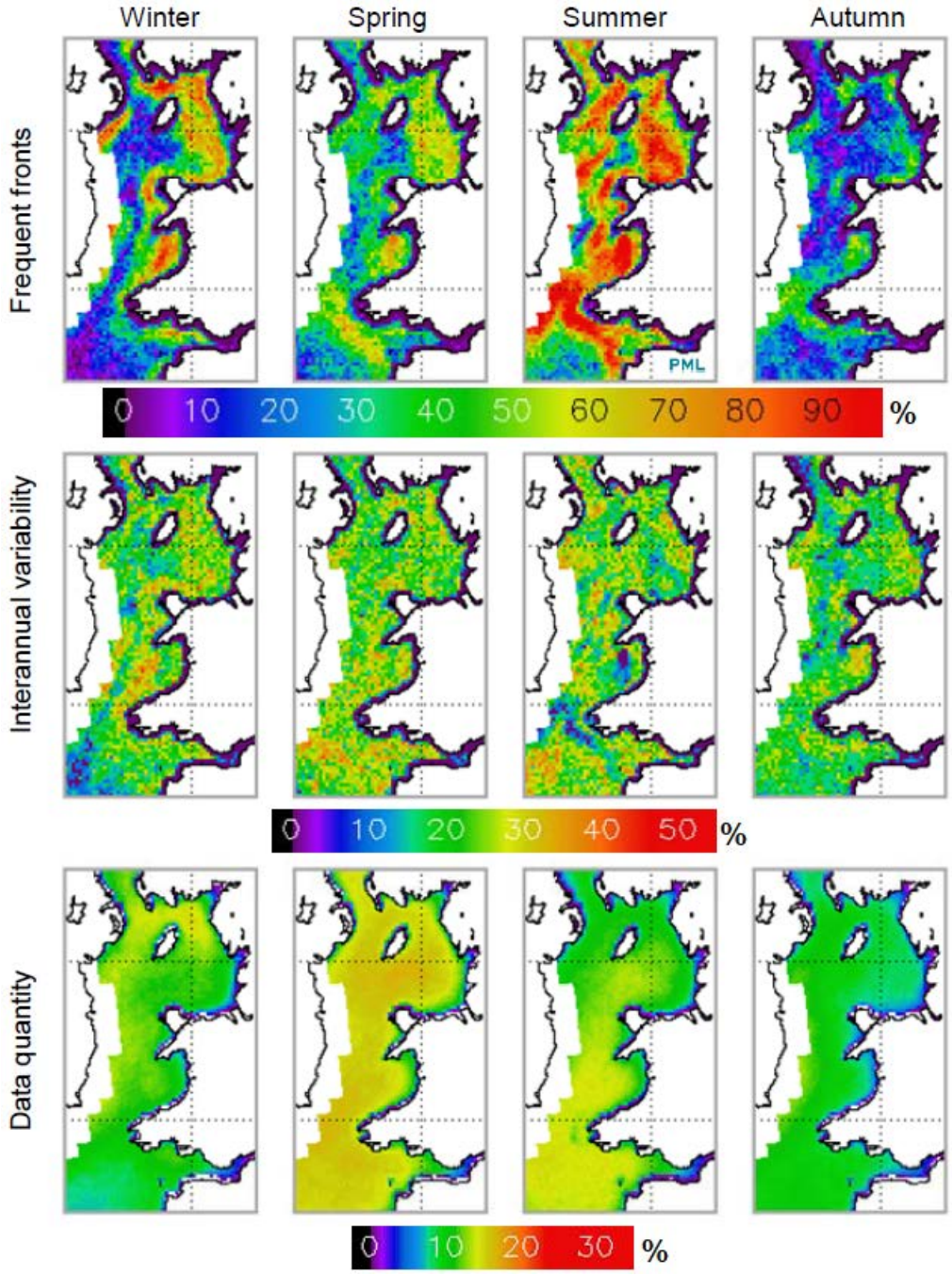


Figure 20 shows:

- Frequent front maps for each season represent the percentage of time that a strong front was observed at each location;
- Interannual standard deviation indicates the temporal variability in front locations;
- Data quantity was estimated using the cloud-free percentage of the available EO sea surface temperature data.

The illustrations in Figure 20 are not intended for scientific usage as it is only possible to accurately interpret and locate the front distributions in GIS resolution and format (Miller et al. 2010).

Primary and secondary productivity

Nearly half the Earth's basic food supply comes from photosynthesis performed by microbes and phytoplankton in the oceans (UKMMAS 2010b). Since they are the basis of the marine foodweb, changes in these primary producers transfer upwards through to higher trophic levels either directly or through their grazers, the zooplankton. Their success can potentially affect the size of fisheries, and the survival and success of such key species as sharks, turtles, seabirds and marine mammals in UK waters. Microbes and plankton are also sensitive indicators of environmental change at both the regional and global level; through various feedbacks they can both influence, and be influenced by, climate change.

<u>Plankton and Microbes</u>

Marine microbial and planktonic organisms play a key role in cycling nutrients that are essential for other marine organisms. Plankton is essential for sustaining many other food chains including for fish, sea birds and marine mammals. Through its presence and absence plankton regulate larval fish development and survival, and thus the success or failure of recruitment to the adult fish stocks (UKMMAS 2010b). Microbial cyanobacteria are responsible for up to 50% of primary productivity in UK waters, although this varies by region and season. However, there is still a lack of fundamental understanding of the complex roles they play (UKMMAS 2010b).

The plankton community in the Welsh marine plan areas contains warm-temperate Atlantic and offshore species and its composition is influenced by the region's hydrological regime (mixed in the winter and stratified in deeper areas during summer). Like the North-East Atlantic as a whole, plankton within the Irish Sea are primarily regulated by the sea's hydroclimatic regime (UKMMAS 2010b).

Long-term observations indicate that plankton as a whole is healthy and subject to few direct anthropogenic pressures (MMO 2013a). Research has shown the major influence in the distribution of plankton to be climate. Large-scale changes have occurred, linked to rising sea temperatures, which have resulted in a large increase in phytoplankton (plant) populations around the west of the UK (including the Welsh marine plan areas). However, the consequences of the feedback relationships with the wider ecosystem, fisheries and climate change are not clear (MMO 2013a).

Kelp

In the Atlantic, Smale et al (2013) noted that kelp primary production can be in excess of 1000 g C m^2yr^{-1} and from *Laminaria* species primary production has been estimated at between 110 and 1780 g C m^2yr^{-1}, while primary production from phytoplankton in coastal temperate regions is typically between 100 and 300 g C m^2yr^{-1}.

Subtidal kelp forests can be found around approximately 12,000 miles of the UK coastline with the majority of the Welsh coastline supporting kelp species (Smale et al. 2013). Their relative abundance is influenced by a range of abiotic (e.g. temperature, latitude, wave exposure, light levels, disturbance) and biotic (e.g. competition, grazing) factors.

Kelp forests are described as some of the most diverse and productive habitats on Earth due to the ecosystem goods and services they provide such as elevated secondary production, nutrient cycling, energy capture and flow, coastal defence, direct applications, and biodiversity repositories. Kelp modifies its environment; for example, kelps alter light, sediments, physical scour, and water flow for proximal organisms while providing structural habitat for a wide range of flora and fauna. Its canopy structure allows for a multitude of organisms to inhabit the forest due to the vertical stratification of biotic and abiotic factors.

In addition to primary production, kelp forests also provide benefits to coastal defence by providing a buffer against storm surges and dissipating wave energy, thereby reducing coastal erosion and reducing the movement of intertidal sediment from adjacent beaches. They provide a habitat for many species but also serve as a nursery ground for species, including Atlantic Cod (*Gadus morhua*), and attract commercially important species such as European sea bass (*Dicentrarchus labrax*), pollack (*Pollachius pollachius*) and conger eels (*Conger conger*) (Smale et al. 2013). Kelp forests also provide raw goods in the form of consumable foods; in the UK, non-kelp seaweeds have been consumed for more than 4000 years (Smale et al. 2013). An implication of the diversity found not

only within kelp forests but also around the Welsh coast is that carbon sequestration and secondary production can be naturally high, although calculating an accurate estimate can be difficult given the complex food webs and trophic levels.

Given the high biodiversity associated with the kelp forests, interaction with marine life is also considered as part of the ecosystem services they provide. There has been a consensus that interaction with marine life has considerable benefits for human health and wellbeing and has directly influenced cultural and economic activities for thousands of years; key recreational activities associated with kelp forests include snorkelling, scuba diving, free diving, kayaking, wildlife watching and angling.

Smale et al (2013) also highlighted that with emerging technologies and the increasing demand for non-fossil fuel based energy production, kelp could be used as a potential source for biofuel given its concentration of polysaccharides which can be metabolized and converted to ethanol.

Kelp forests have been noted to be resilient to changes to biotic and abiotic factors, however, given their habitat is coastal fringing habitats, they are subject to a number of threats and stressors including impacts from climate change, such as increased sea level rise and increased incidences of storminess, impacts at the land-sea interface such as pollution incidents or nutrient run-off and harvesting and cultivation of either the kelp itself or the marine life it supports could affect the community (Smale et al. 2013).

Fish

Dab (*Limanda limanda*), plaice (*Pleuronectes platessa*), solenette (*Buglossidium luteum*) and common dragonet (*Callionymus lyra*) are the most abundant species within the Irish Sea, along with large numbers of poor-cod (*Trisopterus minutus*), whiting (*Merlangius merlangus*) and sole (*Solea solea*) (Marine Institute, 2007).

Larger species such as thornback ray (*Raja clavata*) and spotted ray (*R. montagui*) are thought to have declined within the Welsh marine plan areas in recent years, whereas smaller species such as cuckoo ray (*Leucoraja naevus*) and small-eyed ray (*Raja microcellata*) may have increased (Dulvey et al., 2000; cited in UKMMAS 2010b). Small-eyed ray have also been observed in the Bristol Channel (Ellis et al., 2005a; cited in UKMMAS 2010b). Angel Shark was historically caught in some parts of the Irish sea but saw a large decline in the 1970s, however, recently there have been sightings in

some of the areas where they were once caught. Basking sharks (*Cetorhinus maximus*) are sighted each year in the Irish Sea, and this protected species can be found in association with the fronts that occur during the summer months (Sims et al., 2000; cited in UKMMAS 2010b). Common skate were once regularly caught in Welsh waters but their numbers have declined and, now, an occasional common skate is caught by Welsh boats fishing in the Celtic Sea but the last record from North Wales was a single fish in the early 1980s off Bardsey Island. Other pelagic sharks which occur in the area include blue shark (*Prionace glauca*), tope shark (*Galeorhinus galeus*) and porbeagle (*Lamna nasus*).

Given the proximity of the Welsh marine plan areas to the Atlantic Ocean, warm temperate and subtropical pelagic fish species are relatively commonplace (Stebbing et al., 2002 cited in UKMMAS 2010b). Several southerly species have increased in frequency of occurrence and / or relative abundance in recent years, including John dory (*Zeus faber*), black seabream (*Spondyliosoma cantharus*), anchovy (*Engraulis encrasicholus*) and boarfish (*Capros aper*) (Pinnegar et al., 2002 cited in UKMMAS 2010b). Triggerfish (*Balistes capriscus*) experienced a dramatic increase in abundance in the region and this species has continued to be relatively abundant along Welsh coasts. Some southerly species have, however, decreased in abundance during the second half of the 20th century. Red seabream (*Pagellus bogaraveo*) were historically common but few were recorded during surveys in the later 1980s and 1990s (UKMMAS 2010b).

The inshore grounds are generally sandy with flatfish, tub gurnard (*Trigla lucerna*) and sand gobies (*Pomatoschistus minutus*) all abundant. Inshore sandbanks along the Welsh coast have been identified as possessing a distinctive community typified by low species diversity and shared indicator species such as lesser weeverfish (*Echiichthys vipera*) (see Kaiser et al., 2004; cited in UKMMAS 2010b).

Further offshore, the grounds become coarser and spotted ray (*Raja montagui*), cuckoo ray (*Leucoraja naevus*), lesser-spotted dogfish (*Scyliorhinus canicula*), red gurnard (*Chelidonichthys cuculus*) and thickback sole (*Microchirus variegatus*) dominate the fish assemblage.

Carmarthen Bay, an extensive sandy area between Pembrokeshire and the Gower Peninsula, is an important nursery ground for flatfish and the sandbanks within this are characterised by sand sole (*Solea lascaris*) and lesser/greater sandeels (*Ammodytes tobianus*/ *Hyperoplus lanceolatus*) (UKMMAS 2010b). Spurdog (*Squalus acanthias*), Herring (*Clupea harengus*), Cod (*Gadus morhua*),

Whiting (*Merlangius merlangus*), Sandeels (Ammodytidae) and sole (*Solea solea*) have nursery grounds off the North Wales coast, Liverpool Bay and northern Irish Sea with plaice (*Pleuronectes platessa*) nursery grounds off north Wales and the central parts of the northern Irish Sea (Ellis et al. 2012).

The Severn Estuary and Bristol Channel support one of the most diverse fish assemblages in the UK (UKMMAS 2010b). More than 110 species of fish have been recorded, however, fewer than 10 species make up 90% of all the fish in the samples (Bird, 2008; cited in UKMMAS 2010b), consisting of both fully marine and predominantly estuarine species. Migratory fish found include sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*), salmon (*Salmo salar*), European eel (*Anguilla anguilla*), twaite shad (*Alosa fallax*) and allis shad (*Alosa alosa*). Many marine fish use the Bristol Channel and Severn Estuary as a nursery ground and show sequential seasonal changes in abundance (Bird, 2008; cited in UKMMAS 2010b).

Southerly species such as Trigger fish which were seen in large numbers in the 1960s and 1970s but declined in the late 1970s / early 1980s are now increasing in numbers again. The large Black seabream which were regularly caught in the early 1970s by anglers decreased in size and numbers in the early 1980s but seem to be increasing in size and numbers again recently.

The MSFD initial assessment (HM Government 2012) highlights that all parts of the marine fish community have been impacted by human activities, most notably through the direct extraction by commercial fishing. There has been a substantial increase in the number of fish stocks that are harvested sustainably over the period 2000-2011 but there is some way to go before the majority of commercial fish stocks are at safe levels.

There are particular concerns over the populations of several fish species that remain severely depleted with respect to the population sizes that are known to have existed 50 or 100 years ago. These include many deep-water fish species – sharks, rays and skates – as well as diadromous fish species, such as the European eel and salmon, which move between fresh and salt water during their life cycle (MMO 2013a). Many of these species have been recognised as threatened under international conventions and listed in need of protection under legislation.

Species of conservation interest in the area include shad *Alosa* spp., lampreys and common skate (*Dipturus batis*). Many of the rivers in the area are also important for European eel (*A. anguilla*) and

Atlantic salmon (*S. salar*). Salmon populations in most Welsh rivers have experienced some improvement over the past ten years, although many still 'fail' to meet stated conservation limits or show 'uncertain' signs of recovery. Although salmon have been returning strongly to some historically polluted rivers there is concern about chronic environmental degradation in others, mainly in rural areas, caused by changing land use practices, especially agriculture and forestry. The relative importance of these effects varies around the principality, but clusters of high pesticide levels have been found in some Welsh upland streams, and acidification still occurs in northern Wales (UKMMAS 2010c).

Of the 22 Welsh rivers monitored, the Conwy is the only one that has been deemed to have 'passed' stated salmon conservation limits (UKMMAS 2010b). There have, however been reductions in the abundance of some species, for example whiting (*M. merlangus*), hake (*Merluccius bilinearis*) and lumpsucker (*Cyclopterus lumpus*) and this reflects depleted populations in the wider Celtic Sea, as indicated by fisheries stock assessments (UKMMAS 2010b).

In contrast to declining fish stocks, there have also been improvements noted in fish communities in estuaries as a result of improved water quality (reduction in industrial activity), climate change (increasing water temperature), increased freshwater discharge and reduced fish mortality as a result of power station closures. Additional pressures on fish include the removal of non-target fish (predators, prey or competitors) and the physical impacts of fishing gear on essential habitats (MMO 2013a). Although, records from anglers have shown that the flounder in estuaries in Wales have seen a reduction in their numbers and size.

Marine Mammals and Turtles

Welsh waters are home to both seals and cetaceans (whales, dolphins and porpoises). Twenty species of marine mammal (18 species of cetacean and 2 species of seal) have been recorded in Welsh waters since 1990 (Baines and Evans 2012). Of these, the five regular and relatively common cetacean species occurring in Welsh waters are the bottlenose dolphin (*Tursiops truncatus*), Risso's dolphin (*Grampus griseus*), short-beaked common dolphin (*Delphinus delphis*), harbour porpoise (*Phocoena phocoena*) and minke whale (*Balaenoptera acutorostrata*). Rare sightings and strandings of other cetaceans such as long-finned pilot whale (*Globicephala melas*), fin whale (*Balaenoptera physalus*) and killer whale (*Orcinus orca*) have been recorded, although these remain scarce (Reid et al. 2003; Baines and Evans 2012).

Most cetaceans found in Welsh waters are part of much larger and more widespread populations, and they are highly mobile species. In order to ensure the best possible conservational outcomes for these mobile species, work has been undertaken at both an international level (ICES Working Group on Marine Mammal Ecology) and national level (Inter-Agency Marine Mammal Working Group, comprising NRW, JNCC, Natural England and Scottish Natural Heritage) to define Management Units (MUs) for different species. These management units are based on current understanding of biological populations and any ecological differentiation within these populations, with boundaries defined politically (i.e. between different countries) or defined as a result of human activities. Therefore, while using best knowledge to define units using biological information, there are some artificial divisions of biological populations (Inter-Agency Marine Mammal Working Group 2013). For the six most common species in Welsh waters, management units have been defined as follows:

- Harbour porpoise – part of the Celtic and Irish Seas MU.
- Bottlenose dolphin - part of two MUs; the Irish Sea and the Channel and south west England.
- Common dolphin – part of the sole MU comprising all UK waters and encompassing all North Sea waters, including other countries.
- Risso's dolphin – part of the sole MU comprising all UK waters and encompassing all North Sea waters, including other countries.
- Minke whale – part of the sole MU comprising all UK waters and encompassing all North Sea waters, including other countries.
- Grey Seal- part of the West England and Wales MU

Charting Progress 2 concluded that the status of the five most abundant cetacean species in UK waters (harbour porpoise, bottlenose dolphin, white-beaked dolphin, fin whale and minke whale) was favourable (noting that the assessment for Welsh SACs has not yet taken place), taking into account the 2007 UK Favourable Conservation Status (FCS) assessments under the EU Habitats Directive (UKMMAS 2010b; JNCC 2013). The status of other species was either unknown or the species were considered rare or vagrant (JNCC 2007).

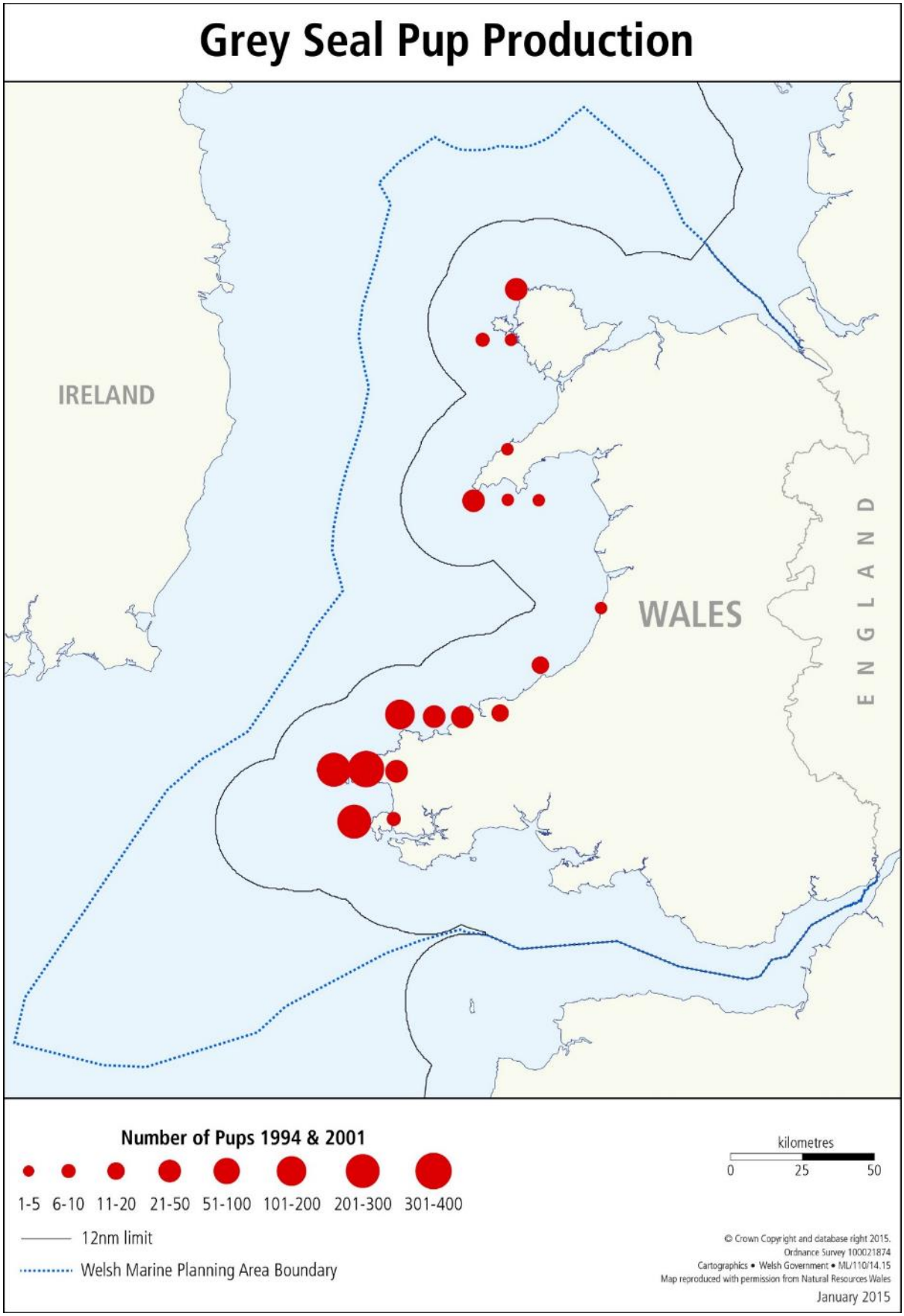
The grey seal (*Halichoerus grypus*) and the common (also called harbour) seal (*Phoca vitulina*) are the two resident seal species in the UK. The majority of the UK seal populations are located in Scotland but haul out sites (both breeding and non-breeding) exist for grey seals along the whole of the Welsh coastline. Important breeding sites of grey seals occur on Ramsey Island, Skomer Island, along the North Pembrokeshire mainland coast, the Llŷn Peninsula and the North Wales coastline, including Bardsey Island and Anglesey (Figure 21). However, much of the information concerning breeding sites gathered elsewhere in the UK is by aerial surveys, which is problematic in Wales as

more than half the seals here are born in cryptic habitats such as sea caves and are not seen by aerial techniques; difficult ground counts are therefore required (Westcott and Stringell 2003; 2004; Strong et al. 2006; Boyle 2012; Stringell et al. 2013). Grey seal pup production in Wales is estimated at 1,650 and the UK population trend is thought to be increasing (SCOS 2013). Management Units have been defined for both the grey (south and west England and Wales) and common seal (west England and Wales) (Inter-Agency Marine Mammal Working Group 2013). There are no major harbour seal haul out sites (breeding or non-breeding) in the Welsh marine plan areas (SCOS 2013).

The leatherback turtle (*Dermochelys coriacea)* is the only marine turtle species that is believed to undertake deliberate seasonal migratory movement to UK waters to feed on gelatinous zooplankton prey (such as the jellyfish *Rhizostoma octopus*). While sightings for this species are relatively rare around the UK, there does appear to be hotspots for sightings in Wales (particularly off Carmarthen Bay and Tremadoc Bay) possibly related to jellyfish aggregations (Houghton et al. 2006). Three other species of turtle (loggerhead (n=123), Kemp's ridley (n=28) and green (n=5) turtles) have occasionally been recorded in UK waters since 1910 (Witt et al. 2007b). In 2013 only one Kemp's ridley, three loggerhead, 21 leatherback and five unidentified turtle species were reported (Penrose and Gander 2014). Sea surface temperature and surface currents are likely to influence these sightings, but there are also possible links to nesting and hatching success (University of Wales Swansea and University College Cork 2006; Witt et al. 2007a; 2007b; UKMMAS 2010c).

In general, and not specific to Welsh waters, fishing activities are identified as a key pressure on marine mammal populations through removal of prey species, damage to the habitat that the prey depends upon and bycatch. Bycatch and entanglement in fishing gear are a large anthropogenic cause of cetacean and seal mortality in UK waters (UKMMAS 2010b). Marine mammals are also vulnerable to underwater noise, pollution and climate change. Sources of anthropogenic noise include shipping, sonar, seismic exploration, wind farm construction and acoustic deterrent (ADDs, also known as pingers) or harassment devices (AHDs, including seal scarers) (Nowacek et al. 2007). Currently, noise from wind farm construction (piling) is a major concern and the expansion of the renewable energy industry is of concern as it will likely increase noise disturbance throughout Welsh and UK waters (currently no Round 3 wind farms are being developed in the Welsh waters, however, the development of a greater number of smaller wind farms could also be a cause for concern with regards to underwater noise). Associated with this expansion is the possibility of an increased risk of collision with vessels and adverse interactions with wave and tidal devices (UKMMAS 2010b). The cumulative impact of pressures is also of concern and may affect the long-term viability of some species (HM Government 2012).

Figure 21 Grey Seal breeding grounds in Welsh waters



Marine Birds

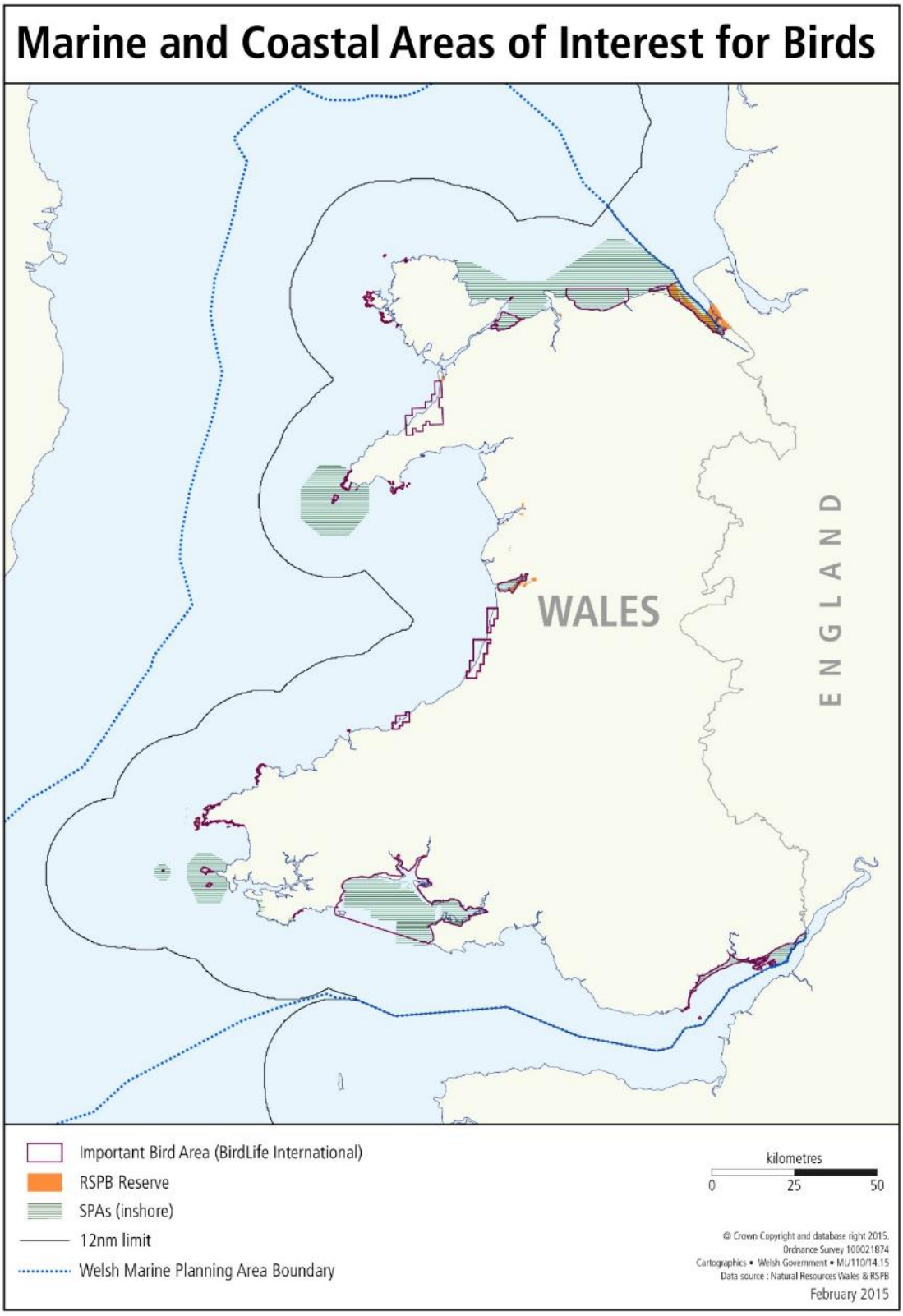
Large numbers of sea and water birds are present in Welsh waters all year round, with others being seasonal visitors, for breeding or over-wintering.

Most seabirds spend the majority of their lives at sea, but some stay in inshore waters (such as Terns, Gulls, Great Cormorant and European Shag) and others venture much further offshore and beyond the shelf-break, even during the breeding season. Waterbirds occur in large aggregations where food is abundant (such as in and around estuaries), with most internationally important aggregations occurring during spring and autumn migrations or during winter.

Important areas for seabirds and waterbirds occur within and adjacent to the Welsh marine plan areas, with 6 sites designated as Special Protection Areas (SPAs) under the Birds Directive for which seabirds and waterbirds are qualifying features. Two of these SPAs which fall within the Welsh marine plan areas are wholly marine: Carmarthen Bay SPA, classified for its internationally important wintering population of Common Scoter (*Melanitta nigra*), and Liverpool Bay SPA, classified for internationally important wintering populations of Common Scoter and Red-throated Diver (*Gavia stellata*). Within the Welsh marine plan areas, there are four SPAs for the protection of two of these species: Liverpool Bay SPA for Red-throated Diver, and Burry Inlet SPA, Severn Estuary SPA and the Dee Estuary SPA for Common Shelduck.

Within Welsh waters, Common Scoter are found in large flocks in embayed areas in winter and spring. The islands around Pembrokeshire, in particular, hold large colonies of Manx Shearwater (*Puffinus puffinus*), Puffins (*Fratercula arctica*), particularly in the breeding season, and Gannet (*Morus bassanus*). Guillemot (*Uria aalge*) and Razorbill (*Alca torda*) are seen throughout the year, but are most numerous during the breeding season (Figure 22). Common Terns (*Sterna hirundo*) are common in the summer whilst Gulls (*Laridae*) and Kittiwake (*Rissa tridactyla*) are common throughout the year (Stone et al. 1995).

Figure 22 Important bird areas in Welsh waters



Numbers of seabirds breeding in the UK as a whole increased from around 4.5 million in the late 1960s to 7 million by the end of the 1990s (this was as a result of increased protection from hunting and persecution in the UK and overseas). Recent downward trends in breeding success of seabirds in the northern Celtic Seas are of concern (MMO 2013a). Pressures such as climate change, fishing activity (on prey species) and the introduction of non-indigenous mammal species (such as North American mink, near breeding colonies), have caused substantial declines in bird numbers in both inshore and offshore seabirds (MMO 2013a). On Skomer, Skokholm and Middleholm island managers, visitors and boat owners / operators work to Island Management Plans to deal with the threat of reintroduction of rats and other ground predators (e.g. feral cats) to ensure that the islands remain rat free. Of those waterbird species that breed in internationally important numbers in the UK, only five predominantly forage in the marine environment during the breeding season (Red-throated Diver, Common Shelduck (*Tadorna tadorna*), Common Eider (*Somateria mollissima*), Ringed Plover (*Charadrius hiaticula*) and Pied Avocet (*Recurvirostra avosetta*) (MMO 2013a).

Invasive non-native species

Invasive non-native species are described as '*organisms introduced by man into places outside of their natural range of distribution, where they become established and disperse, generating a negative impact on the local ecosystem and species*' (IUCN 2011). The ecological impacts of such 'biological invasions' are considered to be the second largest threat to biodiversity worldwide, after habitat loss and destruction. In the last few decades marine and freshwater systems have suffered greatly from invasive species as a result of increased global shipping (Carlton and Geller 1993).

There are currently considered to be 16 species of non-native marine plants and 32 species of animals recorded on Welsh coasts (Oakley Intertidal 2009). Natural Resources Wales maintains comprehensive records and GIS layers of invasive non-native species for Wales. A number of these are described in Table 8.

In addition, non-native mammalian predators, e.g. American mink (*Mustela vison*) can impact on seabirds through depredation of seabird eggs, chicks and adults leading to reductions in breeding success, breeding numbers and eventual extinction of whole colonies. Impacts are greatest on species that nest on the ground or in burrows since they are less able to avoid predation by nesting in locations that are inaccessible to mammals (UKMMAS 2010b).

Table 8 Selected non-native species present within the Welsh marine plan areas

Species	Characteristics	Distribution
American slipper limpet (*Crepidula fornicata*)	Competes for food and space with other filter-feeding species, such as native oysters, *Ostrea edulis* and has been known to displace mussel beds.	Present along the Welsh coast from the Severn Estuary to Cardigan Bay
Barnacle (*Elminius modestus*)	Competes with other shallow water barnacles for space as it is able to settle at higher levels of the shore as well as deeper into subtidal levels than other barnacles.	Distributed around most Welsh coasts
Pacific oyster (*Crassostrea gigas*)	Forms dense aggregations, excluding other species and altering habitats.	Recorded along the Welsh coastline, originating in Conwy, North Wales (JNCC)
Chinese mitten crab (*Eriocheir sinensis*)	Impacts native species through predation of invertebrate species and the eggs of fish, and competition for space. Also burrows into river banks, increasing erosion and river turbidity, and causing bank collapse.	River Dee in North Wales
Leathery sea squirt (*Styela clava*)	A large organism that can achieve high densities and cause fouling to ships.	Recorded in marinas and shallow artificial structures along the Welsh coastline
Sea squirt (*Botrylloides violaceus*)	Colonies can overgrow and displace other sessile fauna and occupy substantial space.	Well established in harbours and marinas along the south coast of England, and in Milford Haven (Wales)
Wireweed (*Sargassum muticum*)	Out-competes native species of seaweeds and seagrasses forming dense assemblages and potentially altering community structure.	Distributed along the Welsh coastline from Swansea Bay round to East Anglesey
Green sea fingers (*Codium fragile* subspecies *tomentosoides*)	Out-competes native species of seaweeds and can become the dominant canopy species, potentially altering community structure.	Established in Wales

(Source: GB Non-Native Species Strategy Secretariat website (GBNNSS 2014)*)*

Trends and historical changes in the Marine Environment of Wales

A report to WWF Wales (Gubbay 2009) uses selective examples from the literature over a 200 year period to describe high level trends in the state of marine wildlife and habitats. Gubbay (2009) concludes that inconsistencies in data and its interpretation within the historic records reviewed creates constraints which makes it difficult to determine what changes may have taken place and to be precise about the scale of such changes in the abundance, distribution, extent and population structure of species and habitats found today compared to those of several centuries ago. However, despite these constraints it is possible to see that changes have occurred and that in some cases these are significant. Table 9 is taken from Gubbay (2009) and provides an overview of the changes and contributing factors for the selective species and habitats listed.

Table 9 Trends in marine wildlife and habitats (from Gubbay (2009))

Species / Habitat	Geographic range/extent	Abundance	Notes
Oysters	↓	↓	Over exploitation and disease in the late 1800s led to the decline. This is despite cultivation and import from elsewhere
Cockles	Similar?	Variable	Changes in harvesting methods have enabled much larger quantities to be collected in recent decades. Large die off in some areas in the last few years with the reasons under investigation.
Edible mussel	Large artificially laid beds	↑	Most of the mussel industry now supported by 'laid' beds taking seed mussel from the wild
Herring	↓	↓	Variable but by the mid-20th century over exploitation and economic factors led to the demise of the fishery.
Skates & rays	↓	↓	Taken in directed fisheries and bycatch. Common Skate commercially extinct in the Irish Sea.
Sturgeon	↓	↓	Habitat damage especially the obstruction of migration routes and pollution of lower river reaches probably the major factor.
Basking shark	Similar?	Similar?	Continues to be an occasional visitor to waters around Wales
Sharks	?	?	Catch records grouped. Difficult to assess for any single species
Cetaceans	Similar?	↓ ?	Anecdotal reports suggest harbour porpoise were much more common. Changes in prey species as well as incidental damage in some types of fishing gears are believed to have affected their status.
Crustaceans	Similar?	?	Large catches but with no catch/effort data difficult to determine
Oysters - Mumbles	↓	↓	Former oyster beds no longer present
Crustaceans - Bardsey	?	?	No data but anecdotal reports of significantly lower numbers
Seabirds - gannets	↑	↑	On Grassholm a dramatic increase
Seabirds - puffins	↓	↓	On Grassholm a decrease possibly due to habitat damage caused by the extensive burrowing by the birds. On Puffin Island a decrease brought on by the accidental introduction of rats to the island
Subtidal habitats - modiolus	↓?	↓?	Large numbers of shells dredged up from some locations. Some beds know to have been lost but full extent difficult to determine
Subtidal habitats - red wharf bay			Significant changes thought to reflect natural variability and significant single events such as cold weather, plankton blooms.
Intertidal habitats - Porth Maddog	↓		Large area of estuarine mudflats lost following construction of the cob
Intertidal habitats - Milford Haven	↓		Significant changes in many of the smaller channels (marinas, enclosure). Construction out into the channel

Key: ↓ decrease; ↑ increase.

The Skomer monitoring reports (see http://www.ccgc.gov.uk/landscape--wildlife/protecting-our-landscape/special-landscapes--sites/protected-landscape/marine-nature-reserves/skomer-mnr-report/skomer-mnr-report-page-2.aspx) also contain relevant evidence on species and habitat trends.

4.2.5 The future

Geodiversity

The primary implications for geodiversity around the Welsh coast in the future are seabed development (e.g. aggregate dredging), new infrastructure development (e.g. offshore wind farms and tidal barrages/lagoons), flood defences and climate change, although apart from major estuarine barrages, none of these developments are likely to have the potential to affect coastal processes beyond the local scale.

The MPS states that '*a secure, sustainable and affordable supply of energy is of central importance to the economic and social well-being of the UK*'. The marine environment is therefore expected to make an increasingly major contribution to the provision of the UK's energy supply and distribution in the future. This includes a growing contribution from renewable energy, predominantly through offshore wind farms and tidal power. Such future seabed and infrastructure development has the potential to significantly alter the hydrodynamic (i.e. tides, currents and waves) and sediment (i.e. transport and morphology) regimes within both estuarine and coastal environments around the Welsh coastline; which may inherently have an additional impact on other receptors, i.e. marine ecology. As such, any future marine developments will need to be appropriately considered, with any impacts to the physical environment minimised and appropriately mitigated in order to achieve sustainable development.

Changes to mean sea level (i.e. sea level rise) and the wave climate are key factors that might occur as a result of climate change. The primary source of climate change information is the UK Climate Change Impacts Programme (UKCIP) and the most recent predictions are from UKCP09 (Lowe et al. 2009). UKCP09 projections up to 2100 for a medium emissions scenario (95%ile) suggest that relative sea level (RSL) could rise by around 0.6 m along the Welsh coastline (with some spatial variability from north to south). A general increase in RSL may result in a number of effects, such as, displacing the high water mark towards the coast and enabling wave energy to move further towards the coast; thus exposing the shoreline to greater periods of wave and tidal energy, and increasing the potential for coastal erosion. UKCP09 also includes projections of the likely future

wave climate. Over the 21st century, climate changes may influence the frequency and magnitude of storms as well as their direction. Along the Bristol Channel, for example, mean winter and summer significant wave heights are projected to increase by up to approximately 0.3 m by 2100. Whilst this increase is relatively insignificant when compared with the general inter-annual variability in present day wave conditions, such increases may lead to increased coastal erosion in more sheltered environments (i.e. shallow embayments) around the Welsh coast.

It should be noted, that, as with any modelling, there are uncertainties with the UKCP09 projections arising from three principle causes: natural climate variability; modelling uncertainty i.e. we do not have a complete understanding of the Earth system processes and their imperfect representation in climate models; and uncertainty over levels of future greenhouse gas emissions. UKCP09 projections have, however, attempted to quantify these uncertainties by using probabilistic climate change projections whereby the projections of future change in climate (relative to a baseline period) assign probability levels to different climate change outcomes (more information can be found in the UKCP09 Briefing Report at: http://ukclimateprojections.metoffice.gov.uk/22530).

Sea level changes are not consistent across Wales because of isostatic rebound (Welsh Government 2011c). While the north Wales coastline shows little movement, Cardigan Bay is sinking by about 0.4 mm/year. The south Wales coastline is sinking by approximately 0.5 mm/year around St. Brides Bay to about 0.8 mm/year around Newport. This means that around Newport, for example, relative sea levels are currently increasing by about 4 mm/year.

Although climate change is a major contributor when considering the future status of the geodiversity of the marine environment, it should be noted that decisions made as part of the wider planning process could also potentially impact marine habitats and species (for example their extent, distribution and / or their condition) and as such would need to be assessed in an appropriate manner such as EIA or HRA (see section 1.5.2 and4.2)

Marine ecology and biodiversity

The future status of marine ecology and biodiversity features over the next 20 years is difficult to predict given the wide range of pressures on them and our lack of knowledge on the interactions between species and habitats. The implementation of the MSFD alongside, for example, the Habitats Directive, Birds Directive and Common Fisheries Policy will seek to ensure that the GES indicators relating to marine ecology and biodiversity are achieved. Delivery of these objectives,

however, will be dependent on an improved understanding of the interactions between human use and marine biodiversity. However, despite the introduction of any new management measures, changes are still predicted to occur. Climate change is likely to impact all aspects of marine ecology and biodiversity through sea level rise, increased sea temperatures and ocean acidification including:

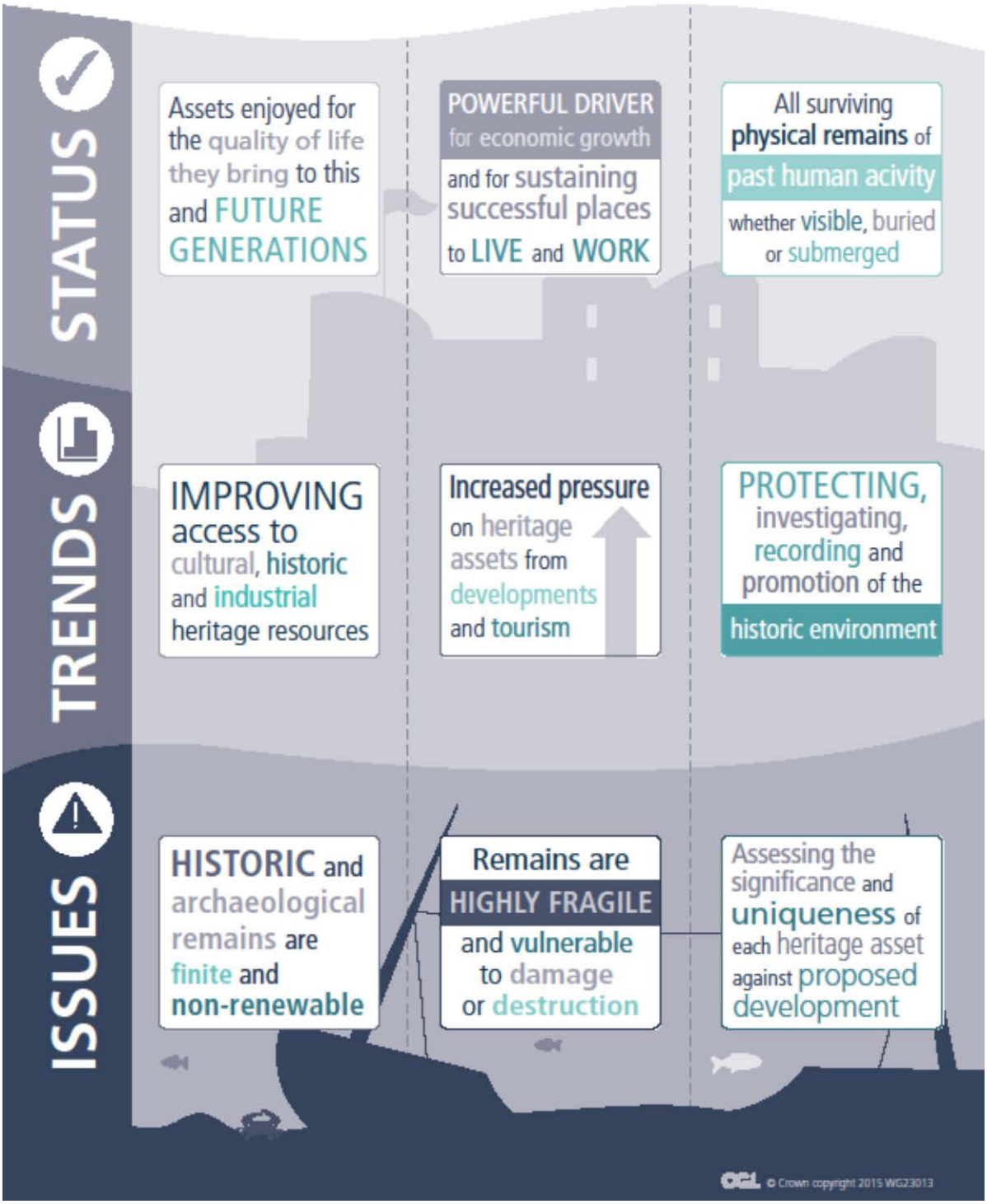
- Habitat loss;
- Changes in benthic community structure;
- Changes in plankton biodiversity and overall biomass;
- Changes to fish distribution, timing of migration and reproduction, recruitment and growth rates;
- Indirect changes to prey abundance and distribution for marine mammals and birds; and
- Increasing the geographic range of non-native species.

In addition, future changes to marine ecology and biodiversity are closely linked to the ongoing and future anthropogenic activities described in section 4.2 of this report.

Marine Protected Areas

The 125 MPAs in Wales make a significant contribution to an ecologically coherent network. It is recognised that Wales needs to strengthen its SPA contribution to the network which includes looking at inshore aggregations of non-breeding waterbirds and offshore seabird aggregations. This work is being considered from a UK perspective to ensure all suitable territories for seabirds are identified. The species being considered as part of this work include the Manx shearwater, Red-throated diver, Arctic tern, Sandwich tern and Little tern. Wales, working with the rest of the UK, is undertaking a stock take of existing and planned MPAs to inform our understanding of the network around the UK. The Welsh Government will use the outcome of this work to determine whether there is a need for any additional MPAs in Wales.

HISTORIC ENVIRONMENT



4.3 Historic Environment

4.3.1 Overview and background

The Marine Policy Statement (MPS) highlights the importance of the historic environment as an asset of social, economic and environmental value, not only for its cultural value, but as '*a powerful driver for economic growth, attracting investment and tourism and sustaining enjoyable and successful places in which to live and work*.' In addition, the MPS states that the UK Administrations shared view is that '*heritage assets should be enjoyed for the quality of life they bring to this and future generations, and should be conserved through marine planning in a manner appropriate and proportionate to their significance*' (Welsh Office 1996; Welsh Government 2014b).

The historic environment from a marine planning perspective has been defined by the MPS as comprising '*all aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged*'. It also defined 'heritage assets' as elements of the historic environment including: buildings, monuments, sites or landscapes that have been positively identified as holding a degree of historical 'significance'.

The MPS document also outlines that the coastal / intertidal zones and inshore / offshore waters may include designated heritage assets such as:

- Scheduled Ancient Monuments (designated under the Ancient Monuments and Archaeological Areas Act 1979);
- Protected Wreck Sites (designated under the Protection of Wrecks Act 1979);
- Sites designated under the Protection of Military Remains Act 1986; and
- Sites designated as World Heritage Sites (these are non-statutory designations).

They may also include listed buildings and conservation areas under the Planning (Listed Buildings and Conservation Areas) Act 1990 and registered parks, gardens and landscapes of special historic interest.

The archaeological remains are finite and non-renewable and in many cases, particularly in the coastal, intertidal and marine zone, are highly fragile and vulnerable to damage and destruction. The assets vary in state of preservation and appeal to the public.

In addition to the 'risk' factors to designated heritage assets associated with offshore development, erosion, and climate change, there is also a concern that many recorded heritage assets that are not currently designated as a scheduled ancient monument or protected wreck site, may be of greater or equivalent archaeological significance to those that have been designated (MMO 2013b). This lack of a designation may be as a result of one or more of several factors such as the lack of understanding, lack of research or simply not appreciating the significance. This becomes particularly pertinent with submerged sites where designation can be resource intensive. However, these very sites and their setting is an important consideration in the protection and planning process.

4.3.2 Key issues for Marine Planning (Historic Environment)

The potential future issues that will arise in relation to the protection of heritage assets are likely to include the effects of new infrastructure development or activities on existing coastal, intertidal, and marine heritage assets and the wider historic marine environment. Furthermore, the effects of increased footfall on the coastal historic environment and heritage assets may contribute to the damage of these sites and, in turn, the tourist economy. As stated, the effects of coastal erosion and damage caused by the sea to heritage assets, both positive (in uncovering) and negative (in abrasion) are also a consideration.

The MPS states that development and implementation of marine plans should take into account the available evidence in relation to the significance of any heritage assets (or the potential for such heritage assets to be discovered) and consider how they are managed. The said evidence would be available from regulators and advisors, including Cadw, the Royal Commission on the Ancient and Historical Monuments of Wales and the local planning authority's archaeological advisors, which includes the four regional Archaeological Trusts. Marine plans should also take into account the historic character of the plan areas, with particular attention paid to the landscapes and groupings of assets that give a distinctive identity. This highlights the importance of assessing the 'setting' and uniqueness of each heritage asset when assigning 'significance' value.

The effects of renewable energy development and cable landfalls on the historic environment and its tourism / visitor attractions are also a concern for the future as this industry expands. A recent guidance document produced by English Heritage (Firth 2013) in conjunction with Historic Scotland and Cadw aims to provide an introduction to the issues involved in wave and tidal energy and presents guidance on specific planning issues associated with the historic environment. It is

important that particular consideration is given to developments that might affect the historic environment and to ensure that adequate mitigation is put in place.

4.3.3 Current policy (Historic Environment)

The organisations involved in the Welsh national marine planning process, from the perspective of both assessing and protecting the marine / coastal historic environment, are:

- Cadw (the Welsh Government's historic environment service which works to conserve and protect the historic environment and to promote regeneration through heritage);
- The Royal Commission on the Ancient and Historical Monuments of Wales (an investigation body and national archive for the historic environment of Wales; its primary remit is to ensure that Wales's archaeological, built and maritime heritage is authoritively recorded, to promote the understanding and appreciation of this heritage nationally and internationally);
- The four Welsh Archaeological Trusts (Dyfed, Glamorgan and Gwent, Gwynedd, and Clwyd-Powys provide a regional archaeological service across Wales and are charged with the protection, investigation and recording and promotion of the historic environment of Wales and provide archaeological advice); and
- Natural Resources Wales (NRW) (responsible for identifying, recording and monitoring the character, qualities and distinct identity of historic and cultural landscapes across Wales and determining applications for marine consents).

Currently, the existing working framework of statutory and non-statutory functions in relation to marine planning, involves heritage protection being administered by Cadw, practical heritage management undertaken, generally, by the Welsh Archaeological Trusts (on behalf of the relevant local planning authority) with the Royal Commission providing a curatorial role (managing the National Monuments Record). Heritage protection decisions which include the scheduling of monuments of national importance, listing of buildings of special architectural or historic interest, registration of parks, gardens and landscapes, and the designation of wreck sites are all taken by Cadw.

There are four tiers of legislation concerned with the protection of the historic environment in the Welsh coastal, intertidal and marine zones. These comprise International policy, European policy, UK/Welsh national policy and local policy.

International Policy and Guidance

UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001

This is not currently ratified by the United Kingdom, but the Annex is accepted by the Government as 'best practice'. The Convention advocates that '*It is important to acknowledge the importance of underwater cultural heritage as an integral part of the cultural heritage of humanity and a particularly important element in the history of peoples, nations, and their relations with each other concerning their common heritage*'.

UNESCO World Heritage Site Status

World Heritage Sites are recognised under the UNESCO World Heritage Convention and are defined as cultural and natural sites of outstanding universal value.

European Policy

European Convention on the Protection of the Archaeological Heritage (Valletta Convention) 1999.

The Convention advocates a responsible approach to management of the cultural heritage. The Convention, which applies to European States, stipulates that the protection of the cultural heritage (including coastal and marine) must form an integrated component of the planning process from its outset.

UK and National Policy and Guidance

As stated previously the *UK Marine Policy Statement* (HM Government 2011) provides the framework for preparing Marine Plans and taking decisions affecting the marine environment. The Secretary of State, Scottish Ministers, Welsh Ministers and the Department of the Environment in Northern Ireland have jointly adopted the MPS. The MPS provides specific provisions for the historic environment of coastal and offshore zones, e.g. that in developing and implementing Marine Plans, the marine plan authority should take into account the available evidence, including information and advice from the relevant regulator and advisors, in relation to the significance of any identified heritage assets (or the potential for such assets to be discovered), and consider how they are managed.

Heritage protection legislation covering coastal, intertidal and marine heritage assets and sites currently comprises the following components:

- Ancient Monuments and Archaeological Areas Act 1979
- The Merchant Shipping Act 1995

- Protection of Wrecks Act 1973
- The Protection of Military Remains Act 1986
- Planning (Listed Buildings and Conservation Areas) Act 1990

The *Ancient Monuments and Archaeological Areas Act 1979* is applicable to monuments or archaeological areas considered to be of national importance and can include structures, buildings, sites or vessels. The designation process for these sites is administered by Cadw. Any work directly affecting a Scheduled Ancient Monument requires scheduled monument consent from the Welsh Ministers, in practice, Cadw. Development controls regulated by the local planning authority must also have regard to the impact of a development on the scheduled ancient monument and its setting.

Merchant Shipping Act 1995 states that any wreck material which comes from UK territorial waters (up to the high water mark) must by law be declared to the Receiver of Wreck (RoW) (Section 236 of the Merchant Shipping Act 1995). 'Wreck' is defined within the Act as, '*flotsam, jetsam, derelict and lagan found in or on the shores of the sea or any tidal water*'. It includes ships, aircraft and hovercraft, parts of these, their cargoes and equipment.

Section 1 of the Protection of Wrecks Act 1973 enables the Welsh Ministers to protect wreck sites within UK territorial waters from unauthorised interference if they are of historic, archaeological or artistic importance. If a wreck or wreck material is encountered during development, which is considered to be of historic, archaeological or artistic importance, it is possible for such a site to be designated in an emergency. The protection regulates activity on a site which may only be undertaken with a licence that may be obtained from the Welsh Ministers (i.e. Cadw).

Protection of Military Remains Act 1986 makes it an offence to interfere with the wreckage of any crashed, sunken or stranded military aircraft or designated vessel without a valid licence irrespective of loss of life or whether the loss occurred during war or peacetime. All aircraft lost in military service are automatically designated as *Protected Places* or a *Controlled Site* under this legislation.

Protected Places include the remains of any aircraft which crashed while in military service or any vessel designated (by name, not location) which sank or stranded in military service after 4th August 1914. Diving is not prohibited on an aircraft or vessel designated as a Protected Place. However, it

is an offence to conduct unlicensed diving or salvage operations to tamper with, damage, remove or unearth any remains or enter any hatch or other opening.

Controlled Sites are specifically designated areas which encompass the remains of a military aircraft or a vessel sunk or stranded in military service within the last two hundred years. Within the controlled site it is an offence to tamper with, damage, move or unearth any remains, enter any hatch or opening or conduct diving, salvage or excavation operations for the purposes of investigating or recording the remains, unless authorised by licence. This effectively makes diving operations prohibited on these sites without a specific licence. (https://www.gov.uk/wreck-and-salvage-law).

Planning (Listed Buildings and Conservation Areas) Act 1990 is applicable to buildings considered to be of special architectural or historic interest so that careful consideration is given to their special interest within the development control process. The designation process for these sites is administered by Cadw. Conservation areas are designated by local planning authorities for their special architectural and historic interest.

The Joint Nautical Archaeology Policy Committee (JNAPC) Code of Practice for Seabed Development. The code, which was significantly revised in June 2006 (The Crown Estate 2006), offers guidance to developers on issues such as risk management and legislative implications. The code also highlights the responsibility of developers in protecting the UK's maritime heritage. It states that '*Due consideration for archaeological remains must be given at the outset of any proposed marine development. This can be both cost-effective and good for public relations*'.

BMAPA and English Heritage guidance on 'Marine aggregate dredging and the historic environment – Assessing, evaluating, mitigating and monitoring the archaeological effects of marine aggregate dredging' was published in 2003, the 'Protocol for reporting finds of archaeological interest' followed in 2005 and the supporting 'Annex to the Protocol Guidance on the use of the protocol for reporting finds of archaeological interest in relation to aircraft crash sites at sea' was published in 2008. Although focussed on an English setting, the principles that are established in all of these documents are equally relevant to archaeological finds recovered in Welsh waters. All the documents can be found at: http://www.wessexarch.co.uk/projects/marine/bmapa/docs.html.

Planning Guidance (Wales): Planning Policy Chapter 5 - Conserving and Improving Natural Heritage and the Coast, states that 'the natural heritage of Wales is not confined to statutorily designated

sites but extends across all of Wales to urban areas, the countryside and the coast.' The guidance promotes the conservation of landscape and biodiversity and ensures that designated sites are properly protected and managed. The guidance should be taken into account early in both development plan preparation and management with the consequences of climate change on natural heritage a central part of this. Specifically in reference to the coastal zone, the Welsh Government Integrated Coastal Zone Management's (ICZM) main principles include consideration for the conservation of the natural and 'historic' environment.

Planning Guidance Wales: Planning Policy Chapter 6 - Conserving the Historic Environment (currently being updated as part of work from Heritage Bill which will also see the development of a new Technical Advice Note). This represents the Welsh Government land use planning policy concerning the historic environment encompassing 'World Heritage Sites, archaeology and ancient monuments, historic and listed buildings, conservation areas and historic parks, gardens and landscapes'. This policy has relevance to the marine historic environment as a whole and more specifically to heritage assets situated in the coastal zone such as historic buildings and scheduled ancient monuments. The primary objectives are:

- To preserve or enhance the historic environment, while recognising any contribution to the economy, civic pride and its importance to future generations.
- To protect archaeological remains, as a finite resource and part of the historical and cultural identity of Wales, and valuable as such in addition to their significance to education, leisure and the economy, in particular tourism.
- To ensure that the character of a historic building is safeguarded from alterations, extensions or demolition that would compromise a building's special architectural and historic interest.
- To ensure conservation areas are protected or enhanced, while avoiding any unnecessary detailed controls over businesses and residences.

Specifically it advocates that 'development plans should reflect national policies for the protection and enhancement of sites of archaeological interest and their settings.'

Historic Environment Strategy for Wales (2006) sets out the role of the historic environment in order to deliver social, economic and environmental benefits for Welsh communities and will lay foundations for the Heritage Bill, due to be introduced in 2015. The historic environment is an important factor for Wales given that it supports over 30,000 jobs. The strategy aims to build and develop the economic role the historic environment plays for Wales and also to maximise the educational, training and leisure opportunities.

Welsh Office Guidance 60/96 'Planning and the Historic Environment: Archaeology' sets out the importance of archaeology and more specifically, advice on the handling of archaeological matters in the planning process. It also emphasises the importance of considering the settings of sites of archaeological interest as well as the protection and enhancement of such sites. It also states that although archaeological remains are finite and non-renewable, 'not all are of equal importance'. This puts the onus on local planning authorities to base any development decisions on an assessment of the archaeological remains of the area.

Welsh Office Guidance 61/96 'Planning and the Historic Environment: Historic Buildings and Conservation Areas sets out a presumption in favour of the preservation of listed buildings and their setting, and conservation areas. It provides practical guidance on managing change.

Local policy and Guidance

A Local Development Plan is produced by a local planning authority and provides the legal framework for the development and use of land within its area. It provides the context for determining local planning applications.

4.3.4 Current Status (Historic Environment)

The historic environment within Welsh coastal / intertidal zones and in inshore / offshore waters is diverse, characterised by the following features in various settings (see also Figure 23).

- Shipwreck Sites, both designated protected wreck sites and war graves. The vast majority of shipwreck sites are undesignated, but contribute to, and reflect, Wales's position as a maritime nation;
- Aircraft crash sites;
- Ancient Monuments such as castles, abbeys, military structures, caves, and standing stones. Some of these monuments are related, directly, to their coastal or intertidal location – for example, scheduled hulks in the Dyfi estuary, designated fish weirs off Anglesey. Others have less of a direct, overt link to the sea (for example, prehistoric funerary monuments) but the sea now forms an integral part of their setting. In some instances, this was probably also the case when the site was constructed;
- Archaeological sites such as peat beds, prehistoric forests, fish traps, middens and other settlement site evidence;
- Historic Buildings, in the form of lighthouses, lifeboat stations, churches;
- World Heritage Sites essential settings and arcs of view;
- Conservation Areas and Listed Buildings;

- Registered Parks, Gardens and Landscapes of Historic Interest in Wales such as Milford Haven Waterway and Lleyn and Bardsey Island;
- LANDMAP Historic Landscapes along the length of the coast in Wales;
- Heritage Coast along 14 stretches of the Welsh coastline including parts of Pembrokeshire and Anglesey.

Shipwreck Sites

There are currently six shipwreck sites protected under the Protection of Wrecks Act 1973:

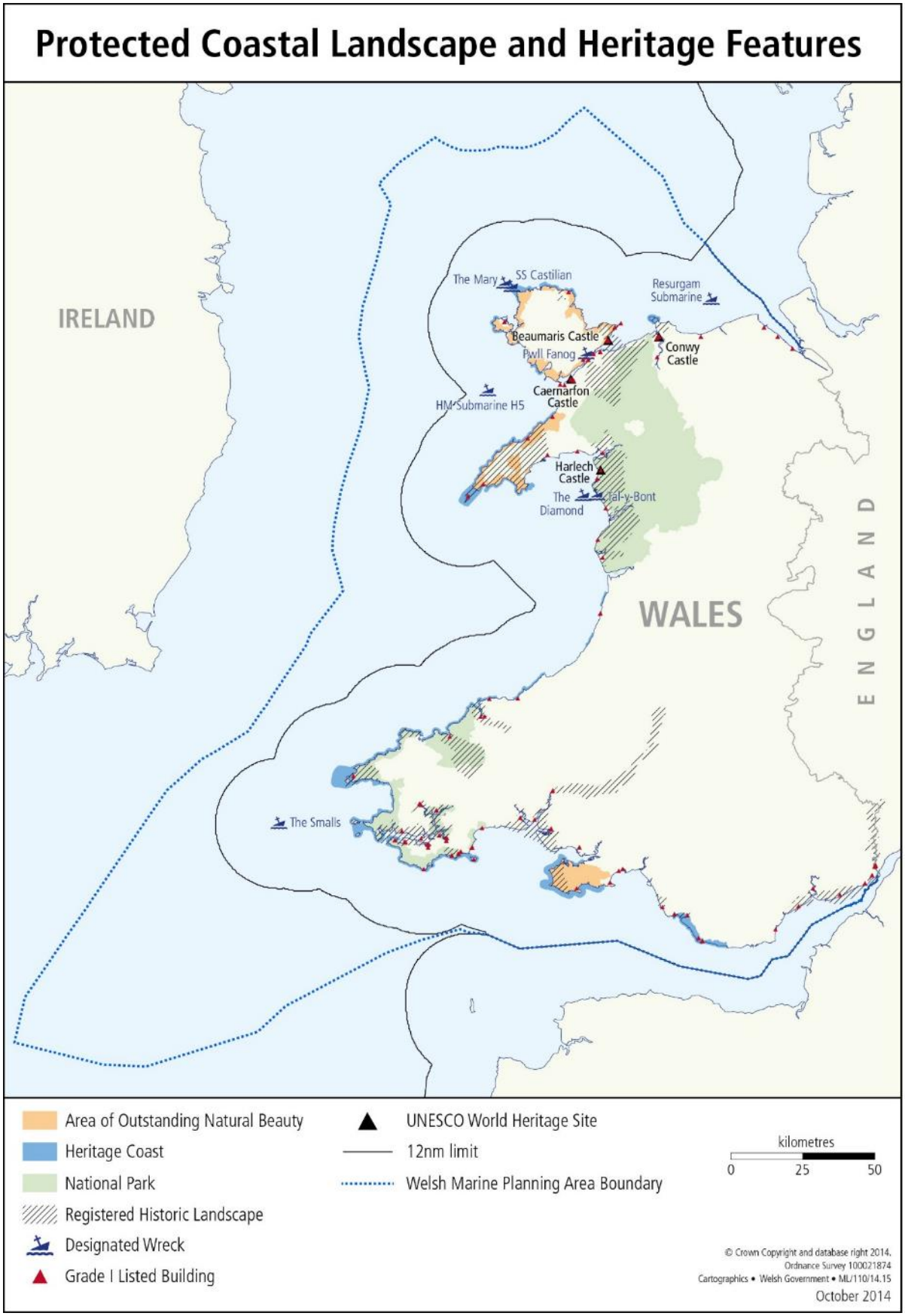
1. The Bronze Bell
2. Pwll Fanog
3. Royal Yacht Mary
4. The Smalls
5. Resurgam
6. Diamond

Each designated wreck comprises a protected area, i.e. the *Bronze Bell* has a protected area of up to 300 m around the medieval shipwreck lying off the coast of Barmouth. Similarly, the *Pwll Fanog* wreck site has a 150 m protection area, while the *Royal Yacht Mary* has a 100 m exclusion zone around it. The protection order forbids any diving and interference such as filming, survey and excavation within the protected area, unless a licence has been obtained from the Welsh Ministers, in practice through, Cadw.

There are potentially over 300 sites relating to military aircraft downed at sea, the vast majority dating from the World Wars. There are some 1400 known shipwreck sites, primarily dating from 18th century onwards. These include warships from the days of sail, large merchant sailing vessels such as East Indiamen and those engaged in the 18th century slave trade, to a large variety of small coastal traders which linked Welsh ports and transported goods such as slate and coal for which Wales was particularly renowned. Many are popular tourist attractions and dive sites. Information on wreck sites can be sourced from the Royal Commission on the Ancient and Historical Monuments of Wales's database, Coflein (RCAHMW 2014).

Due to the history of military conflict around Welsh shores, some wrecks have the potential to be protected as War Graves under the Protection of Military Remains Act 1986. Within Welsh waters, currently there is one such designated wreck - *HM Submarine H5* - sunk off the coast of Anglesey in 1918, during the First World War. It is designated under the act as a controlled site with a 300 m exclusion zone stipulated. Its status as a controlled site means that it is an offence to tamper with, damage, move or unearth any remains without a licence.

Figure 23 Heritage areas for the Welsh coast



Ancient Monuments

This is a broad asset category and includes at least 150 sites along the Welsh coast, many represent defensive features such as medieval castles, fortifications, vessels, prehistoric burial chambers, hillforts, cave sites and standing stones. These are protected under the Scheduled Ancient Monuments and Archaeological Areas Act 1979 and have to be considered of national importance to warrant designation. Any work directly affecting a Scheduled Ancient Monument requires scheduled monument consent from the Welsh Ministers, in practice, Cadw. Development controls regulated by the local planning authority must also have regard to the impact of a development on the scheduled ancient monument and its setting. The Welsh Government's land use planning policy and circular guidance also make it clear that where nationally important archaeological remains, whether scheduled or not, and their settings, are likely to be affected by development, there should be a presumption in favour of their physical preservation in situ. Circular guidance explains that there should be a presumption against proposals which would involve significant alteration or cause damage, or which would have a significant impact on the setting of visible remains (Welsh Office 1996).

Archaeological Sites

Archaeological sites comprise the broadest heritage asset category, comprising a variety of undesignated sites. This can include, but is not limited to, evidence of human settlement sites from all periods such as peat beds, middens and hearths, as well as evidence of industry such as fishtraps and salterns. Archaeological sites also encompass more recent WWI and WWII interests such as pill boxes, gunnery emplacements and sunken vessels. Recent national initiatives such as 'Britain from Above' and 'Afordir' have helped to highlight and record these heritage assets and pressures on the coastal heritage. The Welsh Government's policy includes the preservation and protection of the historic environment. Archaeology is a material consideration within planning policy and the impact on archaeological interests needs to be considered within marine licensing.

Historic Buildings

Historic buildings include those structures that are of architectural and historic interest such as lighthouses, piers, priories and bridges, located in the coastal zone. Nationally significant historic buildings are listed as being of special architectural and historic interest under the Planning (Listed Buildings and Conservation Areas) Act 1990. Buildings are listed in three grades which reflect their relative importance at the national level. Grade II (two) listed buildings represent those that are of special interest which warrant every effort being made to preserve them; Grade II* (two star) listed

buildings are important buildings of more than special interest and Grade I (one) listed buildings are exceptional. Grade I and II* listed buildings represent the top 10% of all listed buildings in Wales.

Listed Building consent is required from the local planning authority before undertaking the demolition, alteration or extension of a listed building in a way that affects its character as one of special architectural or historic interest. Development controls regulated by the local planning authority must also have regard to the impact of a development on the listed building and its setting. The Welsh Government's land use planning policy and circular guidance makes it clear that as a matter of policy there should be a presumption in favour of the preservation of listed buildings. The Welsh Government's objective is to ensure that the character of a historic building is safeguarded from alterations, extensions or demolition that would compromise a building's special architectural and historic interest.

Register of Historic Parks, Gardens and Landscapes

There are 382 parks and gardens and 58 landscapes across Wales which are included on the Register and may be a material consideration in the determination of a planning application.

World Heritage Sites

There are three world heritage sites in Wales, these include:

1. Castles and Town Walls of Edward I in Gwynedd
2. Blaenavon Industrial Landscape and
3. Pontcysyllte Aqueduct and Canal

The castles and town walls are situated on or near the coast. The Welsh Government's policy explains that World Heritage Sites are a material consideration to be taken into account by local planning authorities in the determination of planning applications. Policies must reflect that World Heritage Sites have been inscribed because of their Outstanding Universal Value and both the sites and their settings should be protected

LANDMAP Historic Landscape

Identifies historic land uses, patterns and features that are prominent and contribute to the overall historic character of the present landscape, including character, quality and relative evaluation, and covers coastal areas to the low water mark. See also seascape character assessment in section 4.4.

4.3.5 The future (Historic Environment)

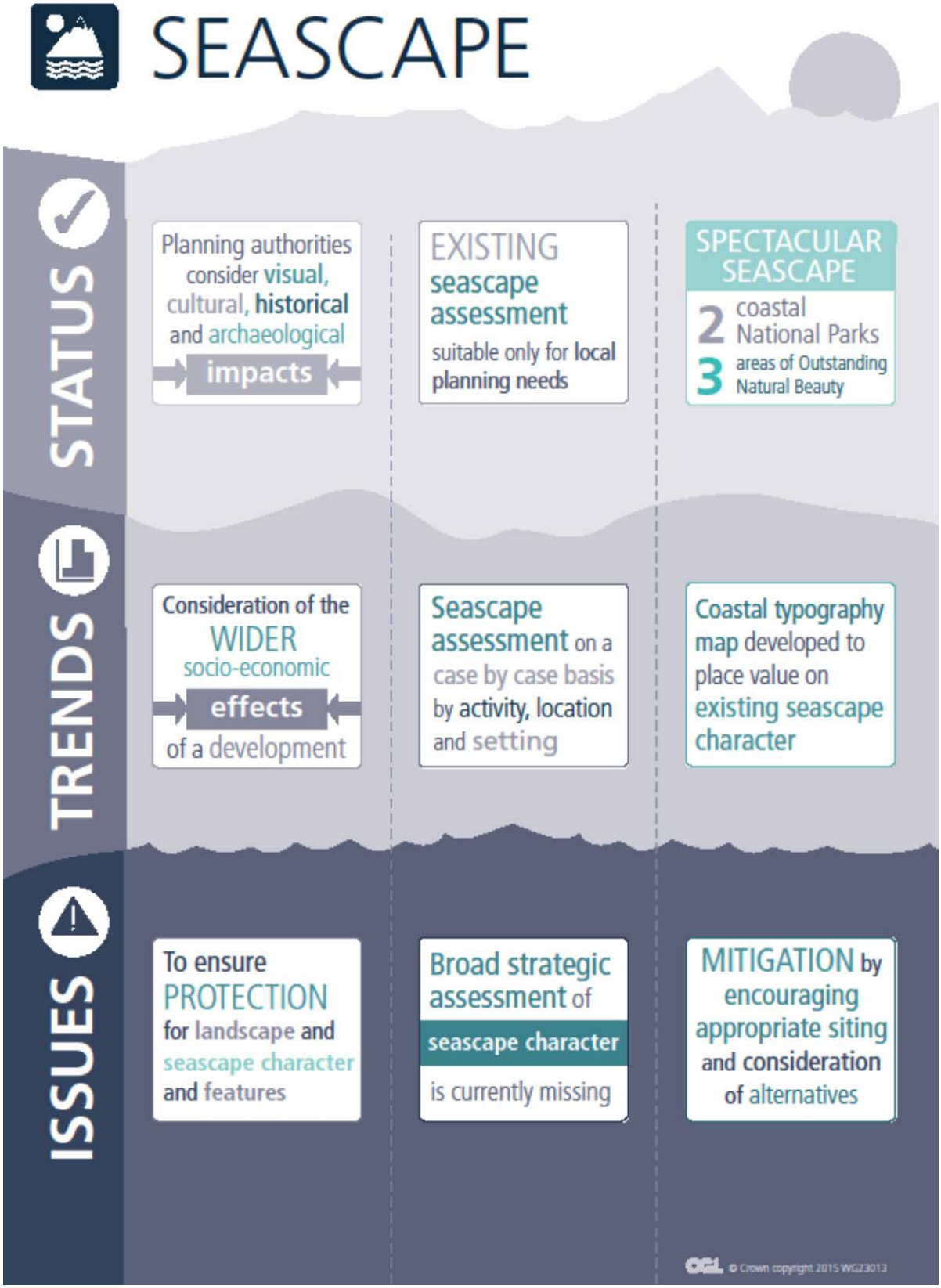
The MPS advises that, in considering the significance of heritage assets and their 'setting', the marine plan authority should take into account the nature of the interest in the asset and the value it holds for future generations.

The primary pressures to the coastal, intertidal, and marine historic environment can be outlined primarily as seabed development, new infrastructure development and human interference most frequently in the form of visitors to the coastal, intertidal and marine zone heritage assets, as well as the effects of climate change and erosion from natural processes on exposed heritage assets.

The relentless action of the sea is constantly altering the coastal strip; revealing, covering up and sometimes destroying heritage assets and changing seascapes. Winter storms which scour the sand from beaches have the potential to uncover palaeo-land surfaces, forests and shipwrecks. Buried structures are revealed eroding from cliff edges. Climate change means that sea-levels will continue to rise and extreme storm events are more likely. In many areas erosion will happen more quickly, resulting in possibly dramatic changes to the Welsh coastline.

A number of recent initiatives provide important information on the character and value of the historic environment which in turn have planning implications. These include:

- 'Historic Wales', a map enabled portal for historic environment information (http://jura.rcahms.gov.uk/NMW/start.jsp);
- The coastal heritage project 'Afordir' (http://www.ggat.org.uk/arfordir/);
- Britain from Above (http://www.britainfromabove.org.uk/) which maps the landscape change using aerial photographs;
- The West Coast Palaeolandscape Project which maps former land surfaces currently submerged (http://www.coflein.gov.uk/en/catalogue/6424614/details/500/);
- 'Valuing the Welsh Historic Environment' (National Trust 2010) which charts the economic value of Wales's heritage assets;
- LANDMAP Historic Landscape & Cultural landscape GIS maps and surveys (http://www.ccw.gov.uk/interactive-maps/landmap.aspx);
- Register of Historic landscapes – (http://www.ccgc.gov.uk/landscape--wildlife/protecting-our-landscape/historic-landscapes/historic-landscapes-register.aspx);
- Historic Landscape Characterisations for the Registered Historic Landscapes- (http://cadw.wales.gov.uk/historicenvironment/protection/historiclandscapes/?lang=en).


SEASCAPE
STATUS
Planning authorities consider visual, cultural, historical and archaeological impacts
EXISTING seascape assessment suitable only for local planning needs
SPECTACULAR SEASCAPE
2 coastal National Parks
3 areas of Outstanding Natural Beauty
TRENDS
Consideration of the WIDER socio-economic effects of a development
Seascape assessment on a case by case basis by activity, location and setting
Coastal typography map developed to place value on existing seascape character
ISSUES
To ensure PROTECTION for landscape and seascape character and features
Broad strategic assessment of seascape character is currently missing
MITIGATION by encouraging appropriate siting and consideration of alternatives
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4.4 Seascape

4.4.1 Overview and background

The European Landscape Convention (ELC) defines landscape as '*an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors*' (Council of Europe 2000). The scope of the ELC includes the whole territory, i.e. including seascapes. The UK Marine Policy Statement (MPS) further defines seascapes as '*landscapes with views of the coast or seas, and coasts and the adjacent marine environment with cultural, historical and archaeological links with each other'* (HM Government 2011). Seascape character is made up of the physical characteristics of hinterland, coast and sea plus a range of perceptual responses to the seascape as well as visual aspects (Scott et al. 2005).

The MPS highlights the importance of considering seascape when developing Marine Plans, noting that marine plan authorities should consider at a strategic level visual, cultural, historical and archaeological impacts not just for those coastal areas that are particularly important for seascape, but for all coastal areas, liaising with terrestrial planning authorities as necessary. The existing character and quality of seascape should be considered including how highly it is valued and its capacity to accommodate change specific to any development, noting that the effects of activities and developments in the marine and coastal area on the seascape will vary on a case-by-case basis according to the type of activity, its location and its setting. In addition, any wider social and economic impacts of a development or activity on coastal landscapes and seascapes should be considered (HM Government 2011).

It is important to understand the relationship between seascape assessment and the historic environment, especially as the UK MPS specifically refers under 'seascapes' to 'historic and archaeological links'. 'Seascape / landscape / visual' and 'historic environment' are each considered as a distinct specialism with different chapters in Environmental Impact Assessments. The relationship is straightforward: that (1) the historic environment specialism is the most appropriately qualified to identify and value historic environment assets; and that (2) a range of influences affect seascape character, including the historic environment. Thus seascape character assessments should draw on existing historic environment information that affects character at the appropriate scale and level of detail being assessed. This would be in addition to drawing on the outputs of other specialisms, such as geology, coastal processes, recreation, coastal habitats and land use. The ideal format of historic environment information to inform seascape character assessment would be area-based rather than site or point based information. Both 'historic seascape characterisation'

(HSC) and 'paleoarchaeological landscape mapping' distil information into area-based formats. Whilst there has been no HSC mapping in Wales to date, there has been some paleoarchaeological mapping of the Bristol Channel and Liverpool Bay areas.

Over the last decade the scope of the concept of seascapes has broadened to encompass a wide range of applications. This evolving recognition has developed in tandem with the evolution of technical assessment methods. For example the identification of culturally defined spatial units offers potential for further application, in relation to presenting socio-economic information. Work to date has focussed on the coastal zone, where more complex land-sea interactions take place.

Approaches to recognising and working with seascapes are still evolving but the trend is towards recognising seascapes through their character, a concept that has already become well established over the last decade in recognising and working with landscapes. In Wales, recent seascape character assessments have focussed on working in partnership with coastal Protected Landscape authorities. Almost 50% of Wales has been covered to date in this way, with study areas running out to the 12 nm line. This work has been locally detailed and has been focussed on the needs of coastal terrestrial planning where the seascape forms an important aspect of their setting. Noting the coastline (whether at high water mark (Snowdonia National Park) or the low water mark (Pembrokeshire Coast National Park)) forms the limit of their jurisdiction, the focus has been to better understand land-sea interactions in respect of cultural benefits. In simple terms, seascapes form important settings for coastal landscapes. Resulting assessments have been coastline-centric in their level of detail.

4.4.2 Key issues for Marine Planning (Seascape)

Seascape and character assessments represent an objective and impartial way to build an evidence base. It reflects the relationship between people and place and the interaction of the natural and cultural components of the environment. The nature of people's experiences, preferences and the value placed on seascape will vary from person to person. A challenge for marine planning will be incorporating varying personal values which people assign to a place into the planning process. However, the Seascape Character Assessment methods and Seascape Assessment for Wales (see below) pioneered by the Countryside Council for Wales and continued by Natural Resources Wales provides a strong basis for meeting this challenge in the WNMP.

At a strategic level, marine planning has a role to play in guiding development and, therefore, will need to take account of potential impacts of different activities and developments upon Welsh seascapes.

The existing seascape character assessments in Wales, have been very detailed and designed for local planning needs. However, the WNMP may require a broader, more strategic assessment of seascape character. Different scales of characterisation recognise different factors and a range of scales have evolved in characterisation for landscapes to suit a range of needs and a similar issue exists for seascapes.

While it is likely that locally based Partnerships will continue to complete coverage of seascape character assessment at a local scale in the coming years, from a strategic planning perspective the needs are:

(1) broader-scale (strategic) areas to be identified; and
(2) a complete coverage of assessment to inform the national plan.

An issue for the strategic study (but arguably not the local, coastal studies) is to include all territorial waters rather than limit consideration to the 12 nm limit. The 12 nm arguably catches most of what needs to be identified, however with large character areas their full extent is likely to be somewhat cut-off, which may have an impact on our understanding of the character areas.

The Guide to Best Practice in Seascape Assessment (Hill et al. 2001) sets out approaches:

- To identify the areas which form the components of seascape.
- To identify the essential elements in determining the character and quality of the coast.
- To assist in the strategic, regional and local planning of coasts and the adjoining marine environment, and assist in coastal zone management.
- As a starting point to evaluate change, and provide a basis for evaluating potential coastal development and developments below the high-water line including coastal defence works, aquaculture schemes and wind farms.
- To assist in the preparation of Environmental Impact Statements related to coastal and marine projects.
- To contribute to the design process by identifying issues and potential.

A report by DTI (2005) entitled 'Guidance on the assessment of the impact of offshore wind farms: seascape and visual impact report' identified the key issues, in the case of seascape and visual effects of offshore wind farms, to include and this has since been updated by the Guidelines for Landscape and Visual Impact Assessment (Landscape Institute and IEMA 2013) which identifies the following key issues:

- Direct effects or physical change to seascape, for example, through development on the coastal edge or construction of onshore grid connection;
- Indirect effects on the character and quality of the seascape, for example, through the development of offshore turbines, substations and masts causing changes in the perception of the seascape;
- Direct effects on the visual amenity of visual receptors, for example, changes in available views of the sea and their content for residents and visitors caused by the development of offshore wind farms; and
- Indirect effects of visual receptors in different places, for example, an altered visual perception leading to changes in public attitude, behaviour and how they value or use a place (Quality of Life Assessment).

These Guidance documents place an emphasis on site selection as the most effective way of preventing significant seascape and visual effects, and encourages appropriate siting and consideration of alternatives as the first priority in any mitigation strategy. It is important to note that seascape and visual effects of offshore wind farms need not be negative and are likely to be reversible (DTI 2005).

4.4.3 Current Policy (Seascape)

It is common for national, regional and local development and spatial plans in Wales to support the following objectives that are of relevance to seascapes:

- To conserve the natural and historic environment;
- To improve areas of landscape and seascape;
- To maintain and improve access to open space and to protect the countryside;
- To protect the undeveloped coast;
- To recognise the value of the landscape and seascape for tourism.

The following section summarises the most relevant UK and Welsh national and local policy and legislation documents which may be used to provide guidance on seascape.

Environment Strategy for Wales (2006)

The Environment Strategy for Wales sets out the Welsh Government's long term vision for the Environment in Wales. The Environment Strategy for Wales has a target that by 2025 there will be a development framework in place to manage the inevitable changes our landscape and seascape face, in a way that maintains and enhances the valued and unique character of the Welsh landscape and seascape.

European Landscape Convention (2000)

The aims of the European Landscape Convention are to promote European landscape protection, management and planning, and to organise European co-operation on landscape issues. The Convention establishes the general legal principles which should serve as a basis for adopting national landscape policies and establishing international cooperation in such matters. As mentioned above the definition of landscape within the European Landscape Convention has been used to define seascape. The general principles are to:

- Consider the territory as a whole;
- Recognise the fundamental role of knowledge;
- Promote awareness;
- Define landscape strategies;
- Integrate the landscape dimension in territorial policies;
- Integrate landscape into sectoral policies;
- Make use of public participation;
- Achieve landscape quality objectives; and
- Develop mutual assistance and exchange of information

Countryside and Rights of Way Act (CRoW) (2000)

The CRoW Act provides better management arrangements for Areas of Outstanding Natural Beauty (AONBs), and strengthens wildlife enforcement legislation. It emphasises the public's right of access to open country and common land and came into force in Wales on 28th May 2005.

Commons Act (2006)

The Commons Act aims to protect common land for current and future generations, and deliver benefits in terms of sustainable farming, public access and biodiversity. It ensures the seascape is not adversely affected by future developments by taking this aspect into consideration.

Environment Act (1995)

Part III of the Act focuses upon National Parks, their purposes and management.

TAN14: Coastal Planning (1998)

The Welsh national planning policy highlights that nature and landscape conservation is a key issue and needs to be considered for all planning applications for the Welsh coast. It clarifies that local authorities should define the coastal zone and should consider visual impacts from both land and sea, noting that on-shore development can often have an impact offshore.

The Pembrokeshire and Snowdonia seascape character assessments are influencing policy and planning through their adoption as Supplementary Planning Guidance whilst similar work in Anglesey is intended to inform the next iteration of their AONB Management Plan.

4.4.4 Current Status (Seascape)

Wales is bounded on three of its four sides by the sea, and across its fourth side many visitors pass who help sustain the Welsh economy en route to the Welsh coast. The area of sea surface is 1,466,210 ha within the 12 nm limit, the landward area is 2,075,422 ha, giving a total area of Wales (land and sea) of 3,541,632 ha (Briggs and White 2009). Coastal landscapes and seascapes are valued resources for nature conservation, hosting many important plant and animal species and habitats, often recognised through statutory landscape and nature conservation designation. Wales has 4067 km^2 of land designated as National Park (20%) on or near the coast and 844 km^2 as Area of Outstanding Natural Beauty (4%). However, together with Heritage Coast and Registered Historic landscapes, over 70% of the coastline of Wales is covered by designation that reflects landscape importance (Briggs and White 2009) (see Figure 23). Coastal landscapes and seascapes also have substantial historic environment interest; many registered historic landscapes have explicit links with the sea (for example, the Milford Haven Waterway) and the maritime nature of the landscape forms part of their reasons for registration. Similarly, registered parks and gardens often have views either designed to encompass the sea, or framed by the coast and sea. Such designed landscapes cannot be divorced from their maritime setting.

There is a great variety of seascape along the Welsh coastline, often within a relatively short distance, from coastal levels and mud flats, through to dramatic mountains, and from exposed cliffs and islands to sheltered sandy bays (Briggs and White 2009). Both natural processes and human intervention have shaped the character of Welsh seas.

As part of the project on Welsh seascapes and their sensitivity to offshore developments (Briggs and White 2009) generated a national overview and regional scale breakdown of Wales into fifty seascape units (Figure 24). The national overview contains a set of map images, with brief descriptive text, relating chiefly to the topographic, inter-visibility and coastal landscape designations in Wales. It also includes map images showing the sensitivity of different sections of the coastline to different offshore renewable energy development types (wind, wave and tidal stream). For the regional assessment the description of each seascape unit included geological, land cover, heritage, cultural associations and visual aspects and each of the fifty units are described and each is assessed in relation to its sensitivity to offshore developments.

It is natural processes that create the underlying shape, form and character of seascapes (Briggs and White 2009). Erosion of cliffs and deposition of materials along the shoreline create distinct patterns that give the edge of the landscape its unique character. Specialised plants and habitats further refine the natural processes and indicates how coastal and inland character can be very different. In only a few places in Wales does high land occur within 250 m from the coastline (Briggs and White 2009). Nevertheless, in such occurrences, dramatic coastal landscapes occur. Most land to sea visibility occurs within 10 km of the coastline, visibility is generally highest on exposed and elevated headlands and areas where the land rises such as around Tremadoc Bay and Caernarfon Bay (Briggs and White 2009). However, the seascape that is observed today is just a snapshot in time in a much longer dynamic process of evolution of the coastline (Briggs and White 2009).

In many places the resulting natural character of the Welsh seascape has been modified by humans. The Welsh sea has had many practical uses and there are a variety of man-made structures and adaptations that add to the intrinsic natural character of the Welsh seascapes, and some that could be considered to detract from this (Briggs and White 2009). Human interventions usually modify natural processes in some way, for example, stabilising a soft coastline to prevent erosion. In recent centuries the scale, forms and occurrences of human interventions have modified the coastline to such an extent that the very character of seascapes have changed. Intertidal areas have been reclaimed; soft coastlines have been built on to create seaside resorts with promenades, whilst coastal defences protect road and rail routes that conveniently follow the coastline. Sheltered anchorages have been made into harbours, ports and marinas, and the coastal landscape is often farmed and settled as close to the edge as conditions allow. In the sea itself, there are recreational, fishing, dredging, transport, offshore renewables and a whole host of uses that affect what happens on the adjacent coastline (Briggs and White 2009).

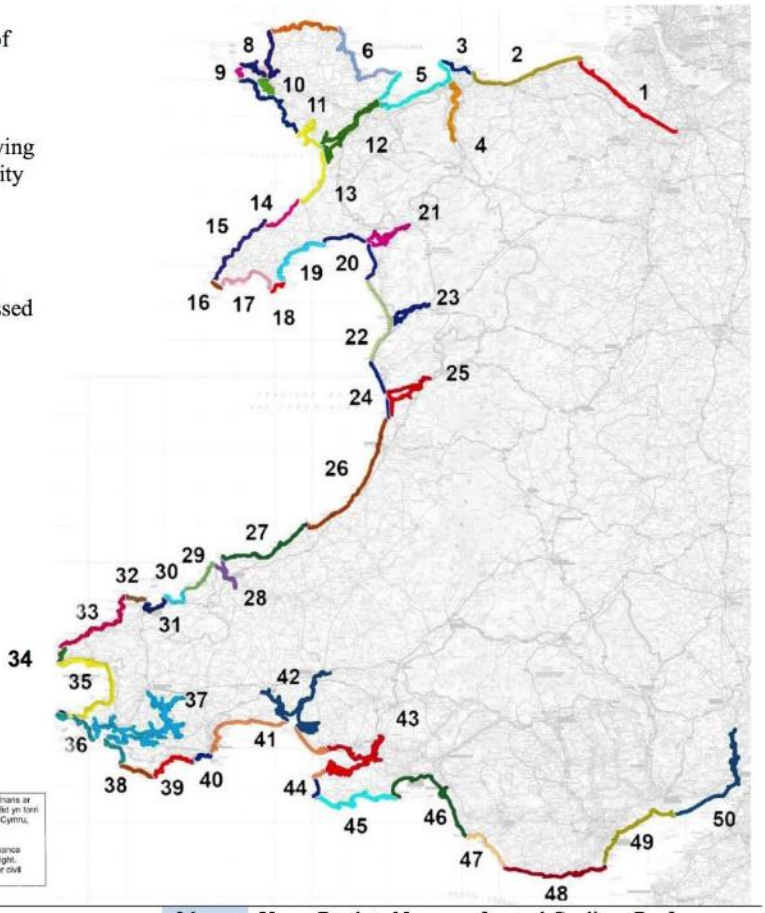
Figure 24 Welsh seascapes and their sensitivity to offshore developments

Welsh National Seascape Units

The assessment consists of a national overview, and a regional scale breakdown of Wales into 50 seascape units. These are separate documents.

The **national overview** includes maps showing all Wales according to land-sea inter-visibility and factors such as coastal elevation and tranquillity.

In the **regional assessment**, each of the 50 seascape units are described, and each assessed in relation to their sensitivity to offshore developments.



1	Dee Estuary	26	Upper Borth to Newquay [central Cardigan Bay]
2	Point of Ayr to Colwyn Bay	27	Newquay to Cardigan Island
3	Rhos Point to Great Ormes Head	28	Teifi Estuary
4	Conwy Estuary	29	Cemaes Head to Trwyn y Bwa
5	Great Ormes Head to Puffin Island	30	Trwyn y Bwa to Dinas Head [Newport Bay]
6	Puffin Island to Point Lynas	31	Dinas Head to Crincoed Point [Fishguard Bay]
7	Point Lynas to Carmel Head	32	Crincoed Point to Strumble Head
8	Carmel Head to Holyhead Mountain North Stack	33	Strumble Head to St David's Head
9	Holyhead Mountain North Stack to Penrhyn Mawr	34	St David's Head to Ramsey Island
10	Penrhyn Mawr to Pen-y-Parc/Maltraeth Bay	35	Ramsey Island to Skomer Island [St Brides Bay]
11	Holy Island Straits	36	Skomer Island to Linney Head
12	Menai Straits	37	Milford Haven
13	Maltraeth Bay to Trefor	38	Linney Head to St Govan's Head
14	Trefor to Porth Dinllaen	39	St Govan's Head to Old Castle Head
15	Trwyn Porth Dinllaen to Braich y Pwll/Mynydd Mawr	40	Old Castle Head to Giltar Point/Caldey Island
16	Braich y Pwll and Bardsey Island	41	Giltar Point to Pembrey Burrows [Carmarthen Bay]
17	Bardsey Island to Trwyn Cilan	42	Taf, Tywi and Gwendraeth estuaries
18	Trwyn Cilan to Penrhyn Du [Porth Ceiriad and St Tudwal's Island]	43	Loughor Estuary
19	Penrhyn Du to Pen-ychain [Abersoch and Pwllheli]	44	Whiteford Point to Worms Head- Rhossili Bay
20	Pen-ychain to Morfa Dyffryn [Tremadog Bay]	45	Worms Head to Mumbles Head- South Gower
21	Porthmadog Estuary	46	Mumbles Head to Porthcawl Point [Swansea Bay]
22	Morfa Dyffryn to Pen Bwch Point [Barmouth Bay]	47	Porthcawl to Nash Point
23	Mawddach Estuary	48	Nash Point to Lavernock Point
24	Pen Bwch Point to Upper Borth	49	Lavernock to Gold Cliff
25	Dyfi Estuary	50	Gold Cliff to Chepstow

Sourced from: http://www.ccgc.gov.uk/landscape--wildlife/protecting-our-landscape/seascapes/seascape-assessment-of-wales.aspx

Seascape features interplay to provide the kind of iconic scenery and coastal character that attracts many thousands of visitors to Wales. Many of Wales's major settlements are also on, or close to, the coastline, often on sheltered rivers or bays, and much of the population lives within 10 km of the coastline with seascape contributing to the quality of life of people living near the coast (DTI 2005). There are traditional fishing villages, important ports, and many coastal resort towns. The coastline and seascape of Wales is also important in the nation's sense of identity and culture, having played an important role in its history and development (Briggs and White 2009).

Figure 25 shows the relative visibility of sea surface from land, taking into account topography and the earth's curvature (Briggs and White 2009). It covers the areas of sea between 0 and 24 km from the coastline. Those areas showing highest visibility tend to be where surrounding landform rises, e.g. Cardigan Bay, and areas with the lowest visibility tend to be near the coastline, on peninsulas, where shielded from wider view by local landform, e.g. off the Pembrokeshire coast. The data used only relates to visibility from land in Wales.

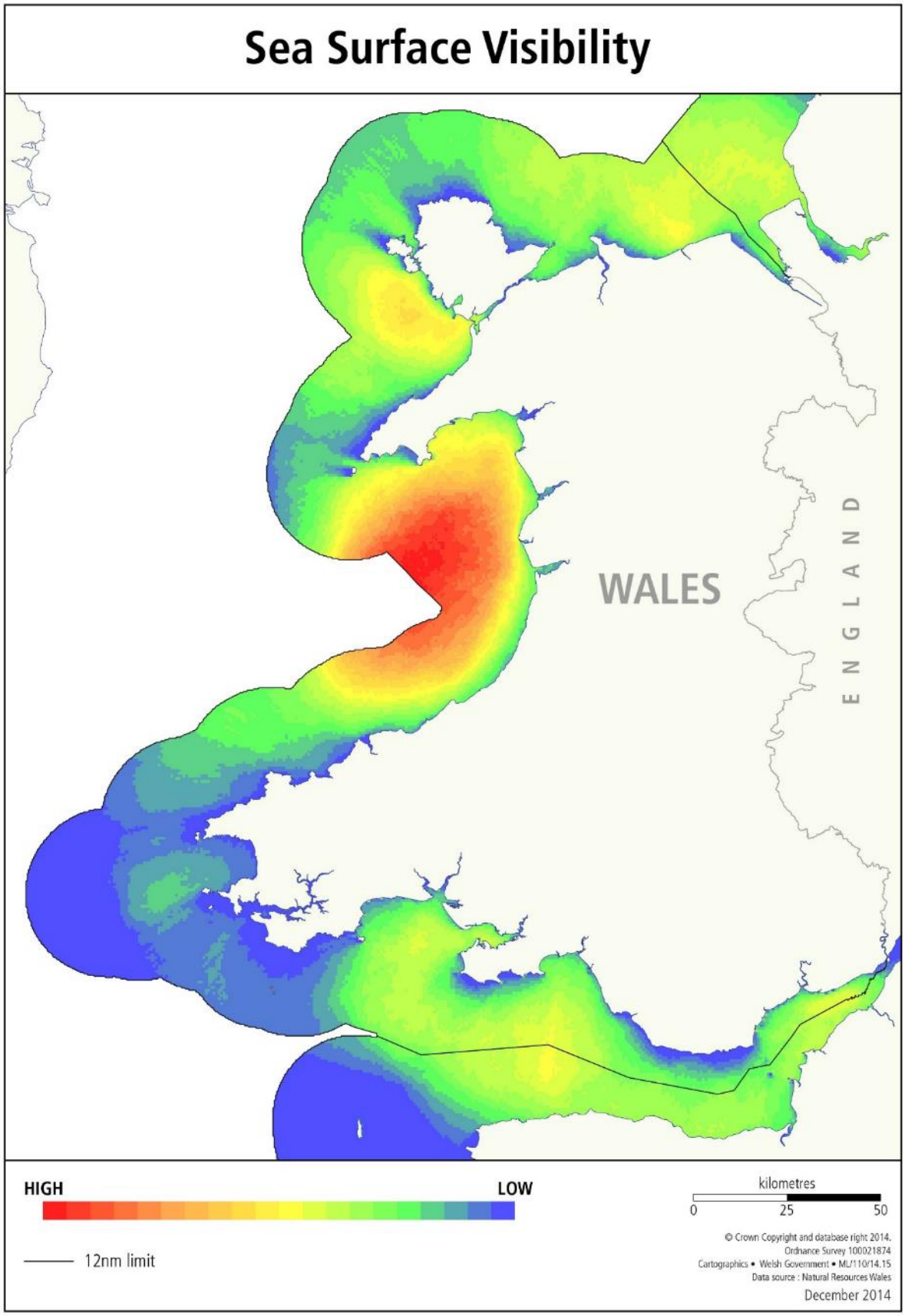
Seascape Character Assessment

Seascape character assessment guidance has also been developed extensively in recent years, in particular in Wales where a number of studies were commissioned by the CCW looking at guiding best practice in seascape assessment. A number of relevant seascape guidance documents and seascape assessments are listed below, in date order:

- Guide to best practice in seascape assessment (Hill et al. 2001), Countryside Council for Wales and University College, Dublin, Brady Shipman Martin, 2001.
- Guidance on the assessment of the impact of offshore wind farms: seascape and visual impact report, Enviros, (DTI 2005).
- An assessment of the sensitivity and capacity of the Scottish seascape in relation to wind farms, University of Newcastle, Commissioned Report no. 103, Scottish Natural Heritage, 2005 (Scott et al. 2005).
- Welsh seascapes and their sensitivity to offshore developments, Briggs, J.H.W. & White, S, CCW Policy Research Report No. 08/5, January 2009 (Briggs and White 2009).
- Dorset Coast Landscape and Seascape Character Assessment, LDA, CSCOPE, 2010.
- An approach to Seascape Character Assessment, (NECR105), Natural England, 2012.
- North-west Anglesey Seascape Character Assessment Pilot study, Land Use Consultants for Countryside Council for Wales, 2012.

- Seascape Characterisation around the English Coast (Marine Plan Areas 3 and 4 and Part of Area 6 Pilot Study) (NECR106), Natural England, 2012.
- Pembrokeshire Coast National Park seascape character assessment, White Consultants for Pembrokeshire Coast National Park Authority in Partnership with Countryside Council for Wales, 2013.
- Anglesey and Snowdonia Seascape Character Assessment, Fiona Fyfe Associates for Isle of Anglesey County Council in Partnership with Snowdonia National Park Authority and Countryside Council for Wales, 2013.
- Northern Ireland Seascape Character Assessment, for Northern Ireland Environment Agency, 2013.
- Seascape Character Assessment and Visual Resource Assessment for England's South Marine Plan Area, MMO, 2014

Figure 25 Relative Visibility



4.4.5 The future (Seascape)

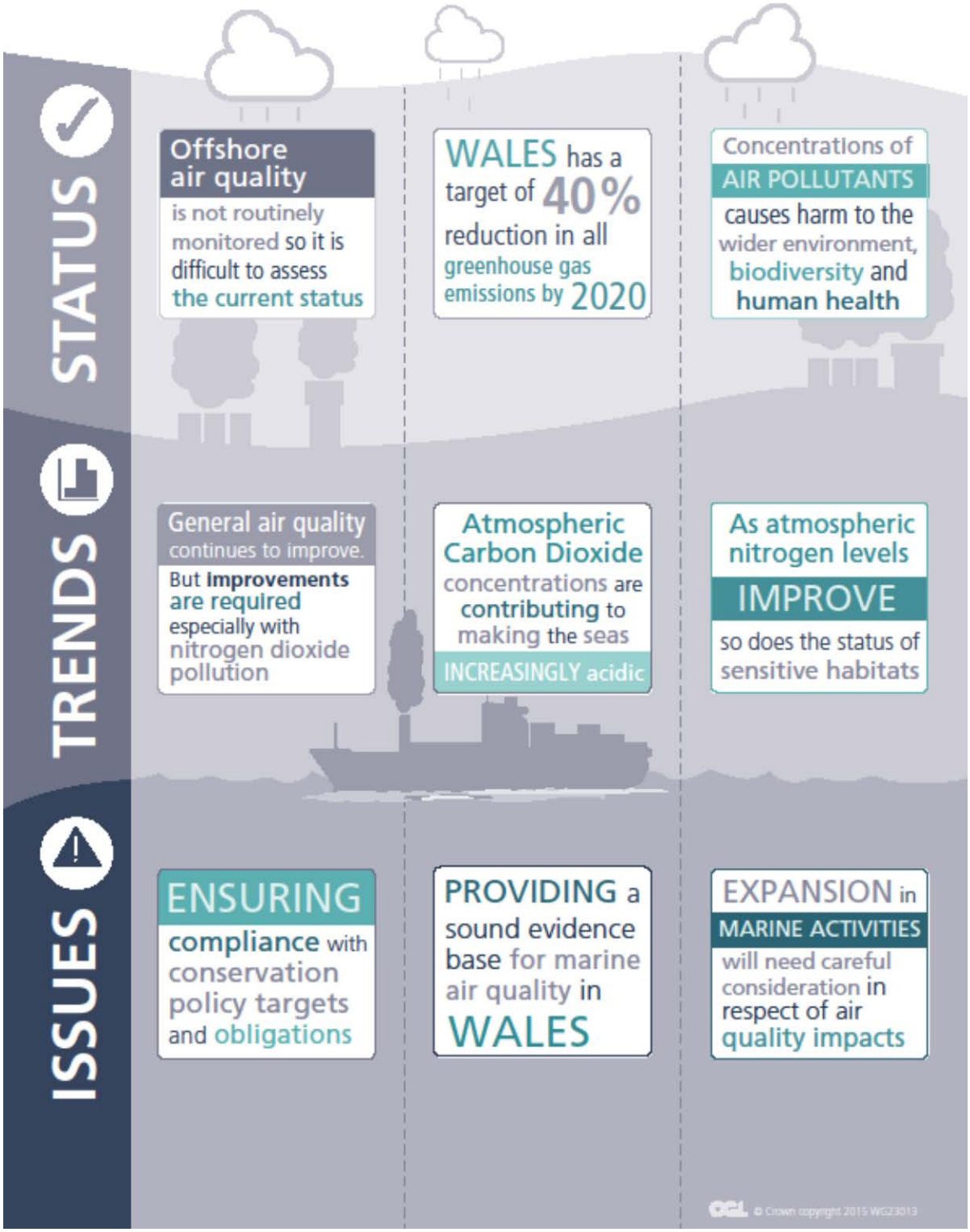
Visual effects result from changes in the landscape or seascape, and are defined as changes in the appearance of the landscape or seascape, and the effects of those changes on people. Developments in the inshore planning area are increasingly likely to encroach on the seascape around the Welsh coastline, in particular renewable energy infrastructure.

There is now concern that the effects of climate change will result in increased sea levels and increased storminess (see Section 3.7). Depending on severity, this could have a very dramatic effect on coastal character (Briggs and White 2009). For example, not only will the coastline change naturally due to changes in sedimentation and erosion patterns but sea level rise may also lead to the construction of new hard, and / or, soft sea defences around the coastline which will also alter the seascape.

Demand for onshore and offshore wind power development and development pressure within and around existing settlements for commercial and leisure projects are also likely to contribute to changes in landscape and seascape.

Characterisation and visual resource mapping are becoming the key baseline through which seascapes are considered. The focus of characterisation is on identifying what is typical or commonplace within an area, and how that is similar or different to another area. They identify areas by mapping the extent of consistent patterns and combinations of 'elements and features' across the study area. They require a range of natural, cultural and perceptual data and information in order to do this. Once areas are defined, they become reporting units for a variety of information, both on what is typical or commonplace and what is rare or special. It is also usual to report on, for example, forces for change, special qualities, inherent sensitivity and cultural benefits. A particular focus is the identification of cultural links between land and sea and vice-versa, which distinguishes this work from purely terrestrial or purely marine characterisation.

AIR QUALITY


STATUS
TRENDS
ISSUES
Offshore air quality is not routinely monitored so it is difficult to assess the current status
WALES has a target of 40% reduction in all greenhouse gas emissions by 2020
Concentrations of AIR POLLUTANTS causes harm to the wider environment, biodiversity and human health
General air quality continues to improve. But improvements are required especially with nitrogen dioxide pollution
Atmospheric Carbon Dioxide concentrations are contributing to making the seas INCREASINGLY acidic
As atmospheric nitrogen levels IMPROVE so does the status of sensitive habitats
ENSURING compliance with conservation policy targets and obligations
PROVIDING a sound evidence base for marine air quality in WALES
EXPANSION in MARINE ACTIVITIES will need careful consideration in respect of air quality impacts
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4.5 Air Quality

4.5.1 Overview and background

Good air quality is essential to ensure ecosystems in both coastal areas and the offshore environment are healthy, productive and balanced. Air quality can be regarded as poor when concentrations of pollutants are at a high enough level to cause harm to biodiversity, the wider environment and human health. Atmospheric pollutants can have significant impacts on biodiversity, for example nitrogen deposition reduces the conservation value of sensitive priority habitats (RoTAP 2012). This is a major concern in relation to the protection of biodiversity and can have implications for meeting national and international conservation policy targets and obligations.

The main sources of air pollution in coastal areas include emissions from the construction, operation and decommissioning phases of certain industrial facilities, shipping, oil and gas extraction and processing platforms, oil and gas importing facilities, coal and gas fired power stations and vehicle emissions. RoTAP (2012) showed that the relative importance of emissions from the shipping sector increased between 1986 and 2008 with North Atlantic shipping emissions of sulphur and nitrogen oxides (NOx) are of particular importance for European air quality (international shipping emissions contributed 18% and 19% respectively of the deposition of oxidised nitrogen and sulphur in the UK during 2005).

Emissions from shipping are becoming increasingly important for European air quality, in particular for the deposition of oxidised sulphur and nitrogen compounds and for ground level ozone (RoTAP 2012). The world seaborne trade increased at typically 3-6% per year between 1987 and 2007 and annual tonne-miles travelled have more than doubled over this period. Scenarios of emissions from shipping indicate that there will be an ongoing increase in demand for sea transport and that fuel consumption may increase substantially until 2020. Cofala *et al.*, 2007 (cited in RoTAP (2012)) indicated that international shipping typically contributed 10-20% of the total sulphur deposition in coastal areas in 2000 (in the baseline scenario (without the IMO-agreed control of sulphur emissions), the relative contribution to sulphur deposition will increase to typically 20-40% by 2020).

Emissions of sulphur dioxide (SO_2) and NOx from international shipping make a major contribution to sulphur and nitrogen deposition in the UK (RoTAP 2012). However, considerable uncertainty surrounds the magnitude of their emissions, spatial location and rate of change. Emissions from shipping have received increasing interest from international bodies, which most recently resulted in

a decision by the International Maritime Organization on emission reductions for sulphur dioxide and nitrogen oxides.

On a global scale poor air quality can contribute to acidification, depletion of the ozone layer and decreases in ambient oxygen. There is also clear evidence that the emission of some pollutants is harmful to human health, causing an increased incidence of respiratory and heart diseases in susceptible individuals. This occurs when nitrogen oxides and ammonia and other compounds combine to form secondary particles which penetrate the lungs. Some pollutants such as heavy metals, e.g. mercury, can deposit within water and sediments, and may accumulate and persist in the environment for many years.

Eutrophication is a particular issue in water based ecosystems and can impact soils and vegetation. As stated in the Water Quality section (section 4.1), eutrophication is relatively uncommon in Welsh waters and mainly attributable to nutrients derived from land-based sources; air quality is only a minor contributory factor.

Table 10 shows the main pollutants and examples of their source and effect on the environment.

Air quality monitoring allows measurements (typically micrograms per cubic metre (µg m^{-3})) of key pollutants to be assessed within a specific area. There are five main types of air quality monitoring; these include photochemical and optical sensor systems, passive samplers, active (semi-automatic) sampling, automatic point monitoring and remote optical/long path monitoring (Welsh Air Quality Forum 2014a).

Monitoring is carried out by automatic monitoring across sites in Wales. Local authorities are required under UK and Welsh national regulations to report the outcomes of the monitoring assessments, which allow for the evaluation of the different areas relative to current standards. Monitoring data also helps to predict future trends. Standards or benchmarks of air quality are used to set acceptable limits within a certain time frame and set a precedent for good air quality status. A breach of these standards would occur if the concentration of pollutants exceeds the standard for a certain period of time.

Table 10 Main air quality pollutants their source and effect on the environment.

Pollutant	Source	Effects
Nitrogen oxide (NOx)	Produced during most high temperature combustion processes. Sources for the marine environment include shipping, industry, road transport emissions, oil and gas extraction and processing, power generation.	Acidification and eutrophication of terrestrial and aquatic ecosystems may damage habitats and lead to reduced biodiversity. Increases in ground level ozone (O_3), harmful to human health and the health of other organisms. Formation of secondary nitrate particles in the atmosphere.
Sulphur dioxide (SO_2)	Produced during the combustion of sulphurous fuels and other chemical processes. Source include industry, shipping, power generation	Acidification, harmful to human health and the health of other organisms. A precursor to the formation of secondary sulphate particles in the atmosphere.
Particulate matter (PM)	Road transport, shipping, power generation (primarily from solid fuels), agriculture.	Harmful to human health and the health of other organisms. Black carbon in PM is implicated in climate change. Secondary PM includes sulphate, nitrate and ammonium, formed from SO_2, NOx and NH_3 which are the main drivers for acidification and eutrophication.
Ground level ozone (O_3)	A secondary pollutant formed by the effect of sunlight on NOx and volatile organic compounds (VOCs).	Harmful to human health and the health of other organisms
Ammonia (NH_3)	Industrial processes and agriculture	Acidification, harmful to human health and the health of other organisms and vegetation. Deposition of atmospheric NH_3 may also contribute to eutrophication (through the degradation of ammonia into nitrate as part of the nitrogen cycle). Ammonia is also directly toxic to vegetation. It is converted to ammonium nitrate and ammonium sulphate with are major components of PM2.5 which has profound effects on human health.

4.5.2 Key issues for Marine Planning (Air Quality)

As offshore air quality is not routinely monitored, it is difficult to assess the current status of marine air quality (MMO 2013a). Even though current policy actions and the associated legislation has improved air quality to the required standards in most cases, further improvements can still be made with better regulation of activities. The development of policies aimed at improving marine air quality needs to consider all potential causal activities which influence air quality, including terrestrial activities as well as domestic and industrial activities occurring in the marine environment.

In particular, the potential expansion of marine activities requires careful consideration by the marine planning system in respect of the air pollution impacts. For example, it is anticipated that shipping activity will increase and expand. This, in combination with other industrial activities already occurring on the coast, may contribute to higher levels of both NOx and SOx in the coastal environment, which may, in turn, affect the achievement of current local air quality standards and objectives - illustrating the need for careful consideration of the impact upon air through marine planning.

4.5.3 Current Policy (Air Quality)

Current legislation and policy focuses on the reduction of impacts of air pollution and to improve air quality. Regulatory commitments range from EU directives, such as the Ambient Air Quality Directive and associated daughter directives, and the National Emission Ceilings Directive, to UK and Welsh national legislation.

Air quality is a devolved matter, though the UK government leads on international and European legislation. The Air Quality Standards (Wales) Regulations 2010 transpose into Welsh law the requirements of Directives 2008/50/EC and 2004/107/EC on ambient air quality. The ambient air quality directives set limits and targets for concentrations of various pollutants in outdoor air for the protection of health and ecosystems. They also require Member States to undertake air quality assessment and to report the findings to the European Commission on an annual basis.

The Environment Act 1995 requires the UK Government and the devolved administrations for Scotland and Wales to produce a national air quality strategy containing standards, objectives and measures for improving ambient air quality and to keep these policies under review. The UK air quality strategy is a framework that aims to improve air quality by setting targets and objectives to benefit both the environment and public health for the whole of the UK (Welsh Air Quality Forum 2014b). Table 11 provides policy recommendations aimed at the continual improvement of the air quality for the UK; the strategy has been under regular review. The first UK air quality strategy was adopted in 1997 (The United Kingdom National Air Quality Strategy, March 1997 (Cm 3587)), and was replaced in 2000 by The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air, January 2000 (Cm 4548, SE2000/3, NIA 7). This was further refined and implemented in 2003 as The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Addendum, February 2003, and then revised again in 2007. The latter strategy aimed to improve the UK air quality further, and involved targets from local to an international level; the most

recently published is The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007. A few examples of pollutants and their associated limits are shown in Table 11.

Within the UK, several indicators have been developed to measure improvements in air quality, including annual mean concentrations of NO_2, and annual mean concentrations of pollutants of particulate matter and ozone. There is also the 'air quality headline indicator', based on the number of days of moderate or worse air pollution.

Local authorities are responsible for reporting on air quality by means of monitoring and assessment to evaluate concentrations of key pollutants and that these are currently meeting national air quality objectives. Where an issue is identified, an Air Quality Management Area (AQMA) is declared and an action plan is developed to address the issue (Defra 2014a). The action plan includes specific targets aimed at reducing local pollution levels.

Table 11 UK air quality objectives for main pollutants to ensure protection of human health and vegetation and ecosystems as set out in

Pollutant	**Air Quality Objective Concentration**	**Measured as**
Nitrogen dioxide (NO_2)	200 µg m^{-3} not to be exceeded more than 18 times per year 40 µg m^{-3}	1 hour mean Annual mean
Nitrogen dioxide (for protection of vegetation & ecosystems)	30 µg m-3	Annual mean
Sulphur dioxide	350 µg m^{-3}, not to be exceeded more than 24 times a year	1 hour mean
Sulphur Dioxide (for protection of vegetation & ecosystems)	20 µg m-3	Annual mean
Particle matter (PM)	**PM10 -** 50 µg m^{-3}, not to be exceeded more than 35 times per year **PM10 -** 40 µg m^{-3} **PM2.5 -** 25 µg m^{-3} (new target)	Daily mean Annual mean Annual mean
Benzene	5µg m^{-3}	Annual mean
Ozone	100 µg m^{-3} not to be exceeded more than 10 times a year	8 hourly running or hourly mean

NB. There are no AQS for ammonium which has profound effects on human health and ecosystems.

In December 2013 the EU adopted its Clean Air Policy Package[6] consisting of a new clean air programme, setting the direction for EU air quality policy until 2030. This policy consists of proposals for revised emissions ceilings (limit values) for key pollutants and policy guidelines on how these targets can be achieved. The policy also includes a proposal for a directive to reduce pollution from medium-sized (between 1 and 50 MW) combustion plants.

The emission to air of pollutants from specific point sources - such as industrial facilities - is currently regulated by the *Industrial Emissions Directive*, which was transposed into UK law in 2013, and which imposes limits on the levels of pollution which may be emitted by specific types of facility. These limits may be modified to take into account local factors through the issue of an environmental permit by NRW (the Welsh environmental regulatory body).

The EU National Emission Ceilings Directive (NECD) (2001/81/EC) sets annual ceilings for EU member states: these include the pollutants sulphur dioxide, ammonia, nitrogen oxide, and non-methane volatile organic compounds (VOCs). A revised National Emission Ceilings Directive (NECD), contains updated national ceilings (caps) for six key air pollutants (PM, SO_2, NOx, VOCs, NH_3 and CH_4) along with targets set for 2020 and 2030 (these are currently proposals and are yet to be confirmed).

The Gothenburg Protocol - contained within the UN Economic Commission for Europe Convention on Long Range Transboundary Air Pollution (CLRTAP) - was revised in May 2012. The protocol also sets out the ceiling for pollutants sulphur dioxide, ammonia, nitrogen oxide, and non-methane volatile organic compounds (NMVOC) for the UK, aiming towards reductions for 2020.

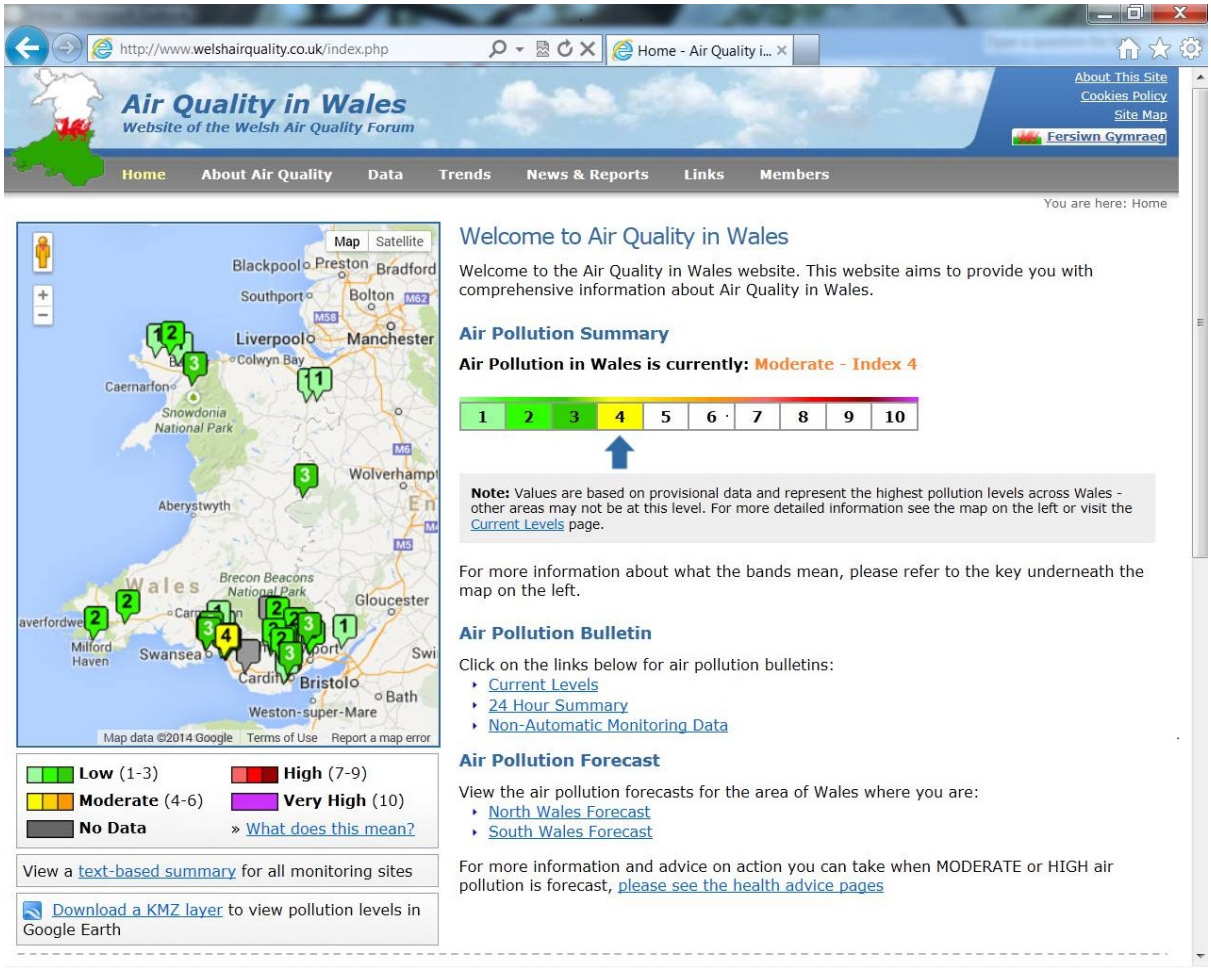
The *International Convention for the Prevention of Pollution from Ships (MARPOL)* aims to reduce emissions from ships for NOx, SO_2 VOC and Ozone Depleting Substances (ODS) and on a local and global scale. Annex VI refers to limits for these pollutants which were established in October 2008; the Convention was adopted in July 2010 (IMO 2014). From January 2015 onwards, Member States are asked to ensure that ships use fuels with a sulphur content of not more than 0.1% in the Baltic Sea and the North Sea including the English Channel (but excluding Welsh waters) (ECG 2013). Equivalent compliance methods, such as exhaust cleaning systems, are accepted. From 2020 onwards, ships operating in all other European Sea areas (including Welsh waters) will have to use fuels with sulphur content of 0.5% or less.

[6] Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the reduction of national emissions of certain atmospheric pollutants and amending Directive 2003/35/EC

4.5.4 Current Status (Air Quality)

In relation to human health, pollutants, including ozone, nitrogen dioxide, sulphur dioxide and particulate matter, are assessed using an Index Point scale which provides a rating for local air quality on a scale of 1-10 (Welsh Air Quality Forum 2014c). Index points are grouped together in bands; a rating of 10 reflects a very high level of pollution, with an index of 1 denoting very low levels. Defra uses this data to produce air pollution forecasts (Daily Air Quality Index) for the UK regions (Defra 2014b). The forecasts for each area, produced twice daily, comprise the 'worst case' of all the pollutants and location types (urban, rural and roadside). The Air Quality in Wales website (Figure 26) of the Welsh Air Quality Forum (http://www.welshairquality.co.uk/index.php) provides a comprehensive update on air quality status in Wales:

Figure 26 Welsh Air Quality Forum website (http://www.welshairquality.co.uk/index.php)



Local air quality has generally improved during the past few decades in the UK. Levels of primary pollutants tend to be in their highest concentrations in areas of significant human activity, and therefore usually occur in developed urban areas, although pockets of poor air quality may also exist

along motorways and around other out-of-town point sources of pollution such as airports (levels being the highest around the source of the pollution).

The most frequently exceeded limits contained within the air quality objectives are usually those associated with nitrogen dioxide pollution; this being the case in both Wales and Europe more generally. Although concentrations of particulate matter have decreased in recent years, nitrogen oxide pollution levels have increased in some areas whilst ozone levels have remained level with yearly fluctuations (Welsh Air Quality Forum 2014d). Whilst much of the variation in pollution levels is as a consequence of changes in the level of human activities, climatic factors such as fluctuations in temperature also play a part in the annual variations.

The National Atmospheric Emissions Inventory (2014)shows that emissions of air quality pollutants in Wales in 2012 were estimated to be:

- NH_3: 25 kilotonnes (kt) (a decline of 15% since 1990, accounting for 9% of the UK total in 2012);
- CO: 205kt (a decline of 69% since 1990, accounting for 10% of the UK total in 2012);
- NOx: 88kt (a decline of 50% since 1990, accounting for 8% of the UK total in 2012);
- NMVOC: 47kt (a decline of 67% since 1990, accounting for 6% of the UK total in 2012);
- PM_{10}: 9kt (a decline of 54% since 1990, accounting for 8% of the UK total in 2012);
- SO_2: 29kt (a decline of 89% since 1990, accounting for 7% of the UK total in 2012);
- Pb: 9.7 tonnes (a decline of 93% since 1990, accounting for 16% of the UK total in 2012).

In summary, emissions of all air quality pollutants in Wales (CO, NOx, NMVOC, PM_{10}, SO_2) have declined since 1990 at a relatively similar rate (National Atmospheric Emissions Inventory 2014). The exceptions are lead (Pb) which has declined at a higher rate from 1990 to 2000 due to the phase-out of leaded petrol whereas NH_3 have declined at a slower rate than other pollutants.

Table 12 provides a summary of the percentage contribution of each sector for each pollutant. Using the ranking of these percentage contributions, the sectors have been ordered to provide its indicative significance across all pollutants.

There is limited air quality data available for marine areas as offshore air quality is not routinely monitored.

Table 12 Source Emission Contributions Ranked by Sector, Wales 2012 (sourced from the National Atmospheric Emissions Inventory, 2014)

Overall Rank	Sector	NH_3	CO	NOx	NMVOC	PM_{10}	SO_2	Pb
1	Commercial, domestic and agricultural combustion	1.30%	22.56%	7.55%	7.96%	32.25%	12.32%	6.66%
2	Industrial processes	0.24%	38.80%	2.22%	4.3%	19.22%	12.76%	73.10%
3	Transport sources	1.60%	17.05%	25.76%	5.29%	15.99%	3.30%	1.10%
4	Industrial combustion	0.00%	13.78%	13.20%	3.13%	5.84%	15.18%	8.42%
5	Energy Industries	0.00%	4.28%	50.25%	0.00%	10.23%	52.75%	4.31%
6	Agriculture	85.73%	0.00%	0.00%	15.91%	8.57%	0.00%	0.00%
7	Fugitive	0.00%	2.90%	0.00%	21.65%	0.47%	2.94%	5.82%
8	Other	6.74%	0.63%	1.02%	1.33%	2.52%	0.74%	0.59%
9	Solvent Processes	0.00%	0.00%	0.00%	35.88%	1.90%	0.00%	0.00%
10	Waste	4.39%	0.00%	0.00%	4.55%	0.00%	0.00%	0.00%
Total		**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

* The sector: 'other' will include all 'other' categories in the inventory and also a number of categories that are insignificant for a specific pollutant.

4.5.5 The future (Air Quality)

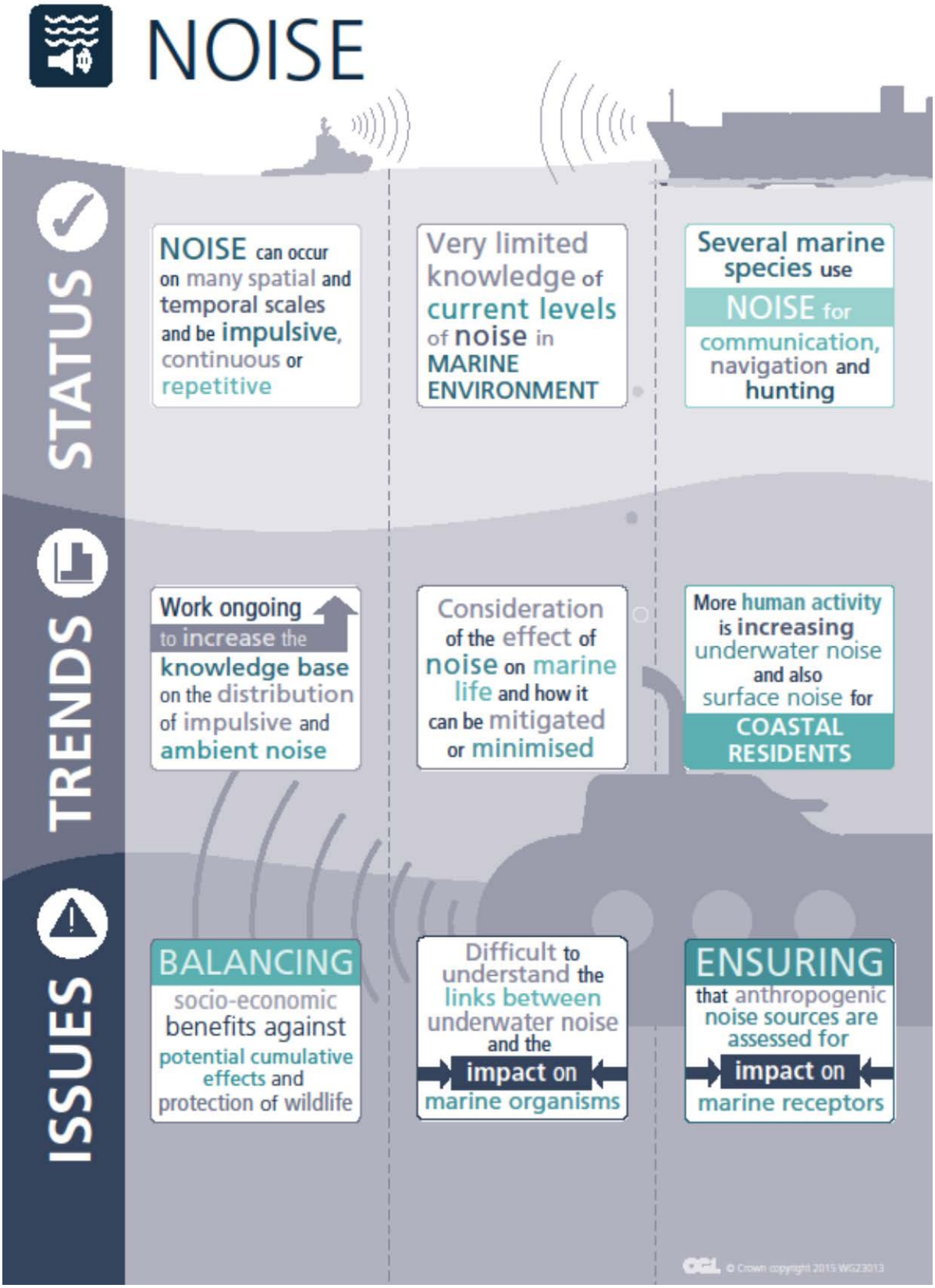
As described in the previous text, there are current local, national and European obligations that need to be fulfilled to reach the requisite standards for air quality. These include continued monitoring and assessments of key pollutants, annual reporting and assessments, and a continued action plan to help improve air quality with targets and objectives with sensible timescales for achievement. Collectively these plans include commitments for reducing emissions from industry, energy generation and transport.

Human activity in the marine and coastal environment is generally increasing. The regulation of key marine activities such as shipping has successfully reduced incidences of poor air quality, via such policies as imposing the use of lower sulphur fuels which has reduced sulphur dioxide emissions. However, the level of control of sulphur emissions will probably maintain the relative contribution from shipping in 2020 at the same level as it was in the year 2000 given that it is predicted there will be an ongoing increase in demand for sea transport which would mean fuel consumption may increase substantially until 2020 (RoTAP 2012). Similarly, in regards to nitrogen deposition, the IMO agreement on NOx emissions will decrease emissions per tonne transported, but since overall transport is expected to increase, a best forecast may only expect status quo in NOx emissions in 2020 (RoTAP 2012).

Emissions from agriculture have decreased by 21% since 1990, mainly as a result of declining livestock numbers and improved fertiliser use efficiency. An 8% decline in ammonia emissions to 2020 is tentatively projected, but there is a risk that emissions may increase over the period 2020-2030, without additional measures (Whitfield and McIntosh 2014).

The Air Pollution Information System (APIS) provides a comprehensive source of information on air pollution and the effects on habitats and species (APIS 2014). It uses critical loads, which relates to the quantity of pollutant deposited from air to the ground and critical levels as a tool for assessing the risk of air pollution impacts to ecosystems. This approach has primarily been used to map on a national scale the extent of deposition and concentrations which exceeds critical loads and levels (critical load / level exceedance). It has been applied to strategies for emission reductions under, for example, the Gothenburg Protocol. Although the critical load and level approach has been used on a national and European scale the approach is also increasingly being used in Wales and the wider UK for site specific impact assessment.

Future trends in air pollution are difficult to predict in the marine environment as there is no routine monitoring of the air quality at offshore sites. Whilst the current overall status for Welsh air quality suggests a general improvement, levels of nitrogen oxide still exceed the annual quality objectives for both Wales and the UK as a whole, even in areas where this pollution is closely monitored, such as in centres of population.


NOISE
STATUS
TRENDS
ISSUES
NOISE can occur on many spatial and temporal scales and be impulsive, continuous or repetitive
Very limited knowledge of current levels of noise in MARINE ENVIRONMENT
Several marine species use NOISE for communication, navigation and hunting
Work ongoing to increase the knowledge base on the distribution of impulsive and ambient noise
Consideration of the effect of noise on marine life and how it can be mitigated or minimised
More human activity is increasing underwater noise and also surface noise for COASTAL RESIDENTS
BALANCING socio-economic benefits against potential cumulative effects and protection of wildlife
Difficult to understand the links between underwater noise and the impact on marine organisms
ENSURING that anthropogenic noise sources are assessed for impact on marine receptors
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4.6 Noise

4.6.1 Overview and background

The input of noise energy into the marine environment can occur on many spatial and temporal scales (MSFD Technical Sub-Group on Underwater Noise 2013). There is great variability in transmission of noise in the marine environment. Underwater noise from human activities may be of short duration (impulsive) or be long lasting (continuous); the repetition of impulsive sounds may become diffuse with distance and reverberation and become indistinguishable from continuous noise. Lower frequency noises will transmit further in the marine environment than higher frequency noise.

In developing Marine Plans, the MPS (HM Government 2011) says that the marine plan authority should take a strategic overview of man-made noise sources and assess the potential cumulative effects of noise and vibration across sensitive receptors in the marine area, balanced against potential socio-economic benefits and the protection to wildlife that can be achieved through acoustic deterrent devices (ADDs) and noise reduction techniques. Marine Plans should consider how the effects of noise and vibration on wildlife can be mitigated and minimised taking account of known sensitivities to particular frequencies of sound and should consider how significant adverse effects on health can be avoided.

Marine organisms which are exposed to noise can be adversely affected both on a short timescale (acute effect) and on a long timescale (permanent or chronic effects) (MSFD Technical Sub-Group on Underwater Noise 2013). Noise emissions can be measured or modelled to describe the propagation from source, however transposing noise levels into biological effects remains a significant challenge. Adverse effects can be difficult to detect (e.g. temporary reduction in hearing sensitivity, behavioural effects) or obvious (e.g. injury, death).

Underwater noise can be generated from an array of marine activities, e.g. coastal and offshore construction, drilling, sand and gravel extraction, fishing, shipping and other vessel movements, use of sonar, seismic surveys, underwater explosions, and acoustic deterrent devices such as the use of pingers (OSPAR 2010).

Two indicators have been published for Descriptor 11 (Noise/Energy) of the MSFD 2008/56/EC in the EC Decision 2010/477/EU on criteria and methodological standards on GES of marine waters. These are: Indicator 11.1.1 on 'low and mid frequency impulsive sounds' (e.g. associated with explosions,

pile driving, airguns) and Indicator 11.2.1 on 'Continuous low frequency sound' (ambient noise, e.g. associated with shipping, wind farm operation). As a follow-up to the EC Decision, the Marine Directors established a technical sub-group (TSG) to develop of Descriptor 11 Noise / Energy. In November 2013 the TSG published guidance which sets out recommendations for MSFD monitoring of impulsive and ambient noise. For indicator 11.1.1 this is to be achieved via the establishment of a register of the occurrences of impulsive sounds, in the UK this work is being led by the JNCC.

Several studies have highlighted and documented the adverse effects of underwater noise on marine life, especially for several marine mammals and fish species (Richardson et al. 1995; Popper et al. 2004; Hastings and Popper 2005; Wahlberg and Westerberg 2005; Madsen et al. 2006; Thomsen et al. 2006; Nedwell et al. 2007; Southall et al. 2007; UKMMAS 2010e). Several marine species are thought to use sound for daily activities such as communication, locating mates, searching for prey, avoiding predators and hazards, and for short- and long-range navigation. Human induced underwater sounds therefore can cause interference and sometimes mask these natural behavioural responses, which can lead to injury, physiological effects and even death.

Rough estimates of theoretical zones of noise influence have been reported by Richardson *et al,.* (1995) (i.e. noise, detection; behavioural & physiological response; masking of communication signals or echolocation clicks and hearing loss (Temporary Threshold Shift and Permanent Threshold Shift)) and have been used to guide impact assessments in the past, however the propagation of sound is a far more complex issue when there are several sources of underwater noise being emitted in combination. Due to the increase in the levels of human activity in the marine environment, levels of underwater noise are thought to be on the increase internationally, this is especially true for regions such as the Greater North and Celtic Seas (OSPAR 2010).

Sources of underwater sound such as the engines of ships also generate airborne sound, and this can have a significant impact on the health and wellbeing of coastal communities, particularly people living near major ports. For example, Pembrokeshire County Council has reported receiving over 500 complaints about the noise due to ship movements at the liquid natural gas terminals in Milford Haven during their first few years of operation (see section 8.2 of *A noise action plan for Wales 2013-2018*, (Welsh Government 2013c)). The World Health Organization (WHO) has ranked environmental noise as the second biggest environmental contributor to the burden of disease in Europe after ambient air pollution (WHO 2014). Its 2011 report (WHO 2011) estimated that at least one million healthy life-years are lost in Western Europe each year as a result of long-term exposure

to environmental noise, primarily through sleep disturbance and annoyance, but also through an increased risk of heart disease and the cognitive impairment of children.

4.6.2 Key issues for Marine Planning (Noise)

There is a general lack of understanding between transmission of underwater noise and the scale of the effect on marine organisms (either individually or at the population level). There is a lack of understanding for the sensitivities of different species to underwater noise and it is difficult to determine dose response relationships.

Ongoing work investigating these issues includes projects recently commissioned by the European Commission:

- Impacts of noise and use of propagation models to predict the recipient side of noise (ENV.D.2/FRA/2012/0025);
- Environmental Impacts of Noise, Vibrations and Electromagnetic Emissions from Marine Renewables (RTD-K3-2012-MRE).

Also, the work being progressed by Member States under the MSFD will increase the knowledge base on the distribution of impulsive and ambient noise activities. OSPAR also has work in progress to adopt both the impulsive and ambient MSFD indicators as Common Indicators and have measures in place to allow for regional sea scale assessments.

In developing Marine Plans a strategic overview of man-made noise sources should be considered and the potential effects of noise on sensitive marine receptors assessed.

4.6.3 Current Policy (Noise)

Descriptor 11 of the MSFD relates to underwater noise; good environmental status of underwater noise is described as *'Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment'* (2008/56/EC). Guidance has been produced to assist member states in the design and implementation of both impulsive and ambient noise pressure monitoring (MSFD Technical Sub-Group on Underwater Noise 2013).

Currently there are no published standards or regulations for shipping activities, although the Sub-Committee on Ship Design and Equipment of the IMO (International Maritime Organisation) have produced non-mandatory technical guidelines for ship quietening technologies (propellers /

equipment), approved by the 66th session of the Marine Environment Protection Committee (MEPC) in April 2014.

The effects of underwater noise may also require consideration under the EU Habitats Directive in regards to disturbance of protected species, e.g. it is an offence to deliberately disturb animals listed in Annex IV (a).

The Joint Nature Conservation Committee (JNCC) has three key guidelines for underwater noise, these are:

- Statutory Nature Conservation Agency Protocol for minimising the risk of injury to marine mammals from piling noise, (JNCC 2010a)
- Guidelines for minimising the risk of injury and disturbance to marine mammals from seismic surveys, (JNCC 2010b)
- Guidelines for minimising the risk of disturbance and injury to marine mammals whilst using explosives,(JNCC 2009)

Welsh Government policy on noise affecting human health and wellbeing and terrestrial wildlife is laid out in '*A noise action plan for Wales 2013-2018*' (Welsh Government 2013c), which covers all forms of noise, including occupational and neighbourhood noise, and includes commitments to focus attention on those who experience the highest noise levels (people who live in noise action planning priority areas), protect and enhance tranquil urban green spaces (including designated quiet areas) and review and update noise guidance where necessary to ensure that regulators have the tools they need to do their job. It includes a chapter on port noise compiled by the Port Health Technical Panel of Welsh local authorities, which outlines the current regulatory landscape for noise from shipping that affects coastal communities.

4.6.4 Current Status (Noise)

Several studies have focused on the impacts of underwater noise on marine life, which have included looking into the behaviour and physiological effects (Richardson et al. 1995; Popper et al. 2004; Hastings and Popper 2005; Wahlberg and Westerberg 2005; Madsen et al. 2006; Thomsen et al. 2006; Southall et al. 2007).

There is still a lack of quantitative assessments through monitoring to determine the current status of underwater noise (and its associated effects), e.g. evidence to support the hypothesis that

underwater noise from marine activities are having adverse effects at population levels of sensitive species. Monitoring and mitigation techniques such as 'soft-starts', bubble curtains and other noise reduction technology, during piling activity which can reduce levels of underwater noise caused by marine activities, are being evaluated, e.g. in Germany (Koschinski and Ludemann 2013) and also in a UK project under the Offshore Renewables Joint Industry Programme (ORJIP) (Carbon Trust 2014). Some mitigation techniques (mostly but not exclusively on ADDs) has been published by Xodus (2013): Use of Deterrent Devices and Improvements to Standard Mitigation during Piling' was commissioned for Phase 1 of Project 4 of the Offshore Renewables Joint Industry Programme (ORJIP). Noise arising from marine aggregate dredging operations have been measured by Robinson et al. (2011).

There are currently gaps in the guidance available to regulators for managing shipping noise affecting residential populations. This deficiency may be partly addressed, at least in relation to industrial shipping operations, by the publication of British Standard BS 4142:2014, *Methods for rating and assessing industrial and commercial sound*, currently in preparation.

4.6.5 The future (Noise)

Trends in underwater noise are directly related to the trends in the activities exerting noise pressures in the marine environment, e.g. shipping, oil and gas, offshore wind farms, described elsewhere in this report. Mitigation measures such as spatial and timing controls, noise barriers (i.e. bubble curtains), pile sleeves and pingers can be used to avoid injury and mortality of sensitive marine species but require further evaluation.

Evidence on the health effects of different types of noise on human beings is steadily growing. Quantitative dose-response relationships are currently unavailable for industrial and shipping noise, but the gaps are closing and may be expected to continue to do so in the coming years.

5 Sectoral Considerations

Wales is highly dependent on the trade, tourism and fishing industry that its seas provide. As such protecting and sustainably developing Wales's seas is essential. Wales's marine resources support a wide range of sectors including:

- marine aggregate extraction (sands and gravels);
- aquaculture (the cultivation of seafood);
- military activities (training and national security);
- navigation dredging and sea disposal to ensure Welsh ports can operate efficiently;
- energy (including oil and gas, carbon capture and storage, renewable energy developments, coastal power stations and coal gasification);
- fisheries;
- recreation and tourism;
- ports and shipping; and
- surface water management and waste water treatment and disposal.

This chapter provides an overview of each of these sectors and the evidence available to support the development and implementation of the WNMP.

AGGREGATES


STATUS
Extraction of minerals such as sand and gravel from the seabed
Essential to meet demand as 47% OF ALL sand and gravel sold in WALES is marine aggregate
In South Wales 80% of fine aggregate demand is met from marine sources
TRENDS
Effective management of licenced areas to OPTIMISE the area dredged
ADDRESSING environmental impacts Aggregates Levy Sustainability Fund
Increasing knowledge: 2002-2011 £25 million spent on UK reasearch
ISSUES
Aggregate wharves need to be SAFEGUARDED to enable continued access to local markets
POTENTIAL co-existence conflict as aggregate industry tied to certain areas where deposits are found
New dredging vessel costs £30 million and has a twenty-five YEAR LIFE SPAN
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5.1 Aggregates

5.1.1 Overview and background

The marine aggregates sector involves the extraction of aggregates, such as sands and gravels from the seabed. Marine aggregates make an important contribution to the Welsh economy, providing direct employment within the sector as well as within a range of ancillary activities that support the industry including ship building and repair, exploration services, processing of aggregate at wharves, manufacture of products from marine aggregates and agents involved in the sale of marine aggregates (UKMMAS 2010a).

Marine sand and gravel provide an essential contribution to meeting the nation's demand for construction material, being used for the development of our built environment (including large infrastructure, housing, the transport network, water and energy) (North Wales Regional Aggregates Working Party 2009). As an example, at a UK scale total construction mineral extraction is worth £2.4 billion, total construction products are worth £5.3 billion and downstream markets are worth £400 billion. There is a similar relationship with employment – with extraction representing 6-7,000 jobs and construction products 19,000-23,000 jobs (Capital Economics 2012). While these relationships are UK scaled, there is likely to be a similar relationship at a Welsh scale. In addition, there are often no practicable alternative sources to marine aggregate for the maintenance of coastal defences that are likely to be required for, amongst other things, adaptation to climate change. Marine aggregates contribute to energy security and economic development through provision of fill for major coastal infrastructure projects, for example ports, renewable energy and nuclear energy projects. BMAPA, MPA Wales and The Crown Estate have commissioned the Welsh Economic Research Unit at Cardiff University to undertake some specific research to refine the contribution of the mineral products industry to the Welsh economy.

The construction market requires very precise specifications of sand. Such deposits are not widespread around the UK (or Wales), therefore, the marine aggregate industry is tied to certain areas where these deposits are found. The Crown Estate commissioned the British Geological Survey (BGS) to create maps of where suitable aggregate resource is located across UK waters. These maps provide a useful reference to where the aggregate industry can (and cannot) potentially operate (Highley et al. 2007).

Wales, and South Wales in particular, has a strong historic reliance on marine aggregates (Gosson 2011). In South Wales, marine sand meets more than 80% of the demand for aggregate (HM

Government 2011). In 2002, an impact assessment comparing marine and land won aggregate concluded that it was unlikely in the foreseeable future that Welsh marine aggregate could be replaced with aggregate from other sources, without significant increases in cost and a reduction in the quality of the construction material, which would have adverse economic consequences for Wales (Thompson et al. 2002). In addition, marine is also the only significant source for sand to be used for general construction and building purposes in Wales. Therefore, marine aggregates are essential in Wales to maintain existing infrastructure and services as well as provide a resource for new construction projects (Figure 27).

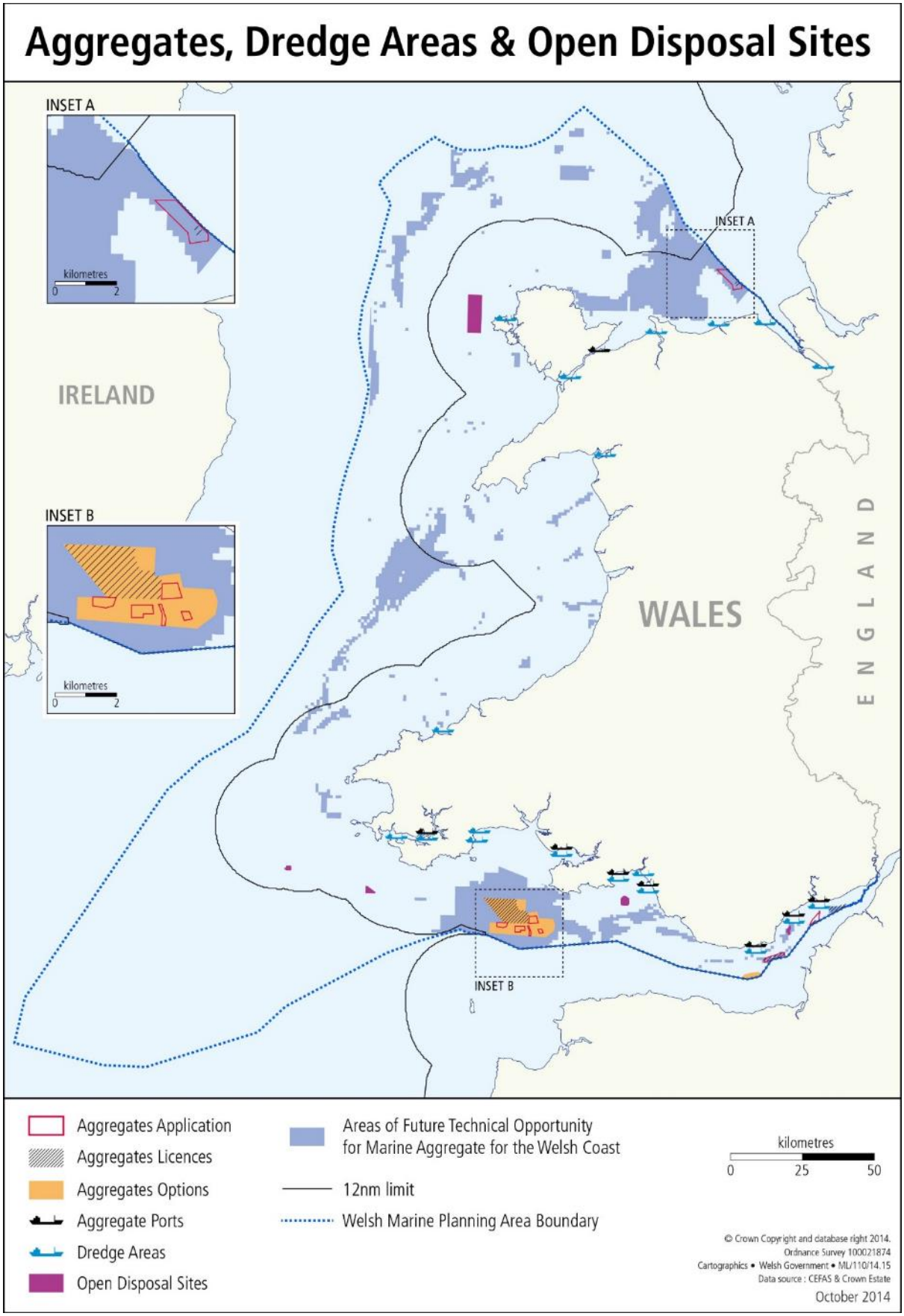
The impacts of aggregate extraction are relatively well known, with a wealth of research undertaken over the last 10 to 20 years. A major part of this research has been funded under the Aggregate Levy Sustainability Fund (ALSF), a levy which the UK Government imposed on all primary aggregates production to reflect the environmental costs of winning these materials. Whilst these studies were focussed in English waters many of the outputs are readily transferable / applicable to the understanding of the impacts of marine aggregate extraction in Welsh waters. From 2002 – 2011, £25m worth of research into the effects of marine aggregate extraction was conducted (Cefas 2014b).

5.1.2 Key issues for Marine Planning (Aggregates)

Marine aggregate extraction may cause direct, indirect and cumulative impacts on the environment and may have both positive and negative interactions with other sectors. Licensing of aggregate extraction usually requires an Environmental Impact Assessment (EIA) to be carried out to assess the impacts of the activity, which provides a transparent mechanism for assessing any potential impacts and how negative effects can be mitigated. The main issues for consideration are, or could be:

- Disturbance / habitat loss due to sediment removal.
- Removal of species within sediment.
- Creation of sediment plumes by draghead disturbance, by overflow when loading sediment and by screening (sorting) of aggregate for end user requirements.
- Changes in bathymetry / seabed topography.
- Potential impact on sensitive receptors – nature conservation or archaeological.
- Employment – directly in industry, but also ancillary works – e.g. shipbuilding and construction works.
- Sediment for coastal protection, including coastal defences.
- Interactions with other sea users (e.g. shipping, fishing).

Figure 27 Marine aggregate interests and open disposal sites located off the Welsh coast



However, there are wider key issues with regards to marine aggregates and marine planning:

- Marine dredged aggregates are vitally important in south Wales, as they are the only significant source of sand for concrete manufacture (Bide et al. 2013).
- Marine aggregates make an important contribution to the Welsh economy, including direct employment within the aggregate sector and indirectly (survey ships, equipment and maintenance) as well as supporting regional construction works.
- Marine aggregate extraction is spatially limited and can only take place where there are suitable resources (The Crown Estate 2014). As such, it is important that these resources are safeguarded against other marine activities which may compromise their use, for example, cables and pipelines, energy developments and designated anchorages.
- Marine aggregates represent the most sustainable source of supply. Construction aggregates are a low value, bulk material and are therefore sensitive to the costs of transportation. Through the economies of scale that are possible, marine aggregates are able to be transported in large volumes (over 2,000 tonnes) over considerable distances, and delivered into the heart of coastal urban areas where they need to be used. This is both cost effective and energy efficient.
- The current average age of the UK dredging fleet is approximately 22 years. With a marine aggregate dredger costing approximately £30m to construct and having a working life of 25 years significant investment will be required over the next five years to maintain production capacity. To support this, operators need long-term confidence and security in the resources that they currently dredge, and those that may need to be worked in the future. Mineral resources are finite and can only be worked where they occur. As their extraction is subject to many constraints, it is important that society uses minerals in the most efficient and sustainable manner. Identifying the distribution of known mineral resources on the UK Continental Shelf (UKCS) and presenting them in a consistent fashion at a national scale allows minerals to be considered in the marine spatial planning process and permits more effective and sustainable management strategies to be developed (Bide et al. 2013).

5.1.3 Current Policy (Aggregates)

The current policy for marine aggregates is provided within the Marine Policy Statement (MPS) (HM Government 2011), which sets out the Government's view for the sustainable use of our seas. The importance of marine won sand and gravel is reflected in the MPS, which states that *'marine plan authorities should as a minimum make provision within Marine Plans for a level of supply of marine sand and gravel that ensures that marine aggregates ... contribute to the overarching Government*

objective of securing an adequate and continuing supply to the UK market for various uses.' The MPS further goes on to state that *'marine plan authorities should consider the potential long-term requirement for marine won sand and gravel… and should take into account … the importance of meeting regional and national needs ... and the need to safeguard reserves for future extraction.'*

Extraction of marine aggregates in Welsh waters requires permission (both for prospecting and commercial extraction) from the seabed owner (in most cases The Crown Estate) and a licence from NRW. The Welsh Government's Interim Marine Aggregates Dredging Policy (IMAD-P) elaborates on the general policies of the MPS providing the framework for sustainable, objective and transparent decision-making for licences in Wales to meet society's needs for aggregates dredged from the Bristol Channel, Severn Estuary and River Severn (Welsh Assembly Government 2004a). The IMAD-P includes strategic policies for the continuation of marine sand and gravel extraction into the foreseeable future; a concentration of activities offshore and to the west of the Bristol Channel; maintaining a capacity in Welsh waters of up to 2 million tonnes p.a. and a five to fifteen year supply. However, it should be noted that IMAD-P is nearly 10 years old. As such, aspects of this policy may need to be reviewed and updated as part of the marine planning process.

The provision of dredged aggregates to Wales is considered in the context of Minerals Planning Policy Wales and Minerals Technical Advice Note (Wales) 1: Aggregates (MTAN 1) (Welsh Assembly Government 2004b) which seeks to ensure that supply is maintained and managed in a sustainable way, maximising the use of secondary and recycled aggregates. MTAN 1 requires that in each Regional Aggregate Working Party (RAWP) area a Regional Technical Statement (RTS) is prepared (which are reviewed every 5 years). The RTS documents are an important part of ensuring that an adequate supply of primary aggregates can be maintained, which meets local, regional and UK needs. They form a key delivery mechanism for implementing national planning policy for minerals contained in *Minerals Planning Policy Wales (2000)* and MTAN 1. Collaboration across local authority boundaries is a necessary imperative when dealing with minerals and *Local Development Plans Wales (2005)* states that new and existing cross boundary work should be integrated into Local Development Plans (LDPs), where relevant, noting the RTS documents as a key area of cross boundary work. However, it should be noted that Wales is a net importer of marine aggregates at present (particularly in the Bristol Channel) with the majority of supply being met from licence areas in English waters. This reinforces the importance of the consistency in marine planning at a regional sea scale.

While land-based quarries still provide the majority of aggregates in the UK, material dredged offshore has been playing an increasingly important role in the building industry since the 1960s. Today, marine aggregates meet about 20% of sand and gravel demand in England and Wales, with 16.8 million tonnes of sand and gravel dredged from the UK seas in 2012 (The Crown Estate 2013a).

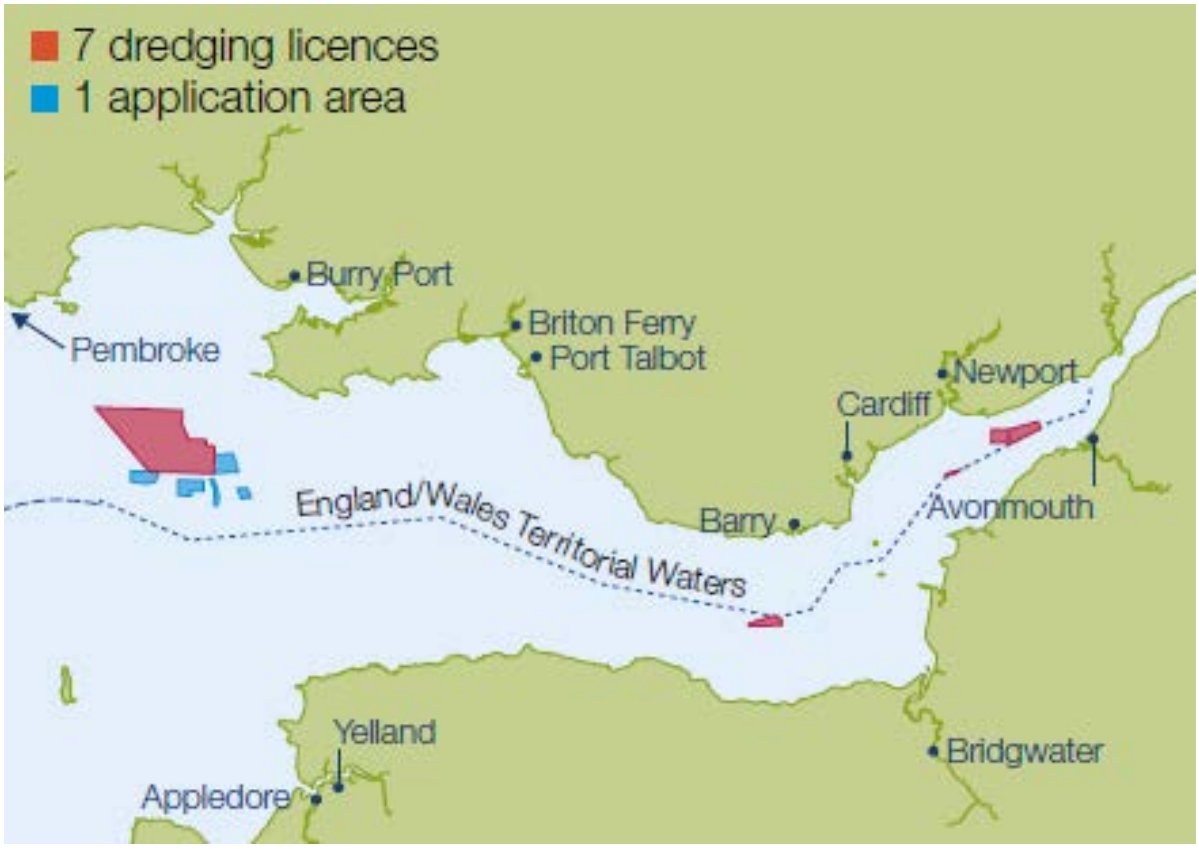
5.1.4 Current Status (Aggregates)

Marine sand and gravel supplied about 47% of total sand and gravel output sold in Wales in 2009 (BGS 2011). On a tonnage basis, Welsh marine aggregates account for 7% of the UK sand and gravel aggregate production (Highley et al. 2007). Marine-dredged aggregates are of major importance in South Wales, with supplies being sourced from the Severn Estuary and the Bristol Channel, but are of very limited importance in North Wales (Cuesta Consulting Limited 2013) although the significance and value of this source of supply to the construction activity taking place in the major urban conurbations of Liverpool and Manchester must be acknowledged – as marine aggregate supplies represent the most sustainable source of supply to these areas. In South East Wales, marine-dredged material accounted for more than 96% of all sand and gravel production over the baseline period (2001 to 2010), reflecting the almost complete lack of historical (or current) land-based sand and gravel extraction in that area, despite the existence of potential land-based resources. However, those potential land-based resources are seriously constrained. This may be through quality (including overburden), location or environmental / development constraints. Local demand is for sand (not gravel) as the coarse aggregate demand is met from crushed rock sources, consequently, the gravel (and fine sand) is considered a waste product and the processing required to produce the quality of sand required makes the resources un-economic.

In 2013, more than 1 million tonnes of material (of a permitted 1.7 million tonnes) were dredged in the Bristol Channel, the majority of which consisted of fine sand which is used in the construction and ready-mixed concrete industry (The Crown Estate 2013a; 2014). Culver Sands (UK waters), Nobel Banks, North Middle Grounds, and North Bristol Deep are the principal licensed areas for marine aggregate extraction in the south west (North Middle Grounds are exposed at low water) (Severn Estuary Partnership 2012). In 2012 and 2013, all of the aggregate extracted was landed at ten wharves in the south west. Approximately 60% of the aggregate was delivered to seven Welsh wharves (Swansea, Barry, Port Talbot, Pembroke, Burry Port, Newport and Cardiff), with 40% landed at three English ports in the south west (Bridgewater, Appledore and Avonmouth). All of these extraction areas are located below low water with the exception of Bedwyn Sands where all dredging takes place above the low water mark (Figure 28). Extraction also takes place in Hilbre

Swash in the waters off North Wales. The application area shown in Figure 28 could produce a further 0.6 million tonnes per year.

Figure 28 Marine Aggregates, Capability and Portfolio for the South West Region2014 (The Crown Estate 2013a)



5.1.5 The future (Aggregates)

The aggregates supply business is closely linked to the construction sector, and therefore the wider economy as a whole. Demand for marine aggregate materials is likely to respond to large scale infrastructure projects such as the expansion and development of ports, nuclear new build and renewable energy, for example, offshore wind farms. The marine aggregate industry predicts that known marine reserves of sand and gravel aggregates will provide a supply for at least another 50 years based on the extent of present reserves (UKMMAS 2010a) and a study by BGS (BGS Resource Assessment Study) commissioned by The Crown Estate shows at a high level where these deposits are located (Bide et al. 2013). Based on the BGS resource assessment study a future technical opportunity for marine aggregates has been derived (shown in Figure 28). This shows spatial areas in the Irish Sea and Bristol Channel which contain nationally important 'coarse aggregate' and selected areas of 'fine aggregate (coarse sand)' which were defined as being of higher importance due to the uniformity or quality of the deposits. If any major infrastructure projects are consented

(e.g. the proposed Severn Barrage) the source and extent of aggregates for construction would be one of a number of considerations, including whether sand and gravel reserves in Welsh waters would be sufficient. For the time being, marine-dredged aggregates will continue to supply a similar proportion of overall demand as they have done over the last decade, so the demand for land won aggregates in any of the sub-regions of either South Wales or North Wales is not likely to be affected (Cuesta Consulting Limited 2013).

As an indication of the possible pattern for Wales the aggregate forecast for England (between 2005 and 2020) (Department for Communities and Local Government 2009) show a predicted decrease in land won aggregate (-7%) and a predicted increase in marine won aggregate (+14%); however, it should be noted that in the RTS prepared by the RAWPs the same proportional contribution from marine aggregates is projected in order to allow flexibility and that any increased demand can be met from marine sources. Furthermore, international demand for marine aggregates may grow in the future as continental land supplies become exhausted, although this may not affect the sector in Wales as it is understood no marine aggregates are currently exported from Welsh ports (Highley et al. 2007). However, marine aggregate dredged from licences in Welsh waters can be landed in English ports (Avonmouth, Bridgewater) and, vice versa, marine aggregate dredged from English licences is landed in Welsh ports. In fact, South Wales is currently a net importer of marine aggregates from English licences.

Demand for flood defence programmes in coastal and inland areas may be increased due to pressures from climate change, and so greater demand for soft engineering defences (such as beach replenishment) could result.

AQUACULTURE

5.2 Aquaculture

5.2.1 Overview and background

Aquaculture includes the rearing or cultivation of aquatic organisms using techniques designed to increase the production of the organisms in question beyond the natural capacity of the environment. It can be characterised in a number of different ways, including the organism farmed, the culture environment, the production intensity and the type of production system used. Aquaculture activities that depend on sea water include different systems of shellfish or finfish farming and seaweed production and harvesting. Marine biomass, from seaweed harvesting for energy production is emerging as one of the newest prospective aquaculture business sectors (see section 5.5.3).

Aquaculture commonly refers to the activity of fish farming and its supporting industries. The term 'fish farming' in this context encompasses the farming or culturing of aquatic species including: fin fish, crustaceans, bivalves, other molluscs and other aquatic animals in sea water. It also encompasses the operation of fish hatcheries, the production of fry, fingerlings and spat, as well as the growing of laver and other edible seaweeds.

The aquaculture sector is complimented by a number of supporting activities, including the manufacture of prepared feed for the farms and the specialised construction, installation and decommissioning of fish farms. Other secondary industries include the processing, distribution and sale of fish for consumption.

The predominance of current marine aquaculture in Wales relates to shellfish cultivation; as such reference should also be made to section 5.6 of this SSE which contains complementary information on the scale and location of fisheries activities. Figure 12 shows all the shellfish harvesting areas in Wales.

5.2.2 Key issues for Marine Planning (Aquaculture)

The Welsh Government is committed to the sustainable development of aquaculture in Wales. This includes shellfish and finfish, in the coastal marine environment and in freshwater. Article 34 of the Common Fisheries Policy sets out the requirement for each Member State to have a multiannual national strategic plan for aquaculture. The European Commission Communication 'Strategic Guidelines for the sustainable development of EU aquaculture' (COM (2013) 229) further develops this. The plan covers actions which can be taken to improve aquaculture, including reducing the

administrative burden on operators, increasing collaboration between industry and scientific institutions.

In relation to aquaculture, the European Maritime and Fisheries Fund (EMFF) in Wales will focus on capacity building, increasing innovation and new developments, building on links between operators and scientific bodies as well as increasing the sustainability of the industry in its interactions with the environment.

The environmental characteristics required by aquaculture and those which support the designation of MPAs are similar (e.g. clean and productive waters) which provides competing issues for marine planners to consider. In Wales there has been some conflict between aquaculture businesses and the management of European Marine Sites (EMS) although the Menai Strait mussel fishery does exist within the EMS without conflict. This can lead to significant expense and delays in businesses getting off the ground. Work could be undertaken to guide developers on the best places to site their businesses to avoid such conflicts.

Non-native species and disease are concerns for aquaculture sectors and marine planning will need to work alongside the Food Standards Agency and local councils to have due regard to the classification of shellfish waters and any activities which may affect these classifications.

5.2.3 Current Policy (Aquaculture)

The Welsh Government is committed to helping support the sustainable growth of aquaculture and has ambitious plans to double Wales's annual finfish aquaculture output, from 1,000 tonnes to 2,000 tonnes by 2020, and shellfish aquaculture production from 8,000 tonnes to 16,000 tonnes. In order to ensure such growth, the current administrative and licensing procedures must be simplified, supporting innovation and collaboration between industry and academic research centres and developing the co-location of aquaculture with other marine industries. The Welsh Government will ensure that the new EMFF is aligned to develop programmes that will support the delivery of the Marine and Fisheries Strategic Action Plan and will work with local businesses to enable them to make the best use of the full range of European funds available (Welsh Government 2013d).

5.2.4 Current Status (Aquaculture)

Commercial aquaculture in Wales has traditionally focused on the managed cultivation of shellfish at sea and freshwater production of salmonids, such as Atlantic salmon for stocking, rainbow trout and

brown trout for the table and for recreational fisheries. The production of salmonids is an onshore activity that requires fast flowing fresh water. Mussel production contributes to the bulk of shellfish aquaculture, the majority of which is exported as live, fresh produce to Europe. Wales is the top producer of mussels compared to other devolved nations in the UK, producing 37% of the UK tonnage total (UKMMAS 2010a). Sustainable shellfish cultivation in Wales depends on cooperation with other sectors and users of coastal areas, as clean, designated, unpolluted waters are essential for shellfish production.

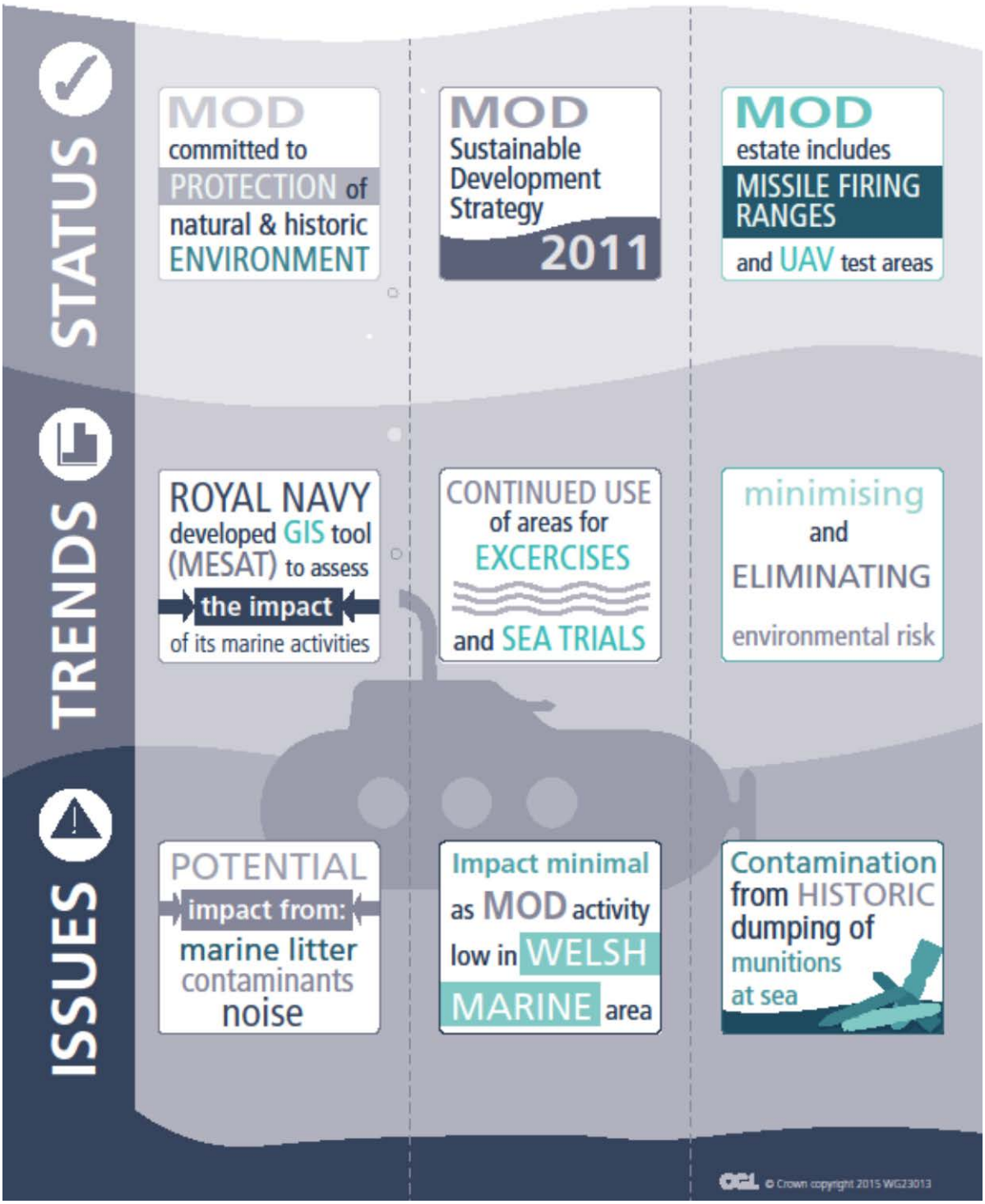
There are estimated to be nine businesses at thirteen sites undertaking aquaculture activities in the Welsh Marine Area, employing approximately 23 Full Time Equivalents (FTEs) directly (Cefas 2012). The businesses are focussed on shellfish aquaculture and are estimated to have generated approximately 9,000 tonnes of produce (99.9% Mussels) in 2012.

5.2.5 The future (Aquaculture)

The long term trend for the aquaculture industry is expected to be one of continued growth. This is despite recent declines in the level of activity in some areas due to the economic downturn. Aquaculture is considered to be a key area for development by UK administrations due to its potential to contribute to the sustainability and security of the UK food supply. Development of this industry is closely linked to changes in wild fisheries, site availability, the environmental carrying capacity and the availability of investment. Therefore, the likely future activity within this sector, although difficult to predict with accuracy, is predicted to be one of continued growth (UKMMAS 2010a).

Aquaculture could become the greatest source of the required increase in fish and shellfish production that will be needed in the coming decades to bridge the gap between diminishing food resources and the increasing demand for food (Environment Food and Rural Affairs Committee 2009). There are possibilities that in the future offshore wind farms and decommissioned oil and gas rigs, could provide the structural supports for fish farms, though based on current market knowledge, such installations appear to be uneconomic due to their likely distance from the shoreline.

DEFENCE


STATUS
TRENDS
ISSUES
MOD committed to PROTECTION of natural & historic ENVIRONMENT
MOD Sustainable Development Strategy 2011
MOD estate includes MISSILE FIRING RANGES and UAV test areas
ROYAL NAVY developed GIS tool (MESAT) to assess the impact of its marine activities
CONTINUED USE of areas for EXCERCISES and SEA TRIALS
minimising and ELIMINATING environmental risk
POTENTIAL impact from: marine litter contaminants noise
Impact minimal as MOD activity low in WELSH MARINE area
Contamination from HISTORIC dumping of munitions at sea
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5.3 Defence

5.3.1 Overview and background

Defence activities that utilise the marine environment, directly or indirectly, in support of operational capability are diverse but include operational vessels and aircraft, HM Naval bases, surface and sub-surface navigational interests, underwater acoustic ranges, maritime exercises, amphibious exercises, coastal training ranges and test and evaluation ranges (UKMMAS 2010a; HM Government 2011).

As one would expect this position is reflected in the Welsh Government consultation on marine planning (Welsh Assembly Government 2011): '*The marine and coastal environment is essential to the MoD in maintaining the operational capability required to achieve UK national security*'.

5.3.2 Key issues for Marine Planning (Defence)

The construction and operation of offshore marine infrastructure, installations and activities, as well as policies on conservation designations and the health of the wider environment may impact on defence interests in certain areas. Marine plan authorities and decision makers should take full account of the individual and cumulative effects of marine infrastructure on both marine and land based MOD interests. Marine plan authorities, decision makers and developers should consult the MOD in all circumstances to verify whether defence interests will be affected (HM Government 2011).

Non-defence activities in the marine area have the potential to impact the MOD elsewhere. Some onshore coastal defences such as aerodromes, transmitter sites and explosive stores have safeguarding zones extending over the marine area to regulate development that may otherwise affect their operation (HM Government 2011).

Through the delivery of security for the UK and Overseas territories, the MOD contributes to the marine sector by providing survey data and cross-government surveillance[7], monitoring and enforcement activities.

[7] The National Maritime Information Centre is responsible for providing situational awareness to central government via the Cabinet Office Briefing Room (COBR) mechanism and lead departments who deal with the impacts of environmental disasters or crises.

It is recognised that there are risks to the marine environment through the maintenance and deployment of operational capability. The MOD is committed to the protection of the natural and historic environment. It will therefore not seek to be exempt from environmental legislation unless such legislation restricts essential operational capability. Where derogations or exemptions are sought to maintain operational capability, the MOD will ensure that internal management arrangements and mitigation measures minimise environmental impact so far as reasonably practicable. The MOD has undertaken to minimise the impact of its activities on the environment and pays due regard to such impacts as part of its decision making process, in line with the Secretary of State for Defence's statement on Safety, Health, Environmental Protection and Sustainable development in the MOD (HM Government 2011).

Key pressures are likely to include noise from sonar and underwater explosions, habitat damage and introduction of marine litter and contaminants. A sustainable development strategy was published by the Ministry of Defence in 2008 and provides a number of objectives, measures and targets for changing the way that activities are carried out in order to reduce pressure on the marine environment, climate and communities (UKMMAS 2010a).

5.3.3 Current Policy (Defence)

The MPS states that marine activities should not prejudice the interest of defence and national security and the MOD should be consulted accordingly. The participation of the MOD in the development of marine plans and their contribution to overall, safety and resilience will ensure the effective use of marine resources while identifying mitigation measures, where possible, for incompatible activity or usage (HM Government 2011).

The MOD has the power to regulate sea areas and restrict their use either temporarily or permanently by making byelaws under the provisions of the *Military Lands Act 1892 and 1900* and the *Land Powers Defence Act 1958*.

The *UK National Strategy for Maritime Security* (May 2014) sets out the scope and objectives to safeguard and promote UK interests and prosperity by upholding the freedom of the seas, by mitigating national security threats and by exploiting opportunities throughout the maritime domain (HM Government 2014).

The National Maritime Information Centre (NMIC) provides a comprehensive picture of potential threats to UK maritime security in UK national waters (NMIC 2012). The NMIC brings together existing functions to provide improved maritime situational awareness and support to lead agencies in the event of emergency or crisis. This allows a much better understanding of maritime safety and security risks and opportunities; information will be shared across Government, and to industry, regional and international partners, and the public as appropriate. Whether the result of this exercise will be an increase in activity in the Welsh marine plan area remains to be seen.

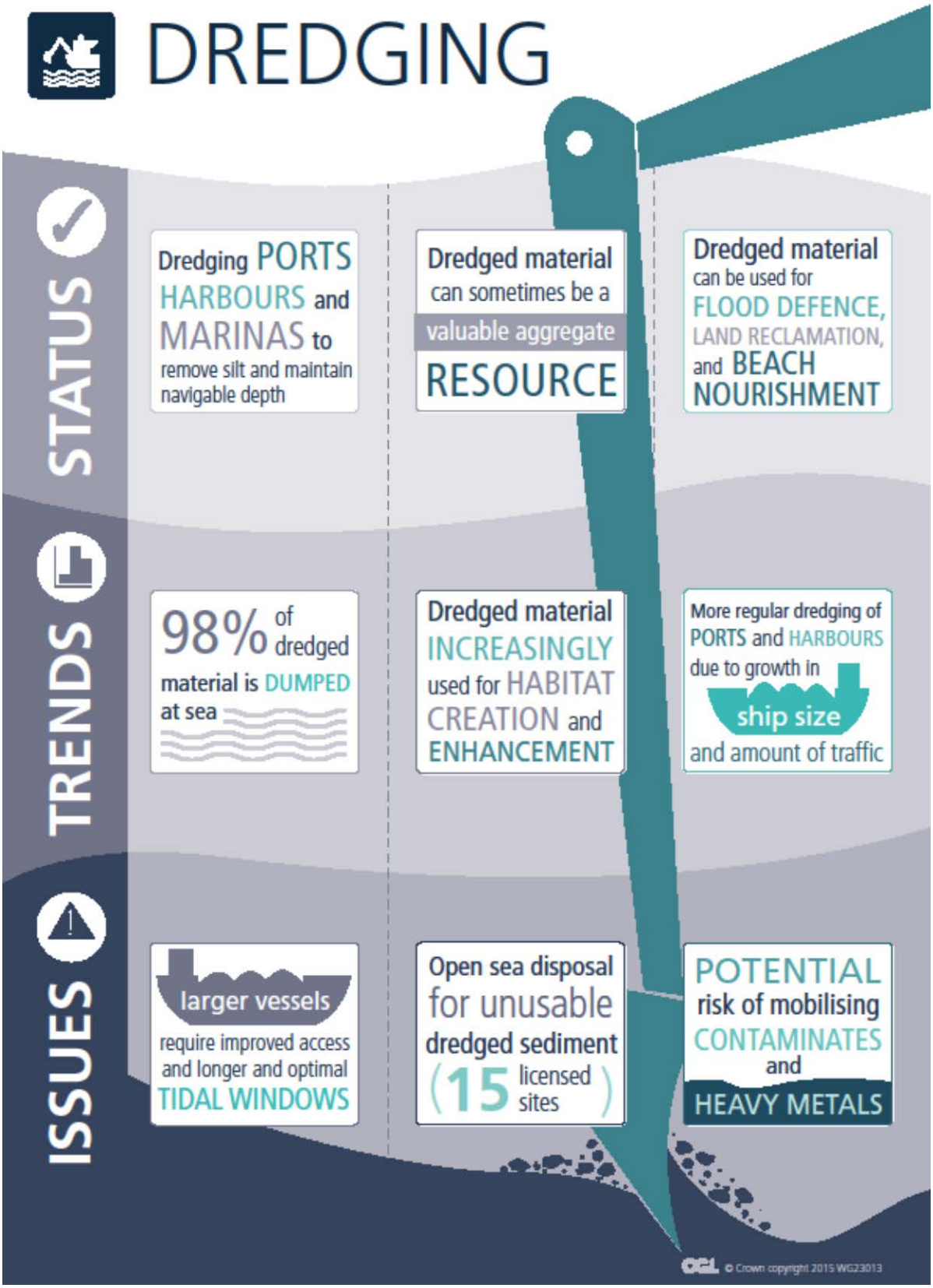
5.3.4 Current Status (Defence)

Relatively little military activity occurs in the Welsh Marine Plan areas, partly due to the lack of naval bases along the coast. However, there are several military practice areas within the plan areas that are used by a combination of Royal Navy, Army and Royal Air Force for practice in air-to-air combat manoeuvres, bombing and firing test areas. This includes the Air Defence Range at Manorbier Head on the Pembrokeshire coast, the Pembrey Sands Air Weapons Range and the Castlemartin firing range in Pembrokeshire (Ministry of Defence 2012). Cardigan Bay is also a military practice area and there are some relatively small munitions dumping grounds off the coast of Pembrokeshire(UKMMAS 2010a).

5.3.5 The Future (Defence)

The Strategic Defence Review announced a series of cuts to the Armed Forces in October 2010, with defence spending to fall by 8% over four years(HM Government 2010). By 2015 there will be 5,000 job losses in the Royal Navy, and the MoD will lose 25,000 civilian staff, amongst other cutbacks. Whilst future defence 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. Any future changes in the nature and level of this marine activity are likely to be driven by strategic decisions at the UK level taken by the MoD. The marine planning process itself is unlikely to have great influence over the prevalence or location of defence-related activities (MMO 2011; MMO 2012a).

In relation to other sectors, there is potential for wind turbines to cause radar interference when turbine heights exceed certain levels; how this will affect future deployment of offshore wind farms remains to be seen. However, a recent breakthrough in radar technology may eliminate the need for MoD to object to wind farm projects on this basis (The Guardian 2012).


DREDGING
STATUS
TRENDS
ISSUES
Dredging PORTS HARBOURS and MARINAS to remove silt and maintain navigable depth
Dredged material can sometimes be a valuable aggregate RESOURCE
Dredged material can be used for FLOOD DEFENCE, LAND RECLAMATION, and BEACH NOURISHMENT
98% of dredged material is DUMPED at sea
Dredged material INCREASINGLY used for HABITAT CREATION and ENHANCEMENT
More regular dredging of PORTS and HARBOURS due to growth in ship size and amount of traffic
larger vessels require improved access and longer and optimal TIDAL WINDOWS
Open sea disposal for unusable dredged sediment (15 licensed sites)
POTENTIAL risk of mobilising CONTAMINATES and HEAVY METALS
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5.4 Navigation Dredging and Disposal

5.4.1 Overview and background

Dredging is closely linked with the Ports sector and consists of navigation dredging of ports, harbours, marinas and navigation channels to maintain navigable depths for vessels. There are two main types of navigation dredging: capital dredging and maintenance dredging.

Capital dredging is the removal of material to create a greater depth than had previously been charted on UKHO Admiralty Charts. It involves the improvement of access by deepening and widening an existing channel, or by creating an entirely new access channel. This is usually done in order to allow larger vessels, longer optimal tidal windows and to provide passing places in narrow channels.

Maintenance dredging is required to maintain water depths in areas where sedimentation occurs. It mainly involves the removal of recently deposited unconsolidated sediments, such as mud, sand and gravel to maintain existing access to ports and ensures that all vessels using the waterway may do so safely. It is undertaken on an as-and-when basis to maintain the level of water necessary for the safe operation of vessels.

If no alternative uses for the dredged material can be found then, as long as the dredged material is deemed suitable by regulators, it is usually disposed of at sea at designated disposal sites. In the Welsh marine area there are currently 15 open sea disposal sites (see Figure 27).

5.4.2 Key issues for Marine Planning (Dredging and Disposal)

Dredging and disposal is essential for maintaining and developing unimpeded and safe navigation of ports, harbours and waterways for shipping and recreational boating as well as for remediation and flood management. Dredged material can be a valuable resource, and can be used in environmental enhancement projects including habitat creation and enhancement, and engineering projects for construction materials, flood defence, land reclamation and beach nourishment. However dredging and disposal of dredged materials may:

- Pose a risk to marine life and ecology through changes in water quality (changes in chemistry and turbidity), noise and physical disturbance;
- Mobilise contaminants (held in sediments from legacy industrial activities, antifouling paints, ongoing industrial or domestic maintenance and operational activities);
- Impact designated nature conservation areas;

- Degrade heritage assets through direct or indirect physical activity;
- Change natural sedimentary systems via morphological changes (i.e. alterations to channel width and depth) (Modified from MMO 2013b).

5.4.3 Current Policy (Dredging and Disposal)

The key policy drivers are (modified from MMO 2013b):

- Licensing of dredging and the sea disposal of dredged material in Wales is undertaken by NRW under Part 4 of the Marine and Coastal Access Act 2009 (MCAA) (Natural Resources Wales 2013b). The MCAA provides the principal statutory means by which the UK complies with EU law, such as the Waste Framework Directive and international obligations such as under the OSPAR Convention and the London Protocol in relation to disposals at sea.
- Section 75 of the MCAA includes an exemption from licensing for dredging or the disposal of dredged material carried out by, or on behalf of, a harbour authority. The exemption only applies if the dredging or disposal is authorised by and carried out in accordance with a Harbour Order or Local Act.
- The UK Government's policy is that no waste should be disposed to sea if there is a safe and practicable alternative. In accordance with the Waste (England and Wales) Regulations 2011, NRW is required to apply the waste hierarchy in authorising any disposal at sea. Therefore alternative or 'beneficial' uses of dredged material should be considered and disposal at sea, assuming the material is suitable, at designated disposal sites should only be considered if no alternative uses can be found.
- NRW in their role as the competent authority in Wales for the Water Framework Directive (WFD) will consider the effects of dredging and disposal activities on water status. The WFD applies to waters out to 1 nm from the baseline from which territorial waters are drawn (Natural Resources Wales 2013c).
- To facilitate compliance of capital or maintenance dredging activities with the WFD the Environment Agency, in partnership with the navigation sector, produced guidance entitled 'Clearing the waters: Marine dredging and the Water Framework Directive' (Environment Agency 2012). This sets out the process that those undertaking or approving navigation dredging activities should follow.
- The development of a baseline document under the Maintenance Dredge Protocol (MDP) provides assistance to operators and regulators seeking or giving approval for maintenance dredging activities that could potentially affect European sites (protected under the EU

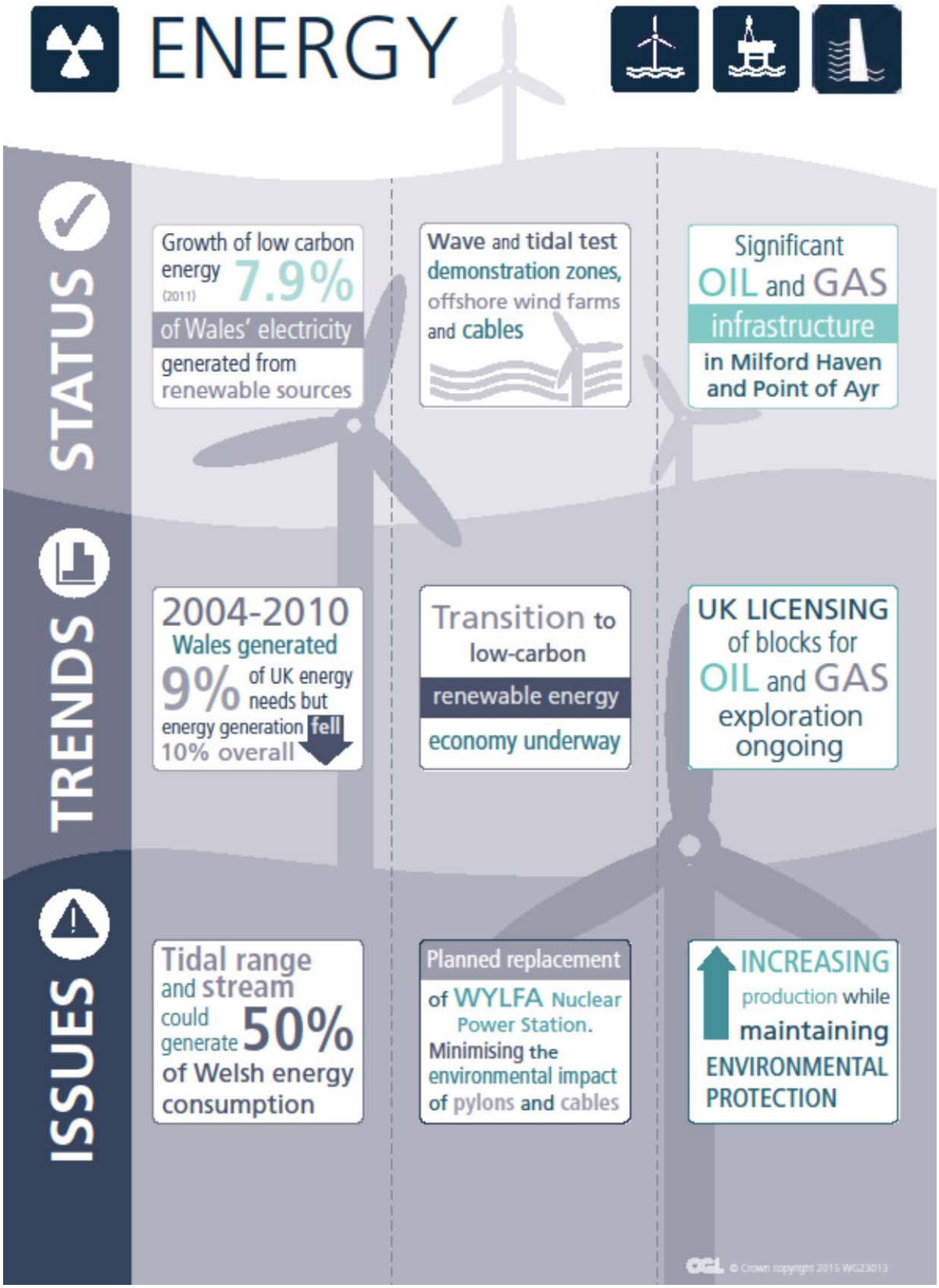
Habitat and Wild Birds Directives) known as Natura 2000 (or N2K) sites (Defra 2007). However the MDP has not been adopted in Wales.

5.4.4 Current Status (Dredging and Disposal)

A considerable proportion of dredging activity is likely to occur in and around major ports; however, there is no clear data on the absolute level of dredging activity (only on disposal volumes) that occurs around the UK in any given year. On average, between 2010 and 2012 there was 1,695,880 dry tonnes of dredged material disposed to licensed disposal sites around the Welsh coast, the location of those sites is shown in Figure 27.

5.4.5 The future (Dredging and Disposal)

The amount of dredged material disposed at sea has remained relatively constant over the last 20 years, with a slight reduction in the trend as operators seek to reduce costs. The requirements for the disposal of dredged material at sea is directly linked to the ports sector (see section 5.9). There will be a limit to which the operators can reduce their maintenance dredging activity, and together with the increasing draft of vessels and potential port expansion projects, the level of maintenance dredging seems likely to be sustained.


ENERGY
STATUS
TRENDS
ISSUES
Growth of low carbon energy (2011) 7.9% of Wales' electricity generated from renewable sources
Wave and tidal test demonstration zones, offshore wind farms and cables
Significant OIL and GAS infrastructure in Milford Haven and Point of Ayr
2004-2010 Wales generated 9% of UK energy needs but energy generation fell 10% overall
Transition to low-carbon renewable energy economy underway
UK LICENSING of blocks for OIL and GAS exploration ongoing
Tidal range and stream could generate 50% of Welsh energy consumption
Planned replacement of WYLFA Nuclear Power Station. Minimising the environmental impact of pylons and cables
INCREASING production while maintaining ENVIRONMENTAL PROTECTION
© Crown copyright 2015 WG23013

5.5 Energy

5.5.1 Overview and Background

A secure, sustainable and affordable supply of energy is of central importance to the economic and social well-being of the UK. The marine environment will make an increasingly major contribution to the provision of the UK's energy supply and distribution. This contribution includes the oil and gas sectors which supply the major part of our current energy needs, and a growing contribution from renewable energy and from other forms of low carbon energy supply in response to the challenges of tackling climate change and energy security. Contributing to securing the UK's energy objectives, while protecting the environment, will be a priority for marine planning (HM Government 2011).

When developing Marine Plans, marine plan authorities should identify how these will contribute to delivery of national targets and priorities, including legally binding commitments entered into under the Renewable Energy Directive (Directive 2009/28/EC) and our domestic binding target to reduce greenhouse gas emissions by 80% by 2050. This will include taking account of preferred areas for development of different energy sources, generation and distribution infrastructure and, if appropriate, setting out potential new opportunities, taking into account the most sensitive areas for biodiversity and considering carefully areas with competing and incompatible uses. When developing the Marine Plans, consideration should also be given to The Crown Estate, as they have large input into most marine energy infrastructure because developers must gain consent from The Crown Estate to lease the seabed and develop on it.

In terms of electricity generation, Wales was responsible for 9% of generation in the UK between 2004 and 2010 (see Table 13) (Statistics for Wales 2013). Total electricity generation in Wales has fallen 10% over this period driven, largely, by a fall in generation from coal and nuclear plants (Welsh Government 2012a).

Table 13 Generation of electricity (Gigawatt hours) by fuel in Wales (Source DECC)

	2004	2005	2006	2007	2008	2009	2010	2011
Gas	17363	15926	14940	17182	16546	14580	16033	10670
Coal	7234	6772	8859	5121	9364	6547	5929	6170
Nuclear	7388	7842	7010	5684	7080	6122	5532	5364
Renewables	1029	1196	1404	1371	1627	1609	1621	2159
Oil & other	2408	2917	3424	3330	3589	3130	3056	2921
Total	**35422**	**34653**	**35636**	**32688**	**38205**	**31988**	**32170**	**27284**

Total energy consumption has been falling since 2005, though more so since 2007 (to a low of 97,900 GWh in 2010) which coincides with the economic downturn (Table 14). It would appear that the industry and commercial sector accounts for a large proportion of this decline (Statistics for Wales 2013).

Table 14 Total energy consumption (Gigawatt hours) in Wales by fuel (Source DECC)

	2005	2006	2007	2008	2009	2010
Coal	1793	1946	2331	2195	1724	1711
Manufactured fuels	9914	10666	10802	8205	8261	8963
Petroleum products	45435	45044	45449	44731	43920	42827
Gas	34311	32401	30938	29684	26989	26469
Electricity	17567	17394	16633	13267	15720	15818
Bioenergy & waste	604	863	1948	1951	2055	2066
Total	**109625**	**108315**	**108101**	**103034**	**98670**	**97854**

5.5.2 Oil and Gas (including Carbon Capture and Storage)

The principal activities of the Oil and Gas sector is the exploration and extraction of petroleum and natural gas from underground wells and the operation of the production facilities and drilling rigs. Exploration may involve the undertaking of geological surveys or the drilling of exploration wells to identify the location of the resource / confirm the presence of the oil / gas. Further appraisal wells may be drilled to confirm the economic viability of the discovery. Where exploration proceeds to development, this may involve the installation of surface infrastructure e.g. platforms / Floating Production Storage Offloading (FPSO) vessels to receive and / or process the oil and gas, and the installation of subsea facilities (wellheads) and pipelines to transport the oil and gas onshore for treatment or export. When a field ceases production the final phase is decommissioning which broadly involves the plugging of wells, cleaning of manifolds and pipelines and the removal of both subsea and topside facilities.

Carbon Capture and Storage (CCS) has the potential to contribute to reducing UK Greenhouse Gas emissions from the power and industrial sectors. CCS can remove carbon dioxide (CO_2) emissions created by the combustion of fossil fuels in power stations and in a variety of industrial processes and transport it for permanent offshore storage in either depleted oil and gas fields or saline aquifers.

To date, there is no commercial scale CCS project in operation within Welsh waters or the UK as a whole. However, through the CCS Commercialisation Programme (CCSCP), there is an ambition to support a portfolio of CCS projects, with at least one full scale CCS project operational before 2020 (DECC 2012a). Various projections of the electricity market in the future point to the need for CCS to aid decarbonisation of the sector and it is therefore likely that this sector will increase in importance over time once CCS is proven and shown to be cost effective. There is further potential to benefit industrial emitters through 'clustering' of infrastructure in areas of high CO_2 emissions.

5.5.2.1 *Key issues for Marine Planning (Oil and Gas)*

Although there is no current oil and gas exploration and production, there are a limited number of licensed blocks, including one with a significant discovery; also the pipeline network to the Point of Ayr Gas Terminal is partly in Welsh waters. In addition there are many blocks within Welsh Waters that are included in the 28th Oil and Gas Licensing Round and, therefore, future developments cannot be discounted.

However, offshore storage of gas[8], offshore unloading of gas and provision of gas import facilities are activities which are of increasing importance to our security of supply as indigenous gas supplies decline (HM Government 2011). A range of offshore infrastructure is required to increase the UK's storage capacity including:

- New import infrastructure, including conventional import pipelines, gas reception facilities and Liquefied Natural Gas (LNG) import facilities. These will be necessary to provide import capacity for the increasingly import dependant UK gas market;
- New subsea storage facilities and pipelines to allow offshore off-loading of LNG.

The key drivers and efforts for CCS technologies are at the UK and international scale. Recommendations from the CCS Cost Reduction Taskforce (HM Government 2013b) and investment from Government and industry are critical factors. Continuing research and development of CCS technologies and capabilities are important factors in reducing the costs towards making CCS economically competitive and viable (modified from MMO 2013b).

5.5.2.2 *Current Policy (Oil and Gas)*

The UK faces a significant challenge in achieving a secure, affordable low carbon energy supply. The Climate Change Act 2008 established a long-term framework to cut greenhouse gas emissions by at

[8] For example see: http://www.gatewaystorage.co.uk/

least 80% below 1990 levels by 2050, and the Climate Change Committee recommended that the electricity sector needed to be largely decarbonised by 2030.

When decision makers are examining and determining applications for energy infrastructure and marine plan authorities are developing Marine Plans they should take into account (HM Government 2011):

- The national level of need for energy infrastructure, as set out in the Overarching National Policy Statement for Energy (EN-1) which applies in England and Wales (DECC 2011a);
- The UK's policy objective to maximise economic development of the UK's oil and gas resources reflecting their importance to the UK's economic prosperity and security of energy supply which applies in England and Wales;
- That the physical resources and features that form oil and gas fields or suitable sites for gas or carbon dioxide storage occur in relatively few locations and need first of all to be explored for, and can then only be exploited where they are found.

The main policy drivers (modified from MMO 2013b) include:

International

- Kyoto Protocol
- Carbon Storage Directive (Directive 2009/31/EC)

National (all of which apply to both England and Wales)

- Energy Act 2008
- Climate Change Act 2008
- UK Marine Policy Statement
- CCS Roadmap (2012)
- Energy White Paper (2003): Our energy future – creating a low carbon economy
- Carbon Plan (2012)

Strategic Environmental Assessment (SEA) is the process of appraisal through which environmental protection and sustainable development may be considered, and factored into national and local decisions regarding Government (and other) plans and programmes – such as oil and gas licensing rounds and other offshore energy developments including gas and carbon dioxide storage. The Department of Energy and Climate Change (DECC), as the principal regulator of the offshore oil and

gas industry, has taken a proactive stance on the use of SEA as a means of striking a balance between promoting economic development of the UK's offshore energy resources and effective environmental protection. Although the European Strategic Environmental Assessment Directive (Directive 2001/42/EC) was not incorporated into UK law until 2004 (The Environmental Assessment of Plans and Programmes Regulations 2004, and equivalent Regulations of the devolved administrations), SEAs have been carried out since 1999 in accordance with its requirements. DECC undertook a sequence of oil and gas SEAs considering various areas of the UKCS (SEA areas 1-8), in addition to an SEA for Round 2 wind leasing. The more recent offshore energy SEA (OESEA) and OESEA2 incorporated the entire UKCS (with the exception of Northern Ireland and Scottish territorial waters for renewable energy), for technologies including oil and gas exploration and production, gas storage and offloading including carbon dioxide transport and storage, and renewable energy (including wind, wave and tidal power) (DECC 2014a).

5.5.2.3 *Current Status (Oil and Gas)*

Oil and gas remain the UK's principal sources of fuel and power, meeting more than 75% of demand in 2008. Domestic resources satisfied about 66% of UK primary energy demand in 2008 (94% of oil demand and 74% of gas demand) and are projected to satisfy about 50% of the UK's oil and gas demand in 2020 (UKMMAS 2010a).

There is currently no oil and gas exploration or production taking place within Welsh waters. DECC have recently undertaken the 28th Oil and Gas Licence Round and there are currently a number of licensed blocks in Welsh waters.

Onshore supporting activities include the significant Point of Ayr Gas Terminal, located close to Prestatyn on the north coast. This terminal handles gas from the Liverpool Bay gas fields, which is delivered via subsea pipeline. Following the refinement process the gas is sent by underground pipeline to the Combined Cycle Gas Turbine power station at Connah's Quay in North Wales.

Whilst Milford Haven plays an important role in the UK's energy sector, with several oil refineries and one of the largest Liquefied Natural Gas (LNG) terminals in the world, this activity is covered under the Ports and Shipping sector (section 5.9). Figure 29 shows oil and gas activities in Welsh waters.

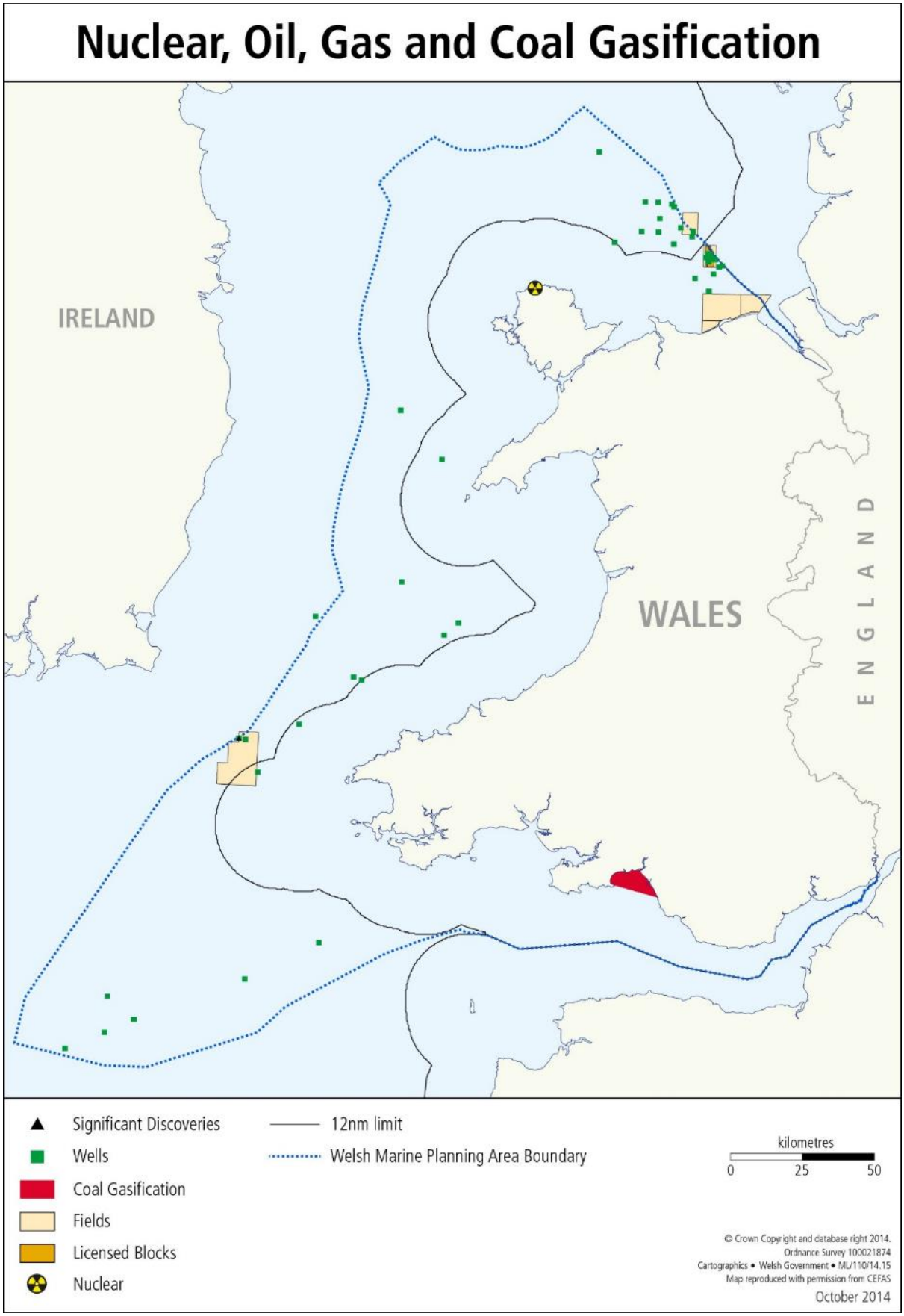
There are currently no commercial scale CCS projects operating in the Welsh marine area but Aberthaw power station in Barry is operating a multi-million pound pilot CCS facility, one of the largest to be built in the UK. However, to put this into perspective, the pilot CCS plant only captures emissions from 3MW of the station's 1,600MW capacity (Wales Office 2012). The pilot aims to provide the operator, RWE npower, with a better understanding of the effectiveness, reliability and costs of the technology. The pilot is also only capturing CO_2 and not attempting to store the gas.

Further efforts to develop the CCS industry in Wales are demonstrated by the Seren research project led by Cardiff University in partnership with the British Geological Survey (BGS) and funded by the European Regional Development Fund (Geoenvironmental Research Centre 2012). This project contains themes linked to the CCS industry, including underground coal gasification and carbon sequestration (the deliberate removal or storage of carbon).

The availability of offshore CO_2 storage capacity is limited by suitable geology, which can be found in hydrocarbon fields and saline aquifers. Work undertaken on potential UK storage sites by the BGS indicates, unsurprisingly given the lack of oil and gas reserves in Welsh waters, that there are no known suitable opportunities for the storage of CO_2 in hydrocarbon fields in Wales; however, it is noted that this could change within the 20 year Marine plan and should therefore be taken into consideration (DTI 2006). Furthermore, known saline aquifers in Welsh waters, which are generally characterised in far less detail than their hydrocarbon bearing counterparts, are not believed to offer significant potential.

Clearly there are a number of significant current CO_2 emitters in Wales, including the fossil fuel power stations of Aberthaw, Barry, Baglan Bay, Pembroke, Severn, Deeside and Connah's Quay, as well as several large industrial emitters, e.g. Port Talbot steelworks and Milford Haven refinery. Assuming that CCS is proven at a commercial scale such facilities would potentially be seeking access to suitable offshore storage resource in the future. Opportunities may exist in the East Irish Sea oil and gas fields when depleted, which would require transport infrastructure (pipelines) through Welsh waters. At this time, however, it is not possible to quantify any economic impacts associated with CCS.

Figure 29 Oil and Gas for the Welsh coast



5.5.2.4 *The future (Oil and Gas)*

Although there is no current oil and gas exploration and production, there are a limited number of licensed blocks, including one with a significant discovery. In addition there are many blocks within Welsh Waters that are included in the 28th Oil and Gas Licensing Round and therefore future developments cannot be discounted.

The Liverpool Bay gas fields are in decline and unlikely to be producing by 2020 (though this clearly depends on the rate of extraction). As such, the Point of Ayr Gas Terminal may become a stranded asset. A report has shown the potential suitability for this pipeline network to be utilised as CCS infrastructure given the proximity of large CO_2 emitters (Eunomia 2011), though this is somewhat speculative at present given the unproven nature of full-scale CCS; however, given that projects have started developing in England, the prospect of CCS projects in Welsh Waters should be considered in a 20 year plan.

A further consideration is the prospect of shale gas reserves being explored and produced, which has been given a boost by the UK Government's announcement that exploratory hydraulic fracturing (fracking) for shale gas can resume and the establishment of an Office for Unconventional Gas and Oil (DECC 2012b). At present efforts are being concentrated onshore, for example, in South Wales, Bridgend-based Coastal Oil and Gas Limited has gained approval for test drilling in the Vale of Glamorgan, however, over the 20 year period of the Marine Plans, this technology may become a possibility offshore (WalesOnline 2012).

This emerging industry remains, however, at an immature stage and is currently not taking place anywhere in the offshore environment. As such, no attempt has been made to quantify this in the forward looking baseline; however, if the relevant geology and economic drivers indicate potential this may become an option.

CCS is very much an emerging industry and as such trends are currently very difficult to predict. There have been early setbacks in terms of financing, though there is still the ambition to have one full scale CCS project operational in the UK before 2020. There are no Welsh CCS projects in this vanguard, and one might reasonably assume that it would take a further 10 years for CCS to be more widely rolled-out, including Wales. By 2030 there might, therefore, be significant CCS pipelines being laid in the Welsh marine area (and associated economic impacts) linking CO_2 emitters to identified suitable storage resources, such as the East Irish Sea (Eunomia 2011). However, by 2030

there is considerable uncertainty as to where the large CO_2 emitters will be. For example, the Aberthaw power station which is currently involved in a CCS pilot project (RWE 2014) is expected to close in the 2020s due to the Industrial Emissions Directive. Given this considerable uncertainty economic impacts have not been projected going forward.

Due to limitations in availability of detailed geological data and knowledge of CCS site accessibility and suitability, MaRS was not used by Crown Estate to model areas of future technical opportunity for this sector. Information about potentially suitable geological structures for storing gasses (depleted oil and gas fields and aquifers) obtained from other sources (including British Geological Survey - http://www.co2stored.co.uk/ - and commercial storage development companies) was used to identify potential opportunities for deep subsurface geological storage. Additional data were used to identify the suitability of potential storage sites, including location of existing infrastructure (including pipelines) and proximity to major CO_2 emitters. However, even with this information included, it is recognised that the areas of future technical opportunity presented for CCS remain incomplete. As has happened historically with oil and gas exploration and production, knowledge of future technical opportunity for CO_2 storage is likely to evolve with time as enhanced interpretation of geological information becomes available.

The primary area currently considered to have the potential for CCS is in the East Irish Sea. This is largely a result of the knowledge gathered through longstanding oil and gas activities in this area. The topography of the subsurface formations (including aquifers) and the associated rock properties are much better understood than other locations beneath the seabed, and thus present a much lower risk to the development of early demonstration sites. It is important to note that due to the status of information currently available the CCS areas of future technical opportunity remain incomplete and therefore it will be important to consider the wider CCS areas in planning work.

The main area of future technical opportunity for pipelines is in the Eastern Irish Sea associated with the location of existing offshore oil and gas production assets, potential future fields, CO_2 storage opportunities and the presence of existing pipeline infrastructure. The development of additional oil and gas resources is likely to be focused on satellite fields, access to which can be achieved from the extension of existing infrastructure. As the life of existing infrastructure could be prolonged, it is not anticipated that significant numbers of additional pipelines will be needed to support the hydrocarbon sector. The extent to which existing infrastructure is re-used by new industries such as CCS and gas storage is, at this time, unclear.

5.5.3 Low Carbon

Key activities within the marine low carbon energy sector include the production of wind, wave and tidal energy (coastal Nuclear Power Stations are described in Section 5.5.4). Ancillary activities that support renewable energy include the construction of marine energy installations, the decommissioning of structures, and transmission of electricity to the distribution system.

Wales has a wealth of natural resources (wind, wave, tidal stream and tidal range) and the low Carbon Marine Renewables Sector Plan relates to the key activities for harnessing the energy potential from these assets.

5.5.3.1 *Key issues for Marine Planning (Low Carbon)*

The UK has among the highest density of exploitable renewable energy resources in the world, and has the potential to become a global leader in both engineering development and energy production with Wales being a contributor. The renewable resources for Wales include wind (for both coastal and offshore); wave; tidal stream (focused inshore) and tidal range (particularly in the Severn estuary).

The Marine Plan should take account of, and identify areas of, potential for the deployment of different renewable energy technologies. Locations of tidal range developments (barrages and lagoons) may be usefully identified through Marine Planning. Measures should be taken to prevent, mitigate, and where that is not possible, compensate for any potential negative impacts in line with legislative requirements. The Marine Plan and the marine planning process will need to be flexible in responding to emerging evidence about the impacts of new technologies; in particular the monitoring and review arrangements for plans will be important in this.

Marine renewable energy projects could have a wide range of impacts, both positive and negative on the marine environment and other sea users throughout the life of a project. Currently most environmental issues and potential impacts are dealt with by developers through the Environmental Impact Assessment and consenting process.

The key issues faced by the marine renewable energy sector in Wales are:

- Interactions with other sea users and the marine environment, dealing with risks and uncertainties.
- Grid Infrastructure.
- Climate Change.

Interactions with other sea users and the marine environment, dealing with risks and uncertainties

The Welsh Government recognises that marine technologies are still emerging and due to a current lack of available evidence about how devices interact with the marine environment, developers and regulators face a number of consenting risks and uncertainties. This has the impact of increasing costs for developers and slowing the consenting process.

The main environmental issues relate to risks and uncertainties to protected species and habitats from:

- Disturbance.
- Effects of underwater noise (from devices and possible deterrents).
- Effects from lighting.
- Effects of habitat loss and prey species.
- Collision risks (with devices and vessels).
- Changes to hydrology and sediment processes.

Impacts from devices can vary, they are likely to be site and project specific and depend on a number of factors such as:

- the technology used;
- the location and sensitivity of the location;
- the timing and approach to activities;
- possible pressures from other forms of activity, such as fisheries, recreational users, shipping and defence, which could create a physical competition for space in the sea;
- Visual impact of developments may also potentially impact on the enjoyment of the marine area and coastline by residents and visitors.

The cumulative effects, both nationally and trans-boundary, from the construction and operation of multiple marine renewable projects also need to be considered when proposing and determining project applications.

Due to the current lack of available evidence and the uncertainties, the Marine Plan and the marine planning process will need to be flexible and respond to emerging evidence.

Grid infrastructure

Wales benefits from good coastal grid connections. However, like most regions across the UK energy infrastructure is under pressure and it is recognised that it will require investment, reinforcement and upgrading to support the aspirations for low carbon energy generation.

Following the work on the Marine Renewable Energy Strategic Framework, the Welsh Government commissioned Halcrow Group Ltd to consider the opportunities and limits to growing the wave and tidal energy industry in Wales. The study identified how potential sites could be developed to support a Welsh marine renewable energy industry.

The Welsh Government is considering the best options to enhance the grid infrastructure. This also includes supporting Menter Môn and Wave Hub on plans for wave and tidal test and demonstration zones.

Climate Change

Energy Wales: A Low Carbon Transition (Welsh Government 2012a) sets out the aim to transition to a low carbon future. The Welsh Government have made good progress to date on this transition and is working hard to create a sustainable marine renewable energy industry. An increase in marine renewable energy generation will assist in reducing carbon emissions and efforts to tackle climate change.

As the climate changes, the Welsh Government and the marine sector will need to adapt and consider the impacts from sea level rise and more severe weather conditions.

5.5.3.2 *Current Policy (Low Carbon)*

Energy policy is mostly a reserved matter with the responsibility shared between the Welsh Government and UK Government.

To deliver the Programme for Government commitments, the Welsh Government has the ambition to create a sustainable, low carbon economy enhancing the economic, social and environmental wellbeing of the people and communities of Wales.

Energy Wales: A Low Carbon Transition (Welsh Government 2012a) sets the priorities for leading the transition to a low carbon future and marine energy is recognised as a reliable and predictable source of renewable energy that could provide a significant contributions towards achieving our

aims, whilst also capturing the benefits from key innovation, research and development on low carbon technologies to power the future.

The UK faces a significant challenge in achieving a secure, affordable low carbon energy supply. The Climate Change Act 2008 established a long-term framework to cut greenhouse gas emissions by at least 80% below 1990 levels by 2050, and the Climate Change Committee recommended that the electricity sector needed to be largely decarbonised by 2030. As part of the move to a low carbon energy economy, the UK must meet a legally binding EU target for 15% of energy consumption to come from renewable sources by 2020. There are specific targets in different parts of the UK. However, as Wales does not have all the necessary levers to delivery renewable energy projects there are no specific targets for Wales. That said, Wales is playing a significant role in assisting the UK Government in meetings its binding targets.

When decision makers are examining and determining applications for energy infrastructure and marine plan authorities are developing Marine Plans they should take into account (HM Government 2011):

- The national level of need for energy infrastructure, as set out in the UK Overarching National Policy Statement for Energy (EN-1) which applies in England and Wales (DECC 2011a) and for Renewable Energy Infrastructure (EN-3) (DECC 2011b);
- The positive wider environmental, societal and economic benefits of low carbon electricity generation and carbon capture and storage as key technologies for reducing carbon dioxide emissions;
- Renewable energy resources can only be developed where the resource exists and where economically feasible;
- The potential impact of inward investment in offshore wind, wave, tidal stream / tidal range energy (both referred to as tidal energy) related manufacturing and deployment activity; as well as the impact of associated employment opportunities on the regeneration of local and national economies. All of these activities support the objective of developing the UK's low carbon manufacturing capability;
- The legally binding commitments entered into under the Renewable Energy Directive (Directive 2009/28/EC);
- The DECC (2012) UK Renewable Energy Roadmap (DECC 2012c);
- UK Electricity Market Reforms (DECC 2014b).

The Welsh Assembly Government's energy policy statement details the potential to produce more than twice as much renewable electricity as Wales consumes as a nation today by 2025. The extraction of energy from renewable sources plays a part in reducing UK dependence on fossil fuel energy, which has much higher associated CO_2 emissions, and improves energy security by increasing the diversity of electricity supply.

The Marine Renewable Energy Strategic Framework (MRESF) project has investigated the potential marine renewable energy resource of Welsh Territorial Waters and considered potential scenarios for the sustainable development of that resource primarily as an aid to policy development and also an indicator of resource for potential developers (Welsh Government 2011d).

DECC undertook a sequence of oil and gas SEAs considering various areas of the UKCS (SEA areas 1-8), in addition to an SEA for Round 2 wind leasing. The more recent offshore energy SEA (OESEA) and OESEA2 incorporated the entire UKCS (with the exception of Northern Ireland and Scottish territorial waters for renewable energy), for technologies including oil and gas exploration and production, gas storage and offloading including carbon dioxide transport and storage, and renewable energy (including wind, wave and tidal power) (DECC 2014a).

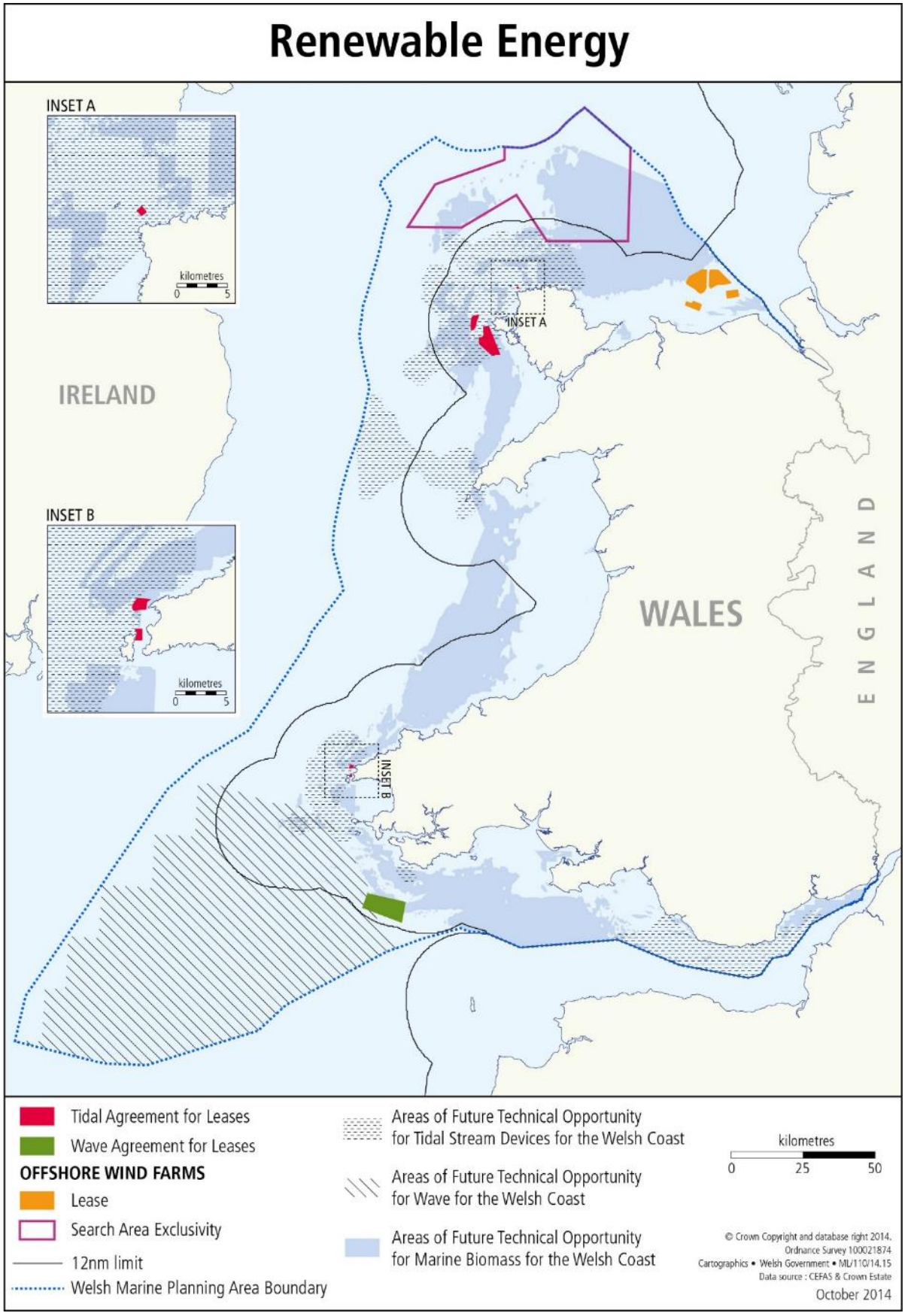
5.5.3.3 *Current Status (Low Carbon)*

Wales is ideally suited for the establishment of a successful and competitive marine energy industry, offering:

- 1200 km of coastline;
- 5 GW of wave and 1 GW of tidal stream potential;
- Proposals for a series of tidal lagoon projects;
- Ongoing interest in a barrage across the Severn Estuary;
- Excellent wind conditions;
- Strategically located deep sea ports;
- Accessible grid infrastructure;
- A manufacturing base; and
- Excellent research capabilities.

The energetic waters off the Welsh coast are ideal for marine renewable energy projects. Welsh ports, supply-chain infrastructure and grid infrastructure provide the means for a thriving marine energy market, both as a significant generator and as an exporter of marine energy knowledge, technologies and services. Figure 30 illustrates the renewable energy areas for the Welsh coast.

Figure 30 Renewable Energy areas for the Welsh coast



Offshore Wind

Commercial scale offshore wind energy generation has been present in Wales since 2003, with the development of the North Hoyle offshore wind farm, the UK's first major offshore renewable power project.

A list of all wind farms currently operational and planned in the Welsh Marine Area is shown in Table 15.

In terms of the supply chain, the engineering firm Mabey Bridge opened a new facility at Chepstow, with the capacity to roll steel monopiles for offshore and near-shore application, as well as fabricating a wide range of steel sub-components for the offshore industry.

Table 15 Operational and Planned Offshore Wind Projects in the Welsh Marine Plan Area

Name of Wind Farm	Round	Size of Wind Farm (MW)	Status	Expected Year of Operation
North Hoyle	1	60	Operational	2003
Rhyl Flats	1	90	Operational	2009
Gwynt Y Môr	2	576	Under construction	2014
Celtic Array (Rhiannon)	3	2200[1]	Proposed	2017

Notes:

- On the 31st July 2014 The Crown Estate announced their agreement to terminate the seabed rights and development activities in the Celtic Array Zone, stating: 'Whilst we have no plans to re-offer the zone to the market, to improve the understanding of the complex geology in this region we intend to make available the wealth of data from Celtic Array's activity through our Marine Data Exchange in due course.'
- The proposed capacity of Rhiannon offshore was 2.2GW in total. It had been assumed that the wind farm's full capacity would come online over 4 years, at a rate of 550MW per year. In total, the Irish Sea Zone (which stretches over multiple territorial waters) had a capacity of 4.2GW.

Source: Table adapted from the Transmission Entry Capacity (TEC) Register: *http://www2.nationalgrid.com/UK/Services/Electricity-connections/Industry-products/TEC-Register/*

Tidal Range

The Welsh Government sees great potential for tidal range developments in Wales and with the second highest tidal range in the world, the Severn Estuary represents a strategically important source of renewable energy. However, it is recognised that most tidal range projects are new concepts and as such a precautionary approach should be applied to ensure projects are constructed, operated and decommissioned within acceptable environmental and financial limits.

Following a UK market engagement exercise carried out by The Crown Estate, an exercise that tested the market appetite for tidal lagoons and a subsequent UK leasing round, there are a number of tidal lagoon proposals around the Welsh coast with one project, Swansea Bay Tidal Lagoon currently in the planning system. If consented, this lagoon would be the world's first man-made energy-generating tidal range lagoon. In addition to a proposed nominal rated capacity of 320 MW and a 120 years design life, as presented by the developer, the lagoon would also provide an amenity value for Wales with recreational and tourism opportunities.

Wave & Tidal Stream

Marine Renewable Energy Strategic Framework

The Welsh Government invested £1 million into developing The Marine Renewable Energy Strategic Framework (MRESF), which assessed the available wave and tidal resource within a sustainable framework.

MRESF, an on-line mapping tool, directs projects to the most favourable locations and provides developers with information on key resource areas and potential development constraints.

MRESF does not treat Natura 2000 sites (European designated sites of conservation importance) as hard constraints. The current deploy and monitor approach to marine licensing ensures that the interactions between marine energy devices and the environment can be understood.

Wave and Tidal Test and Demonstration Zones

To complement the resource zones identified by MRESF, Wales also have a wave and tidal test and demonstration zone. Working with The Crown Estate, the Welsh Government identified a zone off Anglesey suitable for tidal stream projects and a zone off Pembrokeshire suitable for wave devices.

The zone off Anglesey is managed by Menter Môn and the zone off Pembrokeshire managed by Wave Hub. Both zone managers are working with the Welsh Government and other partners to promote and increase the attractiveness of the zones for potential developers, for example by undertaking preparatory activity such as survey work or the installation of infrastructure.

Consented Projects

Wales currently has two projects with the necessary consents to deploy in Welsh waters. These projects will be identified in the Marine Plan.

Trans-European Network-Energy (TEN-E)

Wales has a sub-sea inter-connection to Northern Ireland (EirGrid East West Interconnector). Further offshore grid projects have also been identified as part of the EU TEN-E project and the Welsh Government is engaged with potential developers.

Marine Biomass

Marine biomass, the harvesting and processing of marine macro-algae (seaweed) at a large scale for commercial exploration, is emerging as one of the newest prospective business sectors. There are a number of products that can be developed from this sector; chiefly amongst these are ethanol and methane for energy purposes. Therefore, marine biomass is directly associated with the energy sector. It is yet to develop into a full demonstration phase, however, the research and development is well established in terms of identifying the resource opportunity that exists around the UK.

Areas of future opportunity for marine biomass around the Welsh coast are shown in Figure 30. These areas were derived from MaRS analysis, however this was restricted by the extent of available data sets. The main areas are located relatively close to shore (within 50 km) in the Irish Sea and Bristol Channel. One of the key factors in selecting the optimum sites for such developments is the economic factor of being within around 50 km from a suitable coastal site at which to locate a processing facility, either to use the methane produced locally as a source of community or industrial energy, or a port facility from which it can be collected by a coastal tanker for use elsewhere.

5.5.3.4 *The future (Low Carbon)*

The Welsh Government is committed to continue working closely with The Crown Estate and partners to ensure energy potential is maximised in a sustainable way that delivers economic, social and environmental benefits for the people and communities of Wales, now and in the future.

Recent decisions by major developers to cease projects in Welsh waters are extremely disappointing. However, there is a growing interest in Welsh waters. Technology is continually developing, for example with floating wind turbines, and the Welsh Government wants to place Wales at the forefront of technology development. The Welsh Government will continue work to ensure that they have the expertise and skills to support a sustainable marine renewables sector now and in the future.

The Welsh Government will continue to engage with the National Grid and stakeholders to focus research, and ensure that grid development in Wales is fit for purpose.

Working with UK partners, the Welsh Government are de-risking and accelerating the consenting of renewable energy projects for developers and decision-makers by addressing the priority environmental issues. This work will increase confidence in the marine sector and help the sector to grow.

The Welsh Government is best placed to align Wales's energy aspirations with the needs of the communities and natural environment. This includes continuing to seek full powers over energy consenting (with the exception of Nuclear) and seek the necessary levers that will enable the incentivisation of the right technologies for Wales.

Given the presence of the existing turbine tower and sub-components manufacture hub in Chepstow there is certainly the potential for further expansion in this sector in Wales. Furthermore, the Welsh Government has outlined its desire to see that Welsh companies are actively involved in delivering energy developments and are encouraged and supported to take advantage of the procurement processes associated with them (Welsh Government 2012a).

Ongoing financial incentives such as the Renewables Obligation Certificates (ROCs) will continue to provide support for the offshore wind industry. The Feed-in Tariffs (FiT) with Contract for Difference (CfD) scheme has replaced the ROCs system, with developers able to choose between a FiT with CfD or ROCs up to 31st March 2017. This will apply to installations above 5 MW.

New CfDs will be allocated to chosen projects. The vast amounts of proposed offshore wind energy, and its associated value, coupled with the introduction of a new financial incentive scheme gives rise to significant levels of certainty in the industry, both in terms of start dates of projects, as well as the actual level of wind energy to come on-stream.

Notwithstanding the above uncertainty, the growth in the Renewable Energy sector is expected to be considerable. National Grid publish a register (the Transmission Entry Capacity [TEC] Register) outlining the dates that offshore wind farms are expected to come online, based on industry applications. For the purpose of this assessment, the growth rate of the sector is based on the industry figures contained within the TEC register in July 2012. This growth is used to determine the

level of capacity that is under construction in any one year, as well as the level of capacity that is operational (National Grid 2012).

In addition to the increase in offshore wind farm capacity, there will also need to be an associated increase in transmission access required to connect the electricity generated by the wind farms to the national grid. The issue of connecting Round 3 wind farms to the grid has been considered by Ofgem and DECC within the Offshore Transmission Coordination Project (Ofgem 2012). The project concluded that the most cost effective transmission network would be one which strategically coordinated transmission cables, rather than adopting a radial approach. This approach would reduce the need for cabling and therefore reduce capital and operating costs. Additionally, a key finding of the project was that anticipatory investment (AI), which caters for the addition of future grid connection capacity from the outset, was a key output for a strategically coordinated approach. Ofgem is currently developing plans to ensure that AI is maximised. Therefore, for the marine plans it is assumed that AI will be achieved. The ISLES (Irish-Scottish Links on Energy Studies) project potentially has two cable landfalls in Wales (ISLES 2011; The Scottish Government 2013).

The entire UK Renewable Energy Zone (REZ) is considered to hold resource suitable for the exploitation of offshore wind. In reality, not all areas would be appropriate for siting a wind farm due to a number of other considerations (e.g. the presence of other sea users, interests and sensitivities, the existence of technology suitable for such physical conditions, the economic cost of deploying in certain areas and practical distance from shore). The area of future technical opportunity for offshore wind farms (Figure 30) encompasses almost the entire REZ. The majority of UK waters are deeper than 60 m and is therefore not available for existing technologies at present. None-the-less, the future technical opportunity for floating turbine technology covers a large area covering Welsh waters.

The development of areas of future technical opportunity for tidal stream devices is shown in Figure 30. This was undertaken using MaRS based on an up-to-date understanding of resource, the technical characteristics of emerging technologies and the foreseeable evolution of these technologies.

Tidal Energy Ltd is to install a single Deltastream 400 kW demonstrator unit off the coast of Pembrokeshire at Ramsey Sound for 12 months, commencing in summer 2014. During deployment the device will be connected to the Local Distribution Network. After the completion of this 12 month trial the device and associated infrastructure will be removed (Tidal Energy 2014).

Sea Generation (Wales) Ltd is proposing to develop a tidal stream array with a capacity of up to 10 MW at a site off the North West coast of Anglesey referred to as the Skerries. The landfall location has yet to be decided but is likely to be close to Wylfa. It is proposed that the turbine array will be installed for up to 25 years, where it will serve as a test case for the development of further multiple unit arrays. The intention is to use the port facilities at Holyhead as much as possible for the installation, operation and ongoing maintenance of the devices. It is considered likely that the development will go ahead, with a target installation date of 2016 (Sea Generation (Wales) Ltd 2013)

The likely future marine power activity within Wales is dominated by any decision about a Severn barrage, with an 8 to 12 GW generation potential (DECC 2013). If this major project were to go ahead the potential in Wales from tidal and wave projects by 2025 could be more than half of the current electricity consumption (Welsh Assembly Government 2008b). Clearly the economic impacts of such a scheme would be substantial. The Welsh Government continues to advocate the Severn Estuary as a strategically important source of renewable energy, whilst recognising the significant environmental and financial challenges.

In 2010 a comprehensive two year cross-Government feasibility study concluded that '*a tidal power scheme in the Severn estuary could cost as much as £34 billion, and is high cost and high risk compared to other ways of generating low-carbon electricity*' (DECC et al. 2010). As recently as January 2013, DECC has re-emphasised that the aforementioned feasibility study does not present a strategic case for public investment in the immediate term, though private sector groups are continuing to investigate the potential (DECC 2013). As such, it has been assumed that a Severn barrage is unlikely to commence construction within the 20 year period defined by this strategic scoping assessment. Should the project be seen to be feasible in the future, the Marine Plans should be revised to accommodate this need. There are also smaller scale tidal range projects proposed that might be feasible e.g. tidal lagoons.

In March 2014 the Planning Inspectorate accepted for consideration the application by Tidal Lagoon Swansea Bay plc for consent to build The Swansea Bay Tidal Lagoon (Tidal Lagoon (Swansea Bay) plc 2012). This development would involve the construction and operation of hydro turbines and their housing with a nominal generating capacity of 240MW and construction and dredging for a lagoon including around 9.5 km of new sea wall and related facilities impounding around 11.5 km^2 of seabed/foreshore. The electricity transmission infrastructure required for the export of electrical power via Baglan Substation in the County Borough of Neath Port Talbot would include cables laid

offshore and onshore, electricity step-up facilities and other electricity transmission facilities. The Crown Estate has launched an industry engagement process to understand the market interest in future tidal range and lagoons projects around the UK (The Crown Estate 2013b).

5.5.4 Power Stations

In some parts of the UK, power stations may be sited in coastal locations and will have an important contribution to play in the UK's energy mix. These include conventional (coal, gas, oil), biomass and nuclear power stations. The construction, operation or decommissioning of a coastal power station may have impacts on the local marine environment through, for example, the construction of the plants and associated development and marine offloading facilities, such as jetties and marinas, for heavy plant items. There may also be impacts from abstraction and discharge of cooling water during operation. More detail on impacts and specific measures and actions to avoid or minimise adverse impacts, including on marine ecology, is contained in the UK National Policy Statements for Nuclear Power Generation (EN-6) (DECC 2011c) and Fossil Fuel Electricity Generating Infrastructure (EN-2) (DECC 2011d). Any discharges into water will be controlled in accordance with the permits issued by the relevant licensing authority.

5.5.4.1 *Key issues for marine Planning (Power Stations)*

Key issues for power stations (modified from MMO 2013b) include:

- Flood risk
- Water quality and resources, including temperature changes to water and radionuclide emissions
- Coastal change and impacts from infrastructure (construction, operation and decommissioning)
- Biodiversity and geological conservation
- Landscape and visual impacts
- Social & economic considerations
- Human health and well-being.

5.5.4.2 *Current Policy (Power Stations)*

The transition to a low carbon energy system is already underway, but, in looking forward for Wales, it is likely to be characterised by a number of key elements (Welsh Government 2012a).

Redesigned energy markets are needed to ensure that the most efficient technology choices and optimum investments are made in transitioning to a low carbon economy. This work is currently underway, being led by the UK Government through the Electricity Market Reform.

The pursuit of ever greater energy efficiency will be vital. This provides significant social and environmental advantages, essential to tackling fuel poverty and ensuring long term affordability, as well as substantial economic opportunity for Wales. It will, therefore, be a constant theme through the whole transition process.

A widespread deployment of a diverse range of low carbon technologies is envisaged which will help to generate low carbon electricity, bringing about a steady decarbonisation of energy supply. Some of these technologies, such as wind, solar, nuclear and biomass are mature and currently being developed and deployed. Others, such as wave and tidal, are at an earlier stage of development but have the potential to significantly contribute to low carbon electricity over the medium to longer term.

Gas will be a key transitional fuel because greenhouse gas emissions from gas are significantly less than coal, subject to the method of extraction. Gas is a flexible, responsive and reliable source of energy which can play a key role in the transition to a genuinely low carbon energy system.

Whilst the rise of gas is essential in a low carbon transition, it cannot be a long term basis for the energy economy of Wales without carbon capture and storage. Carbon capture and storage, therefore, if successfully commercialised and supported by the appropriate regulatory framework, will be a vital component of Wales's medium to long term energy future.

Greater electrification of overall energy consumption will also occur as electricity becomes more widely used in transport and heating. It is envisaged that there will be, for example,:

- a gradual introduction of renewable bio-methane into gas supply,
- much greater end-use and conversion efficiency in space and water heating, reducing overall demand,
- a rise in the use of electrical heating through efficient heat-pumps

In the short term, gas, nuclear and bio-energy will provide the energy to compensate for the intermittency in supply from renewable resources. In the medium to long term, the development of

energy storage technologies and a next-generation 'smart grid' will provide further scope for managing the intermittency and balancing supply and demand more effectively.

The Welsh Government will be involved, to varying degrees, in the development of these elements as Wales transitions to a low carbon economy.

5.5.4.3 *Current Status (Power Stations)*

The Wylfa Nuclear Power Station (490 MW) on Anglesey has been in operation since 1971 (Reactor 2 was shut down in 2012 and Reactor 1 is likely to operate until 2015). The Trawsfyndd nuclear power station in Gwynedd shut down in 1991 and is currently being decommissioned by the Nuclear Decommissioning Authority.

Wales has two coastal Coal Fired Power Stations, Aberthaw, (1500 MW) and Uskmouth (393 MW). Wales has six Gas fired Power Stations, Baglan Bay (870 MW), Barry (245 MW), Connah's Quay (1380 MW), Deeside (500 MW), Pembroke (2000 MW) and Shotton (210 MW).

Gas is responsible for almost 50% of all electricity generated in Wales and continues to remain the dominant source. Coal and nuclear have gradually decreased as particular generating plants come off-line. The proportion of electricity generated from low carbon sources, including nuclear, has remained steady at around a fifth of total generation. Growth in renewable generation, from 2.9% in 2004 to 5.1% in 2010, has to some extent negated the fall in electricity generated from nuclear over the same period (Welsh Government 2012a).

5.5.4.4 *The future (Power Stations)*

The Welsh Government supports the development of nuclear new build (Wylfa B) on Anglesey, with the potential to contribute £2.34 billion to the economy over the period to 2025 (Welsh Government 2012a). The Wylfa site was listed in the final Nuclear National Policy Statement (NPS) in June 2011 along with seven other UK sites deemed strategically suitable for nuclear development. The Nuclear NPS was approved by a vote in Parliament on 18th July 2011. Scoping work as part of the planning process has subsequently been commenced for the Wylfa site and if approved electricity generation will not commence until 2020 (Horizon Nuclear Power 2014). There are also proposals for a new Gas Fired Power Station at Port Talbot (1300 MW).

The Welsh Government are committed to making further improvements to the planning system and review other consenting regimes associated with energy developments to simplify processes.

The Welsh Government are already working closely with the private sector, the National Grid, the Distribution Network Operators and others, to secure the investment required for its energy needs.

5.5.5 Coal gasification

Traditional mining methods may not be suited to working offshore reserves, and development and infrastructure costs of new mines can render the exploitation of landward reserves uneconomical. The concept of gasifying coal underground and bringing the energy to the surface as a gas for subsequent use in heating or power generation has considerable attraction. Underground coal gasification (UCG) has the potential to provide a clean and convenient source of energy from coal seams where traditional mining methods are either impossible or uneconomical (The Coal Authority 2014).

UCG is the partial in-situ combustion of a deep underground coal seam to produce a gas for use as an energy source. It is achieved by drilling two boreholes from the surface, one to supply oxygen and water / steam, the other to bring the product gas to the surface. This combustible gas can be used for industrial heating, power generation or the manufacture of hydrogen, synthetic natural gas or other chemicals.

5.5.5.1 ***Key issues for Marine Planning (Coal gasification)***

As discussed in section 5.5.3.1 the UK has among the highest density of exploitable renewable energy resources in the world, and has the potential to become a global leader in both engineering development and energy production with Wales being a contributor. The Marine Plan should take account of and identify suitable areas for the deployment of potential UCG technologies and sites. Measures should be taken to prevent, mitigate, and where that is not possible, compensate for any potential negative impacts in line with legislative requirements. The Marine Plan and the marine planning process will need to be flexible in responding to emerging evidence about the impacts of new technologies; in particular the monitoring and review arrangements for plans will be important in this.

The environmental impacts of a UCG process are visual, acoustic, and include air emissions and groundwater effects. Like any geological extraction process, the geological and hydrogeological risks

of UCG have to be effectively managed. Control has advanced considerably since the early trials and all UCG processes now have active control of the operational conditions in the cavity to ensure an inward flow of groundwater and to prevent gas seepage. The contaminant risk and product gas quality from potential sites is fully assessed in advance and would be monitored during and after operations. A wide range of risk management techniques and management tools from around the world are available for regulatory purposes (UCG Association 2011).

5.5.5.2 *Current Policy (Coal gasification)*

UK Government policy is to encourage the development of cleaner coal technologies for application both at home and in overseas markets. The potential for UCG in the UK relates not only to reducing environmental emissions but also to ensuring security of energy supply and maintaining an acceptable level of diversity of energy supply.

The basic feasibility of UCG has been proven in previous trials. Further detailed studies are required to prove the technology of precision drilling process control over sustained periods of operation and to fully evaluate any possible environmental impact on underground aquifers and adjacent strata. One of the practical problems of UCG is that meaningful experiments cannot be carried out in the laboratory, and trials must be undertaken at pilot scale, which is both costly and time consuming.

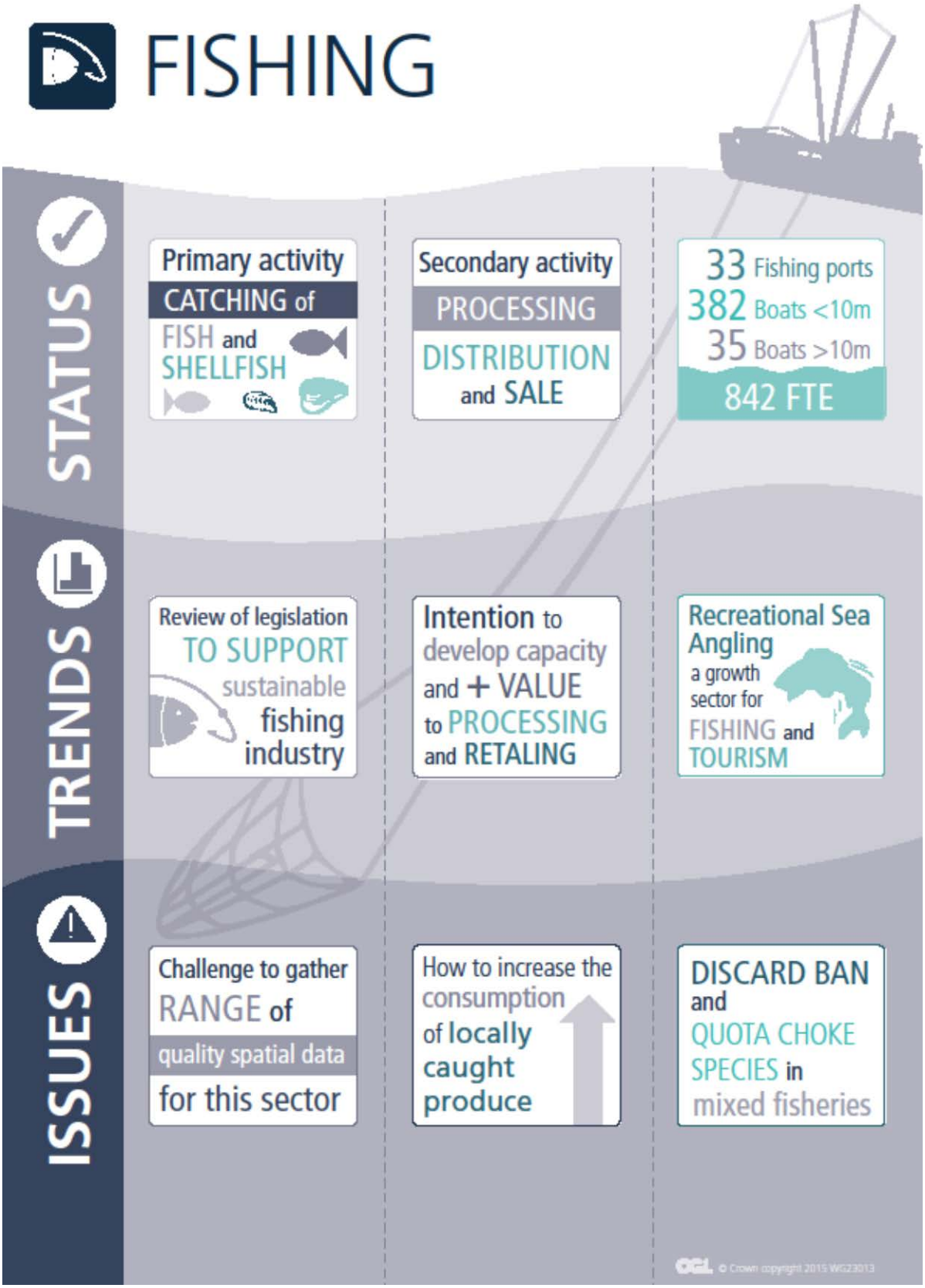
An EU trial, sponsored in part by the UK's Department of Trade and Industry (DTI) (now DECC), has demonstrated the feasibility of UCG at depths typical of European coal. The DTI (sic) concluded that the UCG process has potential for UK coal reserves, particularly when considering the large quantities of offshore coal potentially available.

5.5.5.3 *Current Status (Coal gasification)*

In Wales, Cluff Natural Resources has been awarded a licence for UCG by the Coal Council for the Loughor and Dee estuaries (BBC 2013), although permits to commence the operation have yet to be granted. The Loughor Estuary project area in Carmarthenshire covers 42 km^2; the Dee Estuary project on the north Wales coast involves a 69 km^2 area. In Swansea Bay, Clean Coal Ltd is seeking to apply for planning permission for UCG (BBC 2012). Figure 29 illustrates the areas of coal gasification for the Welsh coast.

5.5.5.4 *The future (Coal gasification)*

Technology targets for UCG were set in DECC Energy Paper 67 and a programme of studies has taken place with industry to critically assess the commercial feasibility of UCG.


FISHING
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Secondary activity
PROCESSING
DISTRIBUTION
and SALE
33 Fishing ports
382 Boats <10m
35 Boats >10m
842 FTE
Review of legislation
TO SUPPORT
sustainable
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Intention to
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and RETALING
Recreational Sea
Angling
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quality spatial data
for this sector
How to increase the
consumption
of locally
caught
produce
DISCARD BAN
and
QUOTA CHOKE
SPECIES in
mixed fisheries
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5.6 Fisheries

5.6.1 Overview and background

The Fisheries sector covers the activities of inshore and offshore commercial fishing, including the harvesting of molluscs and crustaceans, as well as other marine organisms, e.g. algae, sponges, and seaweed (UKMMAS 2010a). Other activities associated with the sector include fisheries enforcement agencies, recreational sea angling, boat building and boat maintenance. It also includes the manufacturing and maintenance or repair of fishing gear. Other secondary activities include the processing, distribution and sale of fish for consumption.

Descriptor 3 of the MSFD relates to commercially exploited fish and shellfish. For the UK, the proposed monitoring programme for commercially exploited fish and shellfish will be based on existing monitoring programmes for the Common Fisheries Policy (CFP) managed stocks and existing national monitoring programmes for non-CFP managed stocks. These monitoring programmes, which will be updated where necessary in light of new knowledge, will provide a sound basis for the monitoring requirements and robust data to assess progress against UK targets for descriptor 3. These targets reflect the commitments agreed during the negotiations on the reform of the CFP to fish sustainability and the achievement of sustainable stock levels.

5.6.2 Key issues for Marine Planning (Fisheries)

A large proportion of the Gross Value Added (GVA) in the Fisheries sector is reliant upon processing and retailing fish associated products. Wales does not have any recognisable internal market structure, which means that finfish sales remain a significant problem to the fleet in the absence of a Welsh auction or other markets. Fishermen, in many cases, are required to transport catches to English markets. Furthermore, there is effectively no added value processing or infrastructure in Wales, exacerbating the ability of fishermen to obtain the best returns for their potentially valuable raw materials. It is unclear whether these activities will increase or decline in the future. It is recognised that measures to achieve good environmental status (under MSFD) may impact on the fisheries sector, but any impacts are unknown. It should be noted that the European Fisheries Fund (EFF) has funded this type of business such as Viles Shellfish Ltd, Celtic Crab Products Ltd, Welsh Sea Foods Ltd, Capestone Organic Ltd, Fishguard Seafood Company Ltd to improve the processing and retailing of fish associated products.

Marine Planning provides the opportunity to manage marine activities in a sustainable manner taking into account economic, social and environmental considerations. However, it may be

hampered by the paucity of good spatial data for fisheries activities (in particular for vessels less than 12 m). Other considerations include the displacement of fishing from MPAs and offshore wind farms (see section 3.3 for a full description and ways forward).

Management of cockle fisheries

Cockle fisheries are some of the most valuable fisheries in Wales and often of great local and cultural importance. Two consultations have been held recently proposing a new management regime for cockle fisheries in Wales which would facilitate an economically and environmentally sustainable industry for future generations.

Management of Welsh crustacean fisheries

Crustaceans are the mainstay of much of the Welsh fishing fleet with crab and lobsters traditionally targeted via fishing with pots. Proposals have been developed in conjunction with the fisheries industry which are subject to a public consultation. The proposals within the consultation seek to remove the current fragmented legislation across Wales replacing them with a single harmonised regulation, providing a consistent set of regulations which simplifies the requirements on industry while protecting stocks for future generations.

Bass fishery

Bass is an important species for the industry in South and West Wales as well as a mainstay of the recreational fleet. Recently, the International Council for the Exploration of the Sea (ICES) recommended a significant decrease in the level of bass catch in Europe. Bass is currently a non-quota species and if it is to stay that way, new robust technical measures are needed. The domestic and European pressure on bass fishery is driving significant change in the attitude towards management of bass. The Welsh Government expects to bring forward proposals for management of the bass fishery.

Historic Access Rights

The consultation regarding the future of Historic Access Rights (Grandfather rights) in the Welsh inshore area, closed on the 1 December 2013.

5.6.3 Current Policy (Fisheries)

The Welsh Government is responsible for ensuring that (Welsh Government 2014d):

- fish health and welfare is monitored

- legislation, both for sea and inland fisheries, is implemented correctly in Wales
- Welsh fishing interests are protected and promoted.

Welsh Ministers are responsible for the inland fisheries in Wales but discharge this function through the work of NRW. NRW is responsible for regulation of inland fisheries in Wales (including salmon, sea trout, eel, smelt and lamprey out to 6 nm) and has a general duty under the Environment Act 1995 to '*maintain, improve and develop fisheries*'. This is achieved through implementation of legislation and externally funded work based on actions agreed with Welsh Government to ensure that it manages fisheries effectively and sustainably. NRW is also responsible for the management of two large cockle fisheries, one on the Dee Estuary (North Wales) and one on the Burry Inlet (South Wales), but these are both regulated by Regulating Orders

The Wales Fisheries Strategy, published in 2008, signalled the need to improve fisheries legislation and a move towards more sustainable fisheries. Whilst this strategy has served the industry well, the Welsh Government Marine and Fisheries Division undertook a review of this strategy in 2013 to ensure it is fit for purpose, easy to understand and in line with current demands and legislation. The Wales Marine and Fisheries Strategic Action Plan (Welsh Government 2013d) aims to safeguard environmental resources, use them as a driver for economic growth and help to ensure that the Welsh fishing industry receives the level of support it needs in order to grow and become more competitive.

Coastal communities require support if they are to develop a fishing sector that is resource efficient, low carbon, resilient and in line with both, the agendas of 'Blue Growth' (strategies to support sustainable growth in the marine and maritime sectors) and 'Green Growth' (economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies). To this end, the Welsh Government has started a process of integrated policy-making for Welsh seas and coasts, focussing initially on marine planning, management and fisheries. The Welsh Government plans to develop that approach further alongside, and as a component of, its approach to marine planning. The Marine and Fisheries Strategy and components of the Action Plan will deliver a range of key outcomes for the implementation of MSFD in Welsh waters and the achievement of GES by 2020. For example, marine planning and marine licensing are expected to be tools for delivery as well as the new Common Fisheries Policy and the Welsh Government's approach to Marine Protected Areas in Welsh waters (including implementation of the Habitats and Birds Directives).

The new framework for managing fisheries within European waters includes:

- the Common Fisheries Policy (CFP) – overarching regulation to manage fisheries within the EU;
- the Common Organisation of the Market (COM) – for the marketing of fisheries products;
- the European Maritime and Fisheries Fund (EMFF) – the financial instrument to deliver the changes.

The reformed CFP will establish the high level framework to enable Member States to manage fisheries and deliver the objectives of the reform including the discard ban, achieving Maximum Sustainable Yield (MSY) for all major fisheries by 2020, establishing Multi-Annual Plans to support decisions around fishing opportunities while maintaining MSY, introducing a regional approach to management and improving aquaculture. The CFP must be complimentary to other EU Directives, including MSFD, Habitat and Birds Directives and Article 17 of the CFP, and requires Member States to provide incentives to fishing vessels deploying selective fishing gear or using fishing techniques with reduced environmental impact, such as reduced energy consumption or habitat damage.

To implement a reformed CFP will require legislative changes to deliver the objectives. This includes revised Control Regulation and Technical Control measures, but also corresponding domestic legislation to deliver those changes within Member States.

The delivery of a reformed CFP is a statutory commitment placed upon the UK as a Member State and its delivery in Wales is devolved to the Welsh Government. In addition to the initial changes, the reformed CFP provides the basis for the day-to-day management of fisheries through licensing and quota and associated statutory enforcement obligations.

An important element to deliver the new CFP in Wales is the management of licensing and quotas. The UK Fisheries Concordat provided the mechanism to enable those functions to be managed by the Welsh Government. Regional groups, established by the Welsh Government will provide effective industry input on licensing and quota management.

5.6.4 Current Status (Fisheries)

In 2011/12, the Welsh Marine Area contributed 4% to the UK's total tonnage of shellfish and fish landings, indicating a relatively small contribution to the UK's total fishery production (MMO 2012b). Two of the most valuable fisheries in the Celtic Sea are beam trawling for demersal fish, and pot

fishing for crabs, lobsters and whelks (UKMMAS 2010c). Cod spawning grounds are closed to fishing during February and March. This also impacts the Dover Sole fishery which mainly takes place in spring in this area. Inshore in the Celtic Sea, there are a wide variety of fisheries for shellfish including crabs, lobsters, cockles, whelks and razor clams. These tend to be pot or creel based fisheries (UKMMAS 2010a).

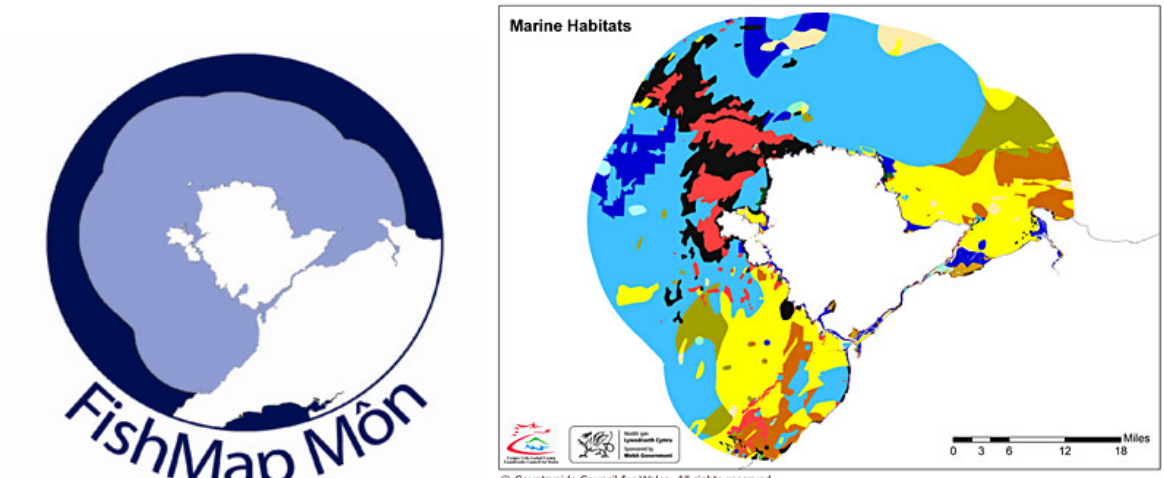
A significant number of Spanish, French or Belgian owned UK 'flagships' land their catches in ports such as Milford Haven, Swansea and Holyhead, however direct benefit to the Welsh economy is limited as catches tend to be landed directly to road vehicles for onward transport to markets in Europe. The limited contributions to the local economy are through harbour dues, wharfage, and the purchase of fuel, chandlery and victualing stores (Welsh Assembly Government 2008c).

The majority of registered fishing vessels in Wales are less than 10 m registered length, and part of the inshore fleet. These vessels fish close to the coast for a wide range of species including bass, crabs, scallops, lobster, prawns, brill, turbot, sole, plaice, rays, cod, mullet and whelks. Many of these species are of high commercial value and high quality due to the methods of capture used and the short time between capture and landing. These small scale fisheries contribute most to the Welsh economy in volume and value. The inshore sector supports a large number of businesses, and the fleet works from 33 recognised ports and harbours, plus numerous beaches, coves, estuaries and jetties along the Welsh coastline (Welsh Assembly Government 2008c). Approximately 842 FTEs are directly employed by the sector, and an estimated 8,103 indirectly related jobs. Figure 12 illustrates areas of shellfisheries for the Welsh coast.

Accurate spatial information on fishing locations for the smaller (less than 12 m registered length) vessels is difficult to obtain. This is due to the fact that such vessels are not required to operate Vessel Monitoring System (VMS) tracking (although since 2011 scallop dredgers do carry VMS). Furthermore, for some methods and species the locations can change seasonally and from year-to-year in response to fish stocks and market conditions. The Sea Fishing Atlas for Wales (Countryside Council for Wales 2010) was compiled from information collected between 2000 and 2005 from various sources, including fishermen, fishery officers, fishery regulators and other marine users. Whilst the outputs may now be somewhat dated and the locations of actual fishing activity may be debated in the absence of any other spatial data, the report is indicative of the then fishing activity areas in Welsh inshore waters.

The total GVA of the sector is currently estimated to be £21.2 million. This figure is based on the value of fish landed in the Welsh Marine Area. It should be noted, however, that the fish landed within the plan area may not necessarily be caught in the plan area. Conversely, fish caught in the plan area may not be landed in the plan area.

The FishMap Môn project (http://www.ccgc.gov.uk/landscape--wildlife/managing-land-and-sea/fishmap-mon.aspx) was jointly funded by the European Fisheries Fund (75%) and Welsh Government (25%) and completed in September 2013. Its aim was to achieve the vision of the Wales Fisheries Strategy which is to '*support the development of viable and sustainable fisheries in Wales as an integral part of coherent policies for safeguarding the environment*'. The FishMap Môn project was run by the Countryside Council for Wales, working with the North Wales Fishermen's Cooperative Ltd, Bangor Mussel Producers Ltd and the Welsh Federation of Sea Anglers. Based around Anglesey, and out to 12 nm, encompassing an area of approximately 265 km² it engaged with fisherman in order to collect information about fishing activity and intensity. Information collected during the project will be combined with existing knowledge about the distribution of marine habitats and their sensitivity to fishing activities. The degree of sensitivity of different habitats to various types and intensities of fishing has been assessed for Wales.



Bangor University has fish survey records that date back approximately 20 years for some areas of North Wales. Surveys have also been conducted in the Wylfa Area for the proposed Nuclear Power Station (http://www.cefas.defra.gov.uk/publications/environment/Wylfa2013.pdf).

Recreational sea angling is known to contribute to local economies and support businesses (e.g. fishing tackle retailers and manufacturers; bait suppliers; boat sales and suppliers; charter boats; tourism and accommodation). Wales supports shore fishing (e.g. for bass, cod, mullet and whiting) and boat fishing (e.g. black bream and tope). In the UK, approximately two million people

participate in sea angling every year in the UK with 76,000 of these in Wales. However, very little is known about current sea angling activity and economic value compared with other coastal uses of marine resources. Specific data for Wales is lacking, however a report for Welsh Government in 2000 (Nautilus Consultants Ltd 2000) suggested that sea angling contributed £28.7 million to the Welsh Economy and supported 471 (Full Time Equivalent) jobs.

5.6.5 The future (Fisheries)

Fishing in Welsh waters within 6 nm is managed exclusively by Welsh Government under Welsh or UK legislation and beyond 6 nm under the CFP. The reformed CFP will establish the high level framework to enable Member States to manage fisheries and deliver the objectives of the reform including the discard ban, achieving Maximum Sustainable Yield (MSY) for all major fisheries by 2020, establishing Multi-Annual Plans to support decisions around fishing opportunities while maintaining MSY, introducing a regional approach to management and improving aquaculture. The Welsh Government will work closely with stakeholders to refine and develop it, particularly in the light of emerging European Union work to implement the new CFP (Welsh Government 2013d).

There have been a number of major changes to fisheries management in Wales over recent years. In 2012, the four UK fisheries Ministers signed the fisheries concordat giving each nation administrative responsibilities for fisheries licensing and quota management. The Welsh Government identified the need to review all fisheries legislation in relation to Wales. Over 200 items of domestic legislation have been identified and the full review will take some years to carry out. The review goes further than simply tiding up the legislation with the Welsh Government taking this opportunity to question the need for legislation, and what management measures are appropriate to ensure sustainable and viable fisheries in Wales.

As the fisheries sector in Wales has evolved there has been a shift of focus from larger vessels operating out of central points (Milford Haven, Swansea, Bangor and Holyhead) to smaller vessels operating from smaller ports and harbours, landing lesser quantities of fish that are of greater overall value than previously. In contrast, this trend has also resulted in the development of systems where shellfish buyers, using vivier lorries (effectively lorries with large water tanks), have strategic collection points where fisherman can take their catch for onward transport to markets in the UK and abroad. With only a few buyers, primary producers have little choice to whom they sell. Furthermore, the price paid for live product does not necessarily reflect its quality. It is uncertain how these trends will develop in the future.

RECREATION and TOURISM

5.7 Recreation and Tourism

5.7.1 Overview and background

Coastal tourism encompasses a wide variety of activities; the key activities (although the list is not exhaustive) include hotels and similar accommodation, holiday and other short stay accommodation, camping grounds, caravan sites and static caravan sites, restaurants and mobile food service activities, beverage serving activities, libraries, archives, museums and other cultural activities, sports activities and amusement and recreation activities.

Coastal Tourism was estimated to be worth £602 million for Wales in 2013 and generated 3.594 million trips (Great Britain Visitor Survey).

Ancillary activities that support coastal tourism include event catering activities, passenger transport by road, rail, water and air, the renting and leasing of cars, car parking, recreational goods, sports goods and water transport equipment, creative arts and entertainment activities and gambling and betting activities and other visitor facilities (UKMMAS 2010a). It is recognised that increased tourism may require not only new developments but also possible enhancement of existing infrastructure and facilities. These, may, in themselves, have a direct or indirect impact on the marine and coastal environment. Such impacts are diverse in their magnitude, extent and the potential receptors that could be affected and can be addressed with the subsequent Marine Plans.

Marine recreation encompasses all recreational activities that occur in the marine and coastal areas. Tourism is a major contributor to these activities. Water sports and recreation include diving, sailing, power boating, windsurfing, board sports, canoe/kayaking, coasteering as well as recreational charter boats and sport fishing.

Ancillary activities, supporting this industry include the construction and maintenance of marinas, moorings and slipways, building and maintenance of pleasure and sporting boats, manufacture of sports equipment, operation of sport, transport and beach facilities, and renting and selling of sports goods and equipment. Other supporting industries include tourism accommodation, with strong links to the coastal tourism sector.

5.7.2 Key issues for Marine Planning (Recreation and Tourism)

The Welsh Marine Area has a strong presence of coastal tourism where some of the benefits of the marine environment are appreciated through tourism activities (i.e. visiting marine reserves).

However, there is also a cost associated with these activities which can cause potential issues to the marine environment. Some of the key issues include the changes to, and removal of, marine fauna and flora, and physical damage and disturbance of the marine environment and life within it. Growth of tourism activities is thought to be on the increase (target 10% by 2020). Increased tourism will require development of facilities such as footpaths, jetties, and other coastal infrastructure, and has the potential to impact on the marine environment in the following ways

- infrastructure provided to support development of tourism and recreation activity (e.g. car parks, hotels, marinas) can impact on landscape character and sense of place;
- increased levels of traffic resulting from promotion and growing popularity of coastal / marine areas can lead to congestion;
- recreational pursuits that fail to recognise the distinctive landscape quality and character of coastal areas can sometimes impact on the quality of experience for the majority of users (e.g. use of jet skis in areas perceived as being of high scenic and tranquil quality).
- increased numbers of visitors can also cause increased litter, pollution and coastal erosion.

These key issues are particularly important for sensitive habitats and marine life.

Coastal tourism is reliant upon the natural and built environments, and landscapes along the coast. Changes to these environments, for example from other intrusive economic activities or developments that are not in keeping with the existing character of an area, can have an unintended negative effect on the sector.

Tourism is likely to compete with several other sectors, including recreation, where there will be competition for marine space. The engagement of marine and coastal users (i.e. stakeholders, local authorities, and water sports associations) may be required to resolve conflicts of use of marine space and help to weigh up the costs and benefits of sustainable tourism and the protection of the marine environment and landscapes when developing marine plans.

Climate change is likely to influence the levels of tourism and recreation within the Welsh marine area; for example, when weather is good, there is likely to be more people taking vacations in Wales and greater recreational use by locals, however, when weather is poor, tourism and other recreational demand is likely to be reduced. It is also worth highlighting that the effects from climate change can also have indirect impacts on tourism and recreation as increased sea levels and storm incidents can affect the infrastructure, i.e. piers, jetties, coastal paths, resulting in increased maintenance and costs and even closure in extreme events.

Increased levels of recreational activities have the potential to increase the risk of negative effects on the marine environment; however, the scale and the impact of recreational activities vary considerably, change rapidly and the impacts are, therefore, hard to define and challenging to manage. For example, experience in Pembrokeshire suggests that marine and coastal recreational activity is increasingly being provided through small individual, mobile enterprises that make extensive use of social media for promotion purposes (as opposed to the larger outdoor and often residential recreation centres and businesses of the past), which can create significant challenges in terms of managing frequency, levels and impacts (social and environmental) of recreational use along the coast. As with tourism, recreational activities rely on the benefits of healthy marine environments, coasts and landscapes. A balance is, therefore, needed to retain both the level of recreational activities to support socio-economic benefits to the area and promoting good environmental status.

It is inevitable that recreational activities (hotspots) overlap with sites of designated and significant landscapes, historic heritage, nature conservation and other key interests along the Welsh coastline. Even though the character of the majority of recreational activities are well understood, there are still gaps in knowledge in respect of the interaction between recreational activity, environmental capacity and appropriate management responses, including promoting responsible behaviours and promoting greater environmental awareness amongst users of the coastal marine resource.

5.7.3 Current Policy (Recreation and Tourism)

The MCAA aims to maintain healthy, biologically productive safe seas and ensure the sustainable use of marine areas.

On a national level the Planning Policy Wales (PPW) chapter on tourism, sport and recreation (Welsh Government 2014e) states that:

- **Tourism** is vital to economic prosperity and job creation in many parts of Wales. It is a significant and growing source of employment and investment, based on the country's cultural and environmental diversity. Tourism can be a catalyst for environmental protection, regeneration and improvement in both rural and urban areas.
- **Sport and recreation** contribute to our quality of life. The Welsh Government supports the development of sport and recreation, and the wide range of leisure pursuits which encourage physical activity.

Partnership for Growth: The Welsh Government Strategy for Tourism 2013-2020 provides a new strategy and sets the vision for the industry and the Welsh Government to work in partnership to increase visitor spend and drive higher tourism earnings to deliver maximum value for the Welsh economy (Welsh Government 2013e). The strategy identifies a product-led approach to developing and marketing tourism in Wales. There will be a focus on more luxury and branded hotels, more well-being facilities such as spas, more heritage hotels that utilise historic and distinctive buildings, more all year round attractions, activities and cultural experiences, and more innovative, unusual and distinctive products. Maximising the tourism potential of the coast is identified as a key action in the Framework Action Plan accompanying the 2013-2020 Strategy.

The Pembrokeshire Coast National Park Authority (PCNPA) Plan was developed for the promotion and sustainable management of recreation in the National Park and surrounding inshore waters (PCNPA 2014; Wales Activity Mapping 2014). The Plan has been created to safeguard the Park's special qualities, identified as being: visual character, remoteness and tranquility, biodiversity, geological diversity and archaeological and historic built resource of the Pembrokeshire Coast National Park. The Plan focuses on encouraging recreation but ensuring that where recreational users come into contact with the Park's special qualities, no adverse impact occurs.

5.7.4 Current Status (Recreation and Tourism)

The Welsh Marine Area has a strong tradition of coastal tourism, with approximately 2,740 km of coastline which includes many beaches, coves, headlands and other areas for recreation and leisure. The greatest bulk of seaside tourism is for leisure and holiday purposes, although cities and resorts such as Cardiff, Swansea and Llandudno also attract business and conference tourism. Within the regions, seaside tourism is particularly important for North and South West Wales, where it accounts for half of all activity (57% and 48% of tourism spend respectively) (Welsh Assembly Government 2008a).

Principal seaside towns are defined as having a population of at least 10,000 and where seaside tourism is a significant component of the local economy. Out of a total of 41 principal seaside towns in England and Wales, four are located within the Welsh Marine Area (Barry, Porthcawl, Llandudno/Colwyn Bay/Conwy, and Rhyl / Prestatyn). Smaller seaside towns, with a population of less than 10,000, are described as coastal resorts; the Welsh Marine Area contains thirteen out of a total of 50 throughout England and Wales (Centre for Regional Economic and Social Research 2010).

The Welsh coast and marine area offers a rich historic, cultural and linguistic heritage that encompasses, for example, seafaring traditions, vocabulary and dialects, names given to coastal and marine features and their social or historic connections, past industrial and maritime features on the shore and in the marine environment, literary or creative connections (e.g. Mabinogi, Cantre'r Gwaelod, musical tradition) and religious or spiritual connections (e.g. the Celtic saints seaways, Bardsey pilgrimage). Not only are these aspects of heritage important in their own right, and in terms of their role in sustaining the identity and social wellbeing of Welsh communities, they also provide a bedrock for tourism and recreational activity that is culturally relevant and distinctive to Wales.

Wildlife and the landscape attract many visitors to the Welsh Marine Area, with 70% of the coastline designated for its environmental quality. Designations include National Parks along the Pembrokeshire Coast and Snowdonia; Areas of Outstanding Natural Beauty at Anglesey, Llyn and Gower Peninsula; Heritage Coasts at Great Orme, Anglesey, Llyn, Cardigan Bay, Pembrokeshire, Gower and the Vale of Glamorgan; National Nature Reserves; Marine Nature Reserves and Sites of Special Scientific Interest. Many parts of the coastal and marine environment are designated as Special Areas of Conservation and Marine Special Areas of Conservation as they are the best examples in the UK for containing habitat types and species listed in the EU Habitats Directive (section 4.2). Other parts of the coast are designated as Special Protection Areas to conserve the habitats of certain rare or vulnerable birds and regularly occurring migratory birds (section 4.2). The Dyfi Estuary in mid Wales is the only designated Biosphere Reserve in Wales, and one of only eleven such sites in the UK (Welsh Assembly Government 2008a).

The plan area also has many important sites of archaeological and historic interest along the coastline, including pre-historic sites and the castles of Beaumaris, Caernarfon, Conwy, Harlech and Flint. Registered historic landscapes, parks and gardens make a significant contribution to the distinctiveness of the Welsh coast and to its appeal to tourists (Welsh Assembly Government 2008a).

The Welsh Marine Area accounts for nearly 3% of the total value of the marine recreation industry in the UK (British Marine Federation 2012). Leisure boating is the most popular and economically valuable part of the marine water sports industry. In the plan area, there are 85 Royal Yachting Association (RYA) affiliated member clubs and 64 registered Training Centres (TCs) (Wales Directory 2013; WYA 2013). There are now 17 marinas in Wales offering a total of 4,839 berths (9.4% of all coastal & tidal marinas in the UK) (RYA 2014) and there are plans in place to build 3 new marinas

offering another 1,210 berths (a 25% increase) (Conygar 2013). In 2010 the total spend in the Welsh economy attributable to marinas was estimated at £23.5 million (additional secondary benefits of £7.1 million), supporting 490 direct FTE and 124 indirect FTE (South & West Wales Marine Leisure Federation 2010). This only reflects the revenue of marinas themselves and under represents the overall contribution of boating to the economy. A recent study by the British Marine Federation (Economic Benefits of the UK Marine Industry, 2014) shows that wider tourism expenditures linked to the marine industry and leisure boating in Wales total £282 million, with total revenue at £359 million.

Surfing in Wales is a popular activity, particularly in South Wales and Pembrokeshire, where the surf is medium to high quality and of medium consistency (Surfers Against Sewage 2010).

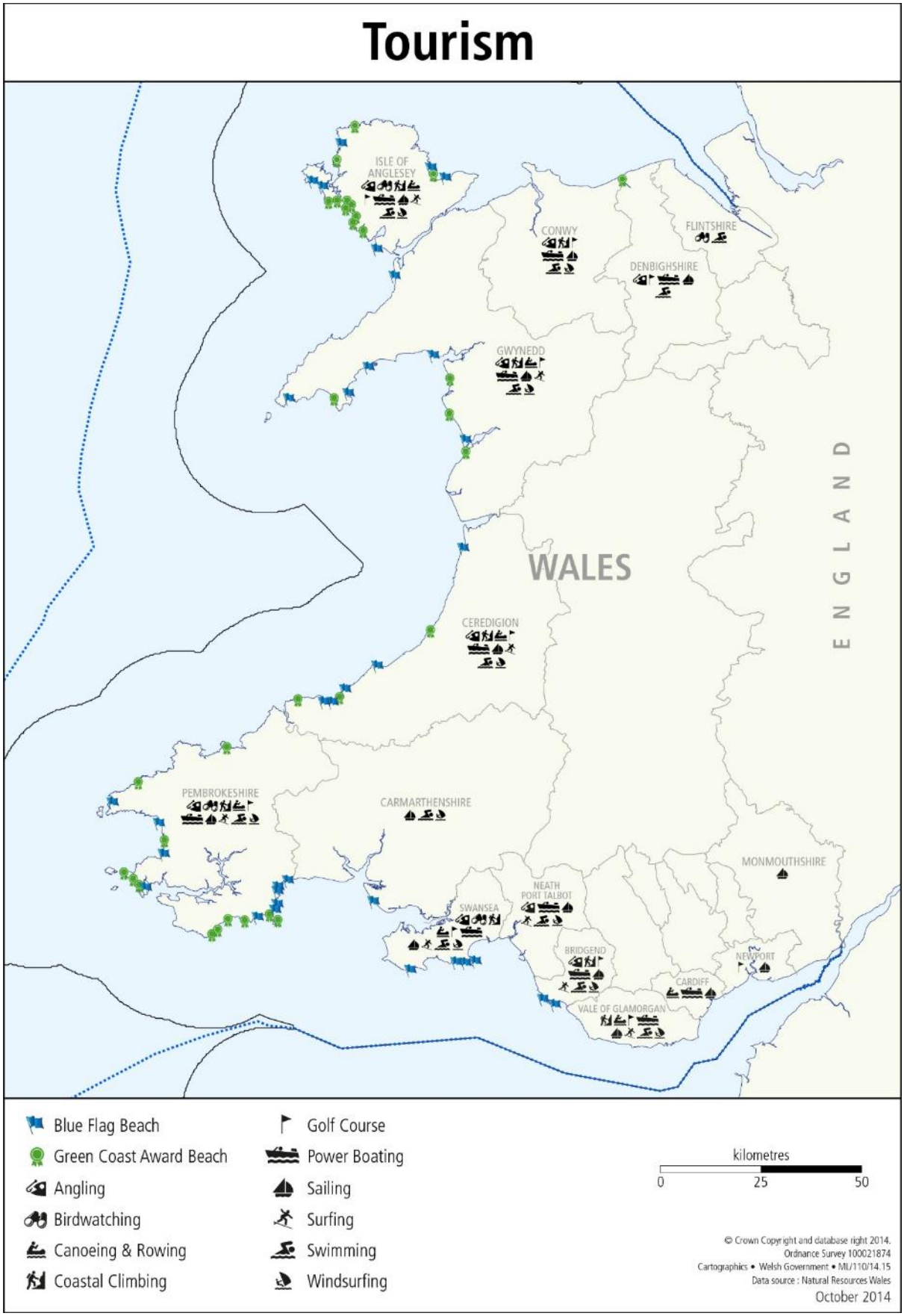
The Wales Coast Path is a 870 miles continuous walking route from Chester to Chepstow. The route follows the coast, as far as reasonably and legally practical. The route is recognised as having national importance due to its outstanding scenery, wildlife and historic features for the users of the path. During the period October 2011 to September 2012, there was an estimated 2.89 million visits to the Wales Coast Path and expenditure related to these trips was approximately £33.2 million (Natural Resources Wales 2013d).

There are estimated to be approximately 132 businesses that fall within the marine recreation sector in the Welsh Marine Area, employing approximately 1,000 FTEs directly. Additionally, there are an estimated 5,000 FTEs that are indirectly related to the industry. The total GVA of the sector is currently estimated to be £22.4 million. Key recreation and tourism activities and locations are shown in Figure 31.

Using European funding, the Welsh Government and wider partners have developed three Centres of Excellence at a total of £18.3 m (£8.2 m of European funding) located along the Welsh coastline:

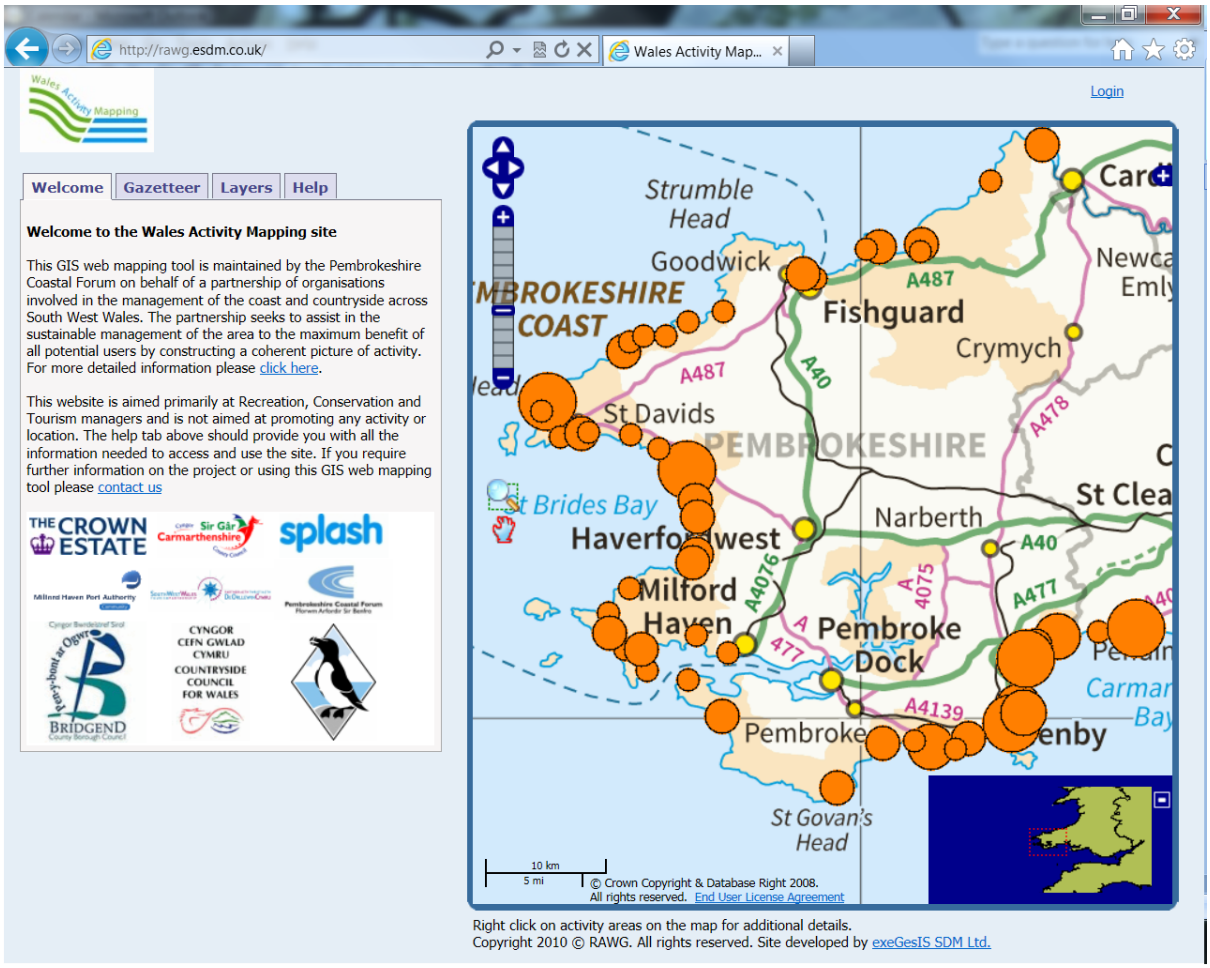
- Centre of Excellence for Watersports, Swansea Bay
- Aberdaron – National Trust
- Pembrokeshire Coastal Centre of Excellence

Figure 31 Tourism activities in the Welsh Marine Area



The Wales Activity Mapping (WAM) project investigated the type, amount and distribution of activities carried out on the South West Wales Coastline, including information on relevant infrastructure and management issues. The project website (Figure 32) provides information from the project in an interactive GIS mapping system of the uses and potential uses of the area (http://www.walesactivitymapping.org.uk/).

Figure 32 Wales Activity Mapping website GIS map (http://www.walesactivitymapping.org.uk/).



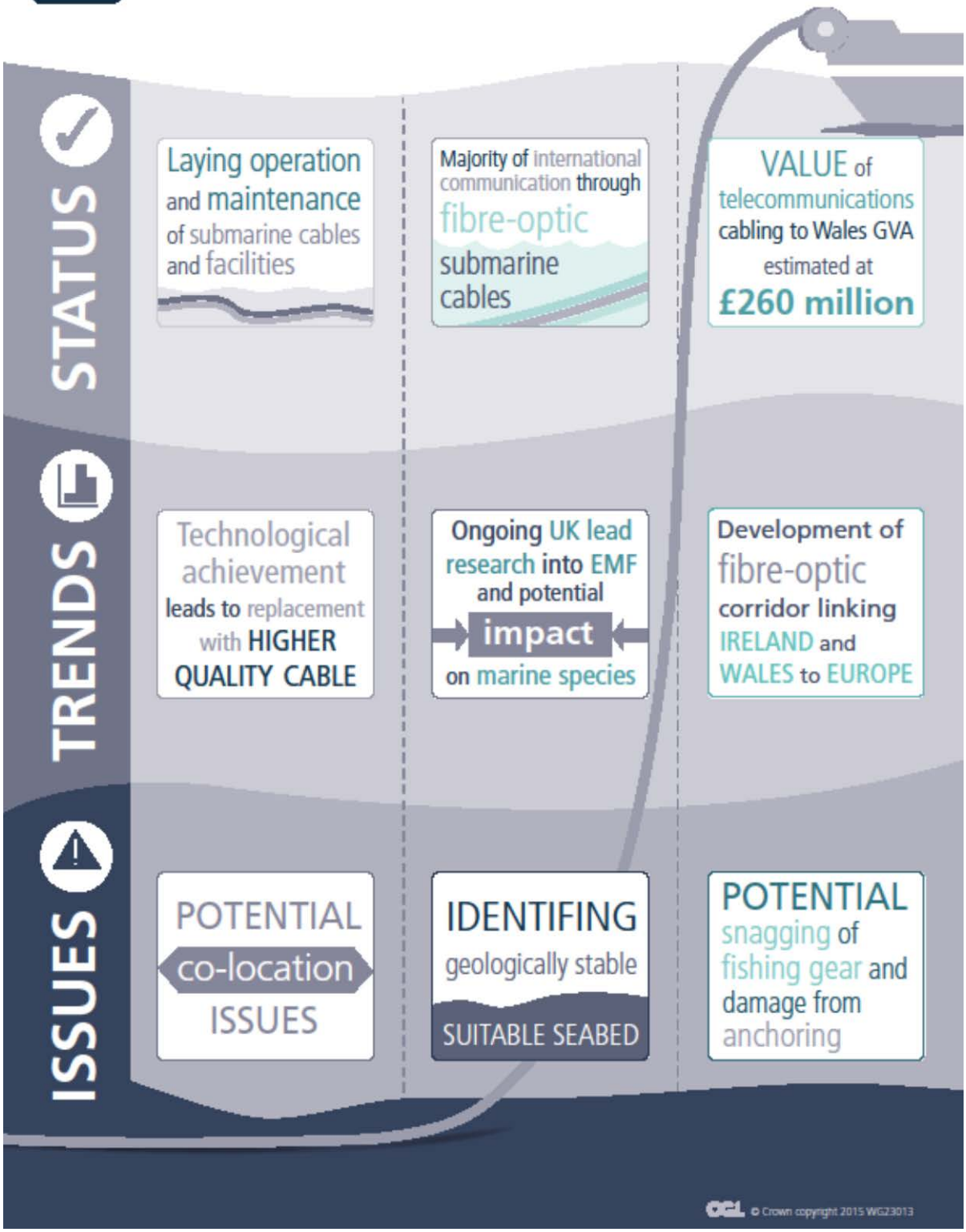
5.7.5 The future (Recreation and Tourism)

It is difficult to predict future trends and demands for tourism and recreation; for example, economic downturns 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. Conversely, some local resorts may not be able to adapt to changes in tourists' expectations and requirements, and therefore, decline. Other factors such as the cost of travel abroad, including the level of the exchange rate, may influence the demand of tourism in the plan area.

Since the Marine Recreation sector is closely linked to the Coastal Tourism sector, the same issues arise when trying to predict future trends and demands, i.e. how 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. Conversely, some local resorts may not be able to adapt to changes in tourists' requirements and, therefore, tourism may decline (MMO 2012a).

Other considerations to take into account can include ongoing technological advances, for example, in wet suit technology, which means that water sport activities can continue for longer periods throughout the year, though this would affect all potential UK sites equally. Such changes will, however, be relatively minor in terms of impacts on the overall marine recreation activities in Welsh (and UK) waters.

TELECOMMUNICATION CABLING



5.8 Telecommunication cabling

5.8.1 Overview and background

The principal activity in this industry is the laying, operation and maintenance of submarine telecommunication cables and their facilities. Supporting activities include the construction of utility projects and the operation of communication facilities.

Please note that submarine cables associated with renewable energy projects have been included within the renewable energy sector (section 5.5.3) to avoid double counting. Similarly pipelines are required for connections to oil and gas rigs. The MoD has subsea cables but the locations of these are unknown due to national security.

The overwhelming majority of international communication transmissions are through fibre optic submarine cables. These carry telephony, internet and data transmissions which service many other industries such as finance, commerce and media. As with pipelines, the principal marine activity is identifying and providing a stable seabed to lay cables across (UKMMAS 2010a).

5.8.2 Key issues for Marine Planning (Telecommunication cabling)

Telecommunications cables may interact with other sectors, such as ports, shipping, aggregate extraction and fishing. Potential impacts include (modified from MMO 2013b):

- disturbance to marine habitat during laying and maintenance of cables;
- impacts associated with other sectors, e.g. fishing (snagging of gears); shipping (damage to cables from anchoring); aggregate extraction – exclusion of activities or other mitigation measures may need to be considered;
- technology improvements for fibre optic cables allow capacity increases per cable which could allow the industry to keep pace with demand without an exponential increase in the number of cables required.

5.8.3 Current Policy (Telecommunication cabling)

Proposals to install cables at sea (within the 12 nm limit) require consent(s) via application to NRW. The UK Government and Devolved Administrations are also signatories to the *UN Convention on the Law of the Sea (UNCLOS)* which governs UK waters beyond 12 nm. The agreement sets out national jurisdictions and establishes the legal regime for the High Seas. It provides the legal basis for the protection and sustainable development of the marine environment and addresses environmental

control, scientific research, economic activities and the settlement of disputes over seabed rights. The industry in the UK is represented by Subsea Cables UK.

The government report *Digital Britain* outlines the importance of the communications sector, its crucial contribution to the economy and its role in building Britain's industrial future (Department for Culture Media and Sport and Department for Business Innovation and Skills 2009). The report includes more than 20 recommendations on Next Generation Networks, universal access to Broadband and enhancing the digital delivery of public services, all of which rely heavily on the submarine telecommunications networks within the waters surrounding the UK.

5.8.4 Current Status (Telecommunication cabling)

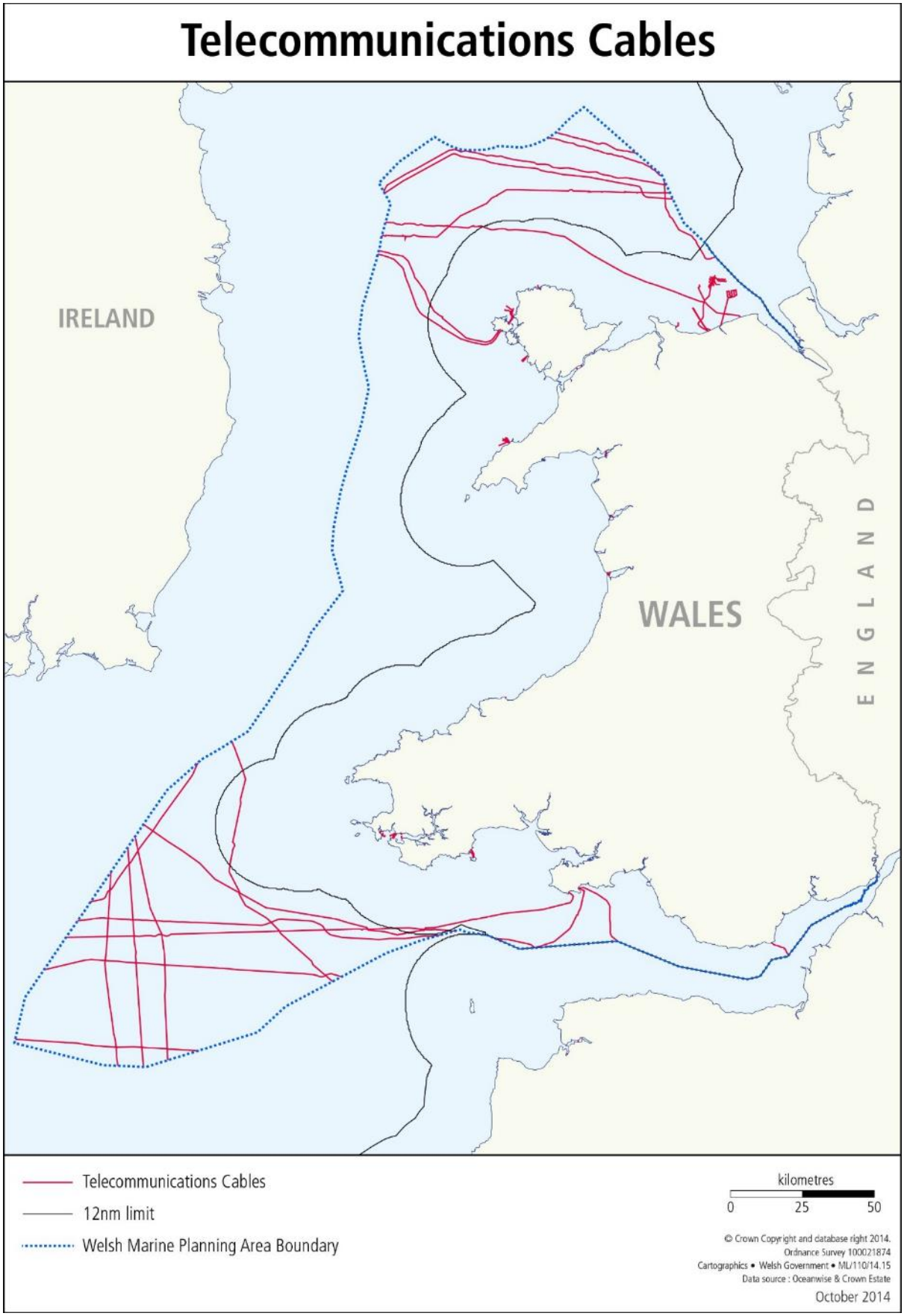
Telecommunication cables in the Welsh marine area are relatively limited in number and are concentrated around the Gower Peninsula on the south coast (trans-Atlantic and Europe) and Anglesey on the north coast (to Ireland) (UKMMAS 2010a). In addition, there are also a number of out-of-service cables in the Welsh marine area. Figure 33 presents an indicative map of cable locations in Welsh waters.

An increasing number of businesses depend on accessing sufficient bandwidth to operate, and with the continued upward trend of e-commerce, the true value added by the Telecoms and Communication sector is difficult to calculate.

This sector has an impact on other marine industries due to the sensitive nature of the cables. There is risk from the fishing industry as nets, trawled gears, and anchors may become caught on submarine cables, which can prove costly, both in terms of physical damage, as well as the loss of bandwidth to other sectors reliant on the transfer of information. There can also be an impact to the aggregates industry and, therefore, seabed agreements with the Crown Estate can include clauses for 'no works' and 'notification' zones, where cables are laid.

The total GVA of the sector is currently estimated to be £260 million. However, these figures should be treated with caution as there is significant uncertainty associated with whether these figures relate solely to offshore activities.

Figure 33 Telecommunications cables in Welsh waters



5.8.5 The future (Telecommunication cabling)

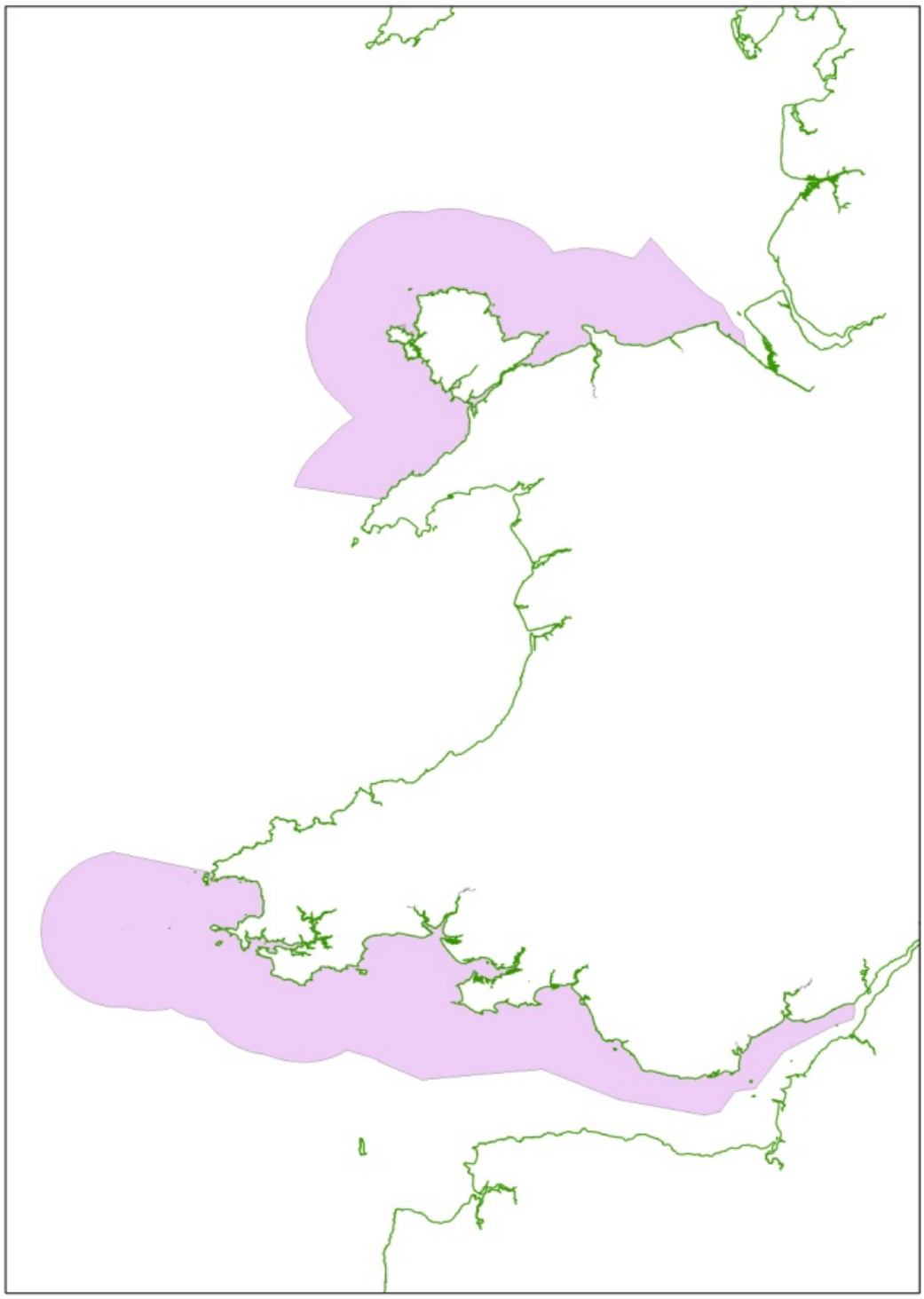
Increasing use of the internet and an increase in e-commerce has led to an increasing demand for communication cables, faster services and the capacity of cables. There has been substantial investment through the delivery of a fibre optic corridor linking Dublin to Holyhead, before going on to Manchester, London and Europe (Broadband Finder 2008). Given that the lifetime of these assets is 15 to 25 years it is considered unlikely that further telecommunication development will be necessary in this area in the immediate future.

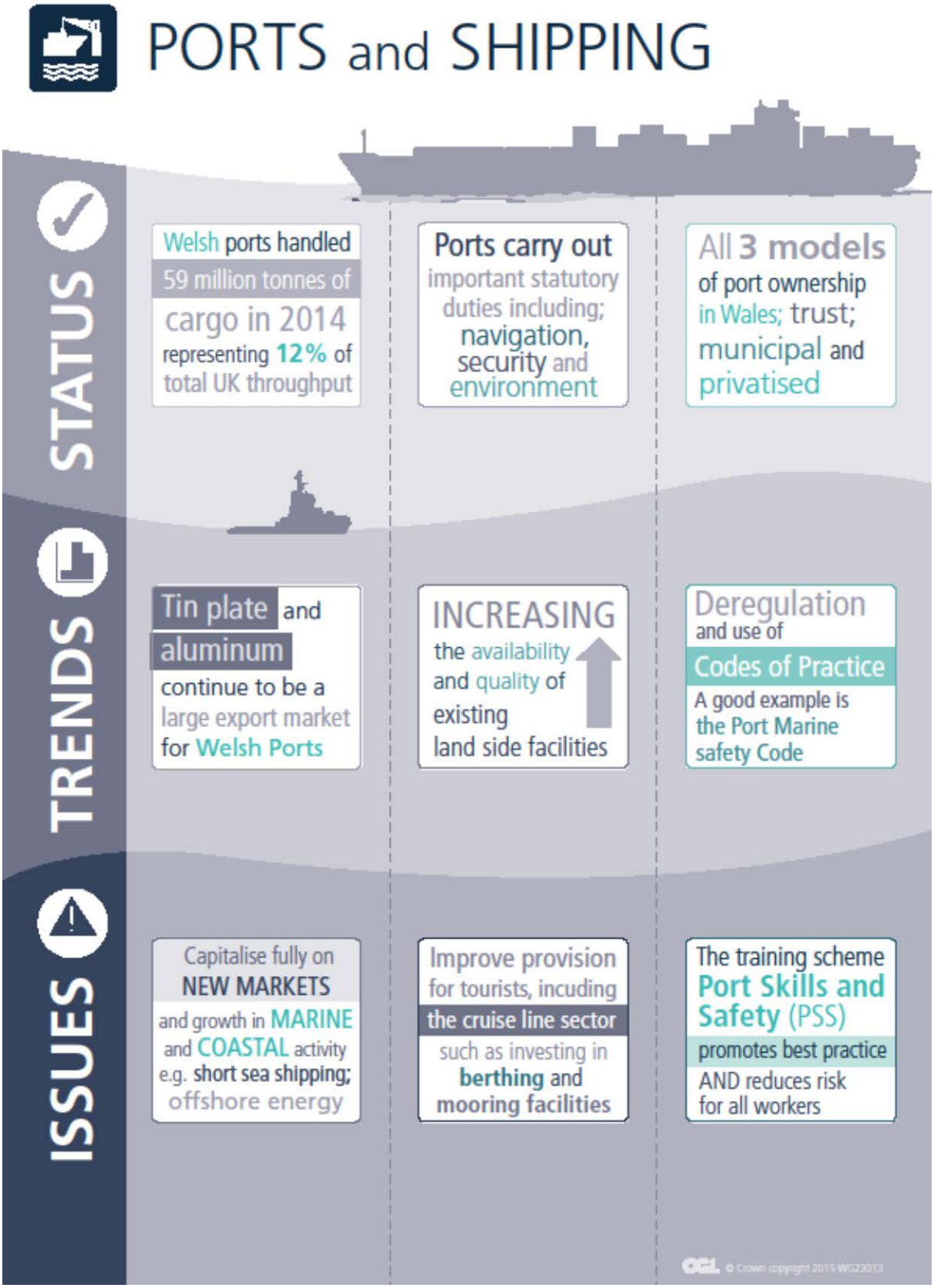
In the south there are no immediate proposals for new infrastructure, with most of the trans-Atlantic cables being run out of Cornwall.

It is expected that the growth of the sector will mirror that of the UK economy as a whole, i.e. the growth rates for the sector are set as the same for the expected growth of the UK economy. Thus growth of 1.1% in Year 1 (2013/14), increasing to 2.1% by Year 4 (2016/17) is forecast. These growth rates are based on the independent forecasts of growth collated by HM Treasury (HM Treasury 2013). From Year 5 (2017/18) onwards, forecasts are not available from HM Treasury and, therefore, they have been fixed at a rate of 2% per annum.

Areas of future technical opportunity for the cables sector (Figure 34) have been derived by identifying sections of territorial waters that provide optimal landing zones. This analysis was driven by the location of developing offshore generating assets and the presence of onshore electricity and telecommunication infrastructure.

Figure 34 Areas of future technical opportunity for Telecommunication cabling for the Welsh coast (figure provided by The Crown Estate).




PORTS and SHIPPING
STATUS
TRENDS
ISSUES
Welsh ports handled 59 million tonnes of cargo in 2014 representing 12% of total UK throughput
Ports carry out important statutory duties including; navigation, security and environment
All 3 models of port ownership in Wales; trust; municipal and privatised
Tin plate and aluminum continue to be a large export market for Welsh Ports
INCREASING the availability and quality of existing land side facilities
Deregulation and use of Codes of Practice
A good example is the Port Marine safety Code
Capitalise fully on NEW MARKETS and growth in MARINE and COASTAL activity e.g. short sea shipping; offshore energy
Improve provision for tourists, incuding the cruise line sector such as investing in berthing and mooring facilities
The training scheme Port Skills and Safety (PSS) promotes best practice AND reduces risk for all workers
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5.9 Transport – ports and shipping

5.9.1 Overview and background

Ports play an essential role in the global economy and are an important catalyst for economic development. It is not surprising, therefore, that ports, and the cities that they are located in, are key to preserving and enhancing the economic strength of countries as they are crucial in so many areas - manufacturing and logistics, the efficient transportation of goods, marine and land connectivity, job creation and growth, international trade, warehousing and distribution, export and import, foreign direct investment, energy industries, regeneration and tourism.

As an island, the coastal maritime sector is an important component of the UK economy, and within Wales they represent many types and activities; indeed of the approximately 120 commercial ports in the UK, 14 are in Wales (Welsh Government 2011a).

The UK National Policy Statement (NPS) for Ports (Department for Transport 2012a) represents the framework for decisions taken by the Secretary of State on proposals for new port development that are UK nationally significant infrastructure projects (NSIPs) under the Planning Act 2008. The NPS applies to England and Wales, including territorial waters. It is also a relevant consideration for any decisions made under the Marine and Coastal Access Act 2009 on other port development proposals. When decision makers are advising on, or determining an application for, an order granting development consent in relation to ports, or when marine plan authorities are developing Marine Plans, they should take into account the contribution that the development would make to the national, regional or more local need for the infrastructure, against expected adverse effects including cumulative impacts. In considering the need for port developments in Wales, reference should be made to interpretations of need as set out in the NPS for Ports (HM Government 2011).

Through the NPS for Ports (Department for Transport 2012a)the UK Government seeks to:

- encourage sustainable port development to cater for long-term forecast growth in volumes of imports and exports by sea with a competitive and efficient port industry capable of meeting the needs of importers and exporters cost effectively and in a timely manner, thus contributing to long-term economic growth and prosperity;
- allow judgments about when and where new developments might be proposed to be made on the basis of commercial factors by the port industry or port developers operating within a free market environment; and

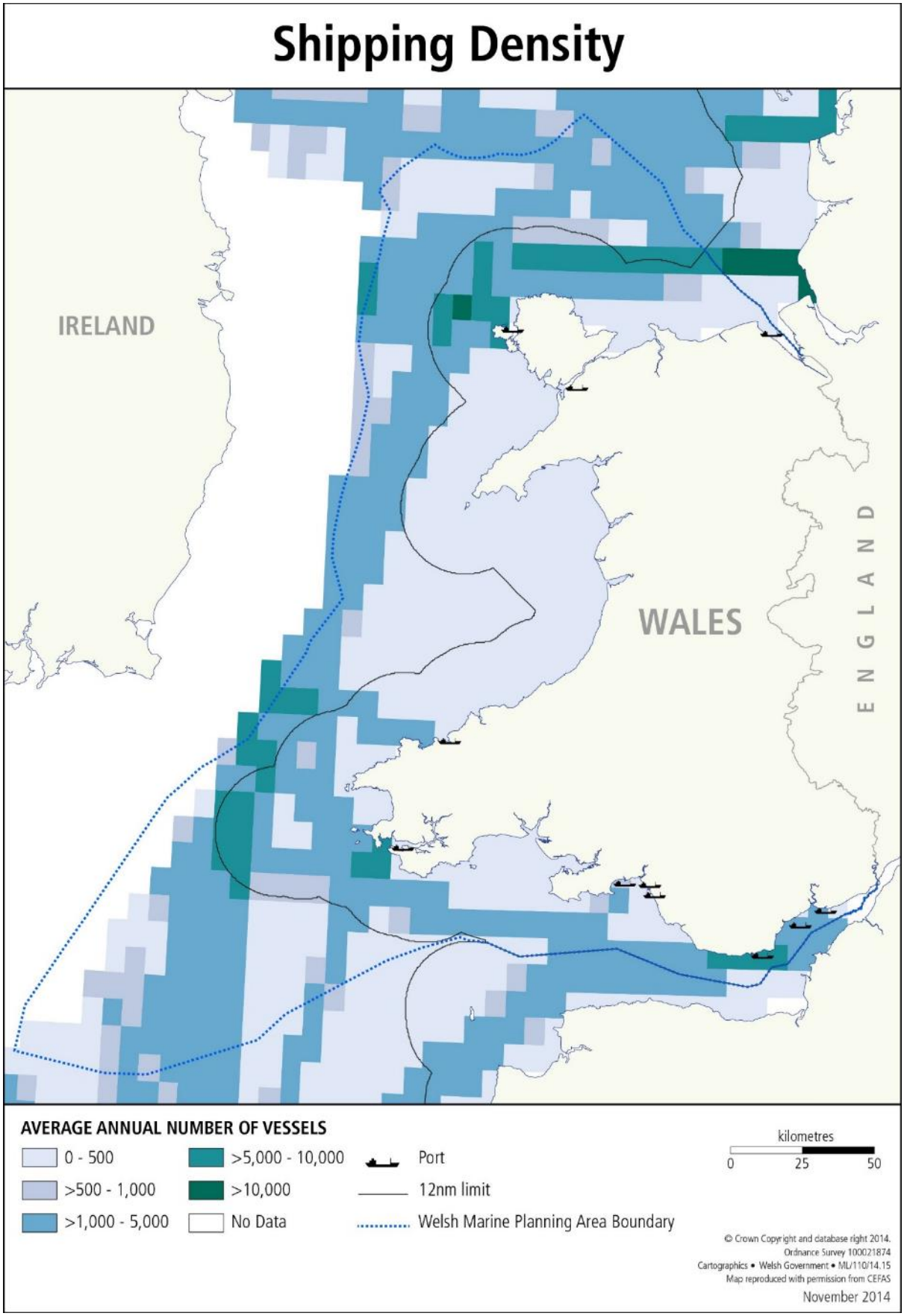
- ensure all proposed developments satisfy the relevant legal, environmental and social constraints and objectives, including those in the relevant European Directives and corresponding national regulations.

The key activities in shipping are sea and coastal water freight transport, sea and coastal water passenger transport and cargo handling. Ancillary activities that support shipping include the building and repairing of ships, the construction of water projects, navigation, pilotage and berthing, and storage and warehousing (UKMMAS 2010a). A key driver in shipping is the sufficient sea port capacity to accommodate demand for import and export of goods. Figure 35 shows the locations of ports and the shipping density in the area.

As targets to achieve Good Environmental Status under the MSFD have yet to be agreed, it is not yet possible to assess whether measures under existing legislation in relation to these descriptors are sufficient to achieve Good Environmental Status and whether the shipping industry will need to further manage its activities. For example, Good Environmental Status descriptor 2 states that '*...non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems'*. However, it is likely that research to describe further the spatial and temporal extent of some pressures will be required in order to assist the assessment of Good Environmental Status.

Shipping is an international industry and, therefore, there are a number of International Conventions to prevent pollution of the marine environment from ships. The most important of these is the IMO International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL). This covers operational and accidental oil pollution and pollution from chemicals, sewage and litter. Other conventions prohibit the use of harmful organotins in anti-fouling paints used on ships and provide ballast water controls to prevent the transport of non-native species. The adoption and implementation of these conventions will contribute to cleaner, less harmful maritime transport in the future.

Figure 35 Shipping density and port locations for Welsh waters



5.9.2 Key issues for Marine Planning (Ports and Shipping)

Ports and shipping are critical to the effective movement of cargo and people, and form an essential part of the Welsh, UK and global economies. The NPS for Ports explains to planning decision-makers the approach they should take to proposals, including the main issues which, in the UK Government's view, will need to be addressed to ensure that future development is fully sustainable. It provides detailed guidance to decision makers on a number of aspects, such as assessing the need for additional port capacity, and guidance on the scope of environmental assessment. The NPS for Ports also states that the decision maker should give substantial weight to the positive impacts associated with economic development. For example, ports have a crucial role to play in developing fields of energy production, particularly offshore wind energy and biomass.

Ports and shipping can have environmental impacts through accidental pollution from ships in the course of navigation or lawful operations, pollution caused by unlawful operational discharges by ships, such as oil, waste or sewage, or physical damage caused by groundings or collisions. Other pressures on the environment from shipping and ports relate to noise, airborne emissions and the introduction and spread of non-indigenous species (transported on the hulls of ships or in ballast water) (HM Government 2011).

Increased competition for marine resources affecting the sea space available for the safe navigation of ships remains a key issue for the sector (HM Government 2011). Shipping can coexist with marine conservation, fishing and aggregate extraction but there are other uses of the sea which may be incompatible (modified from MMO 2013b). The projected growth in offshore renewable energy developments has the potential to disrupt shipping activity (e.g. forcing deviation from planned routes). The MPS states that '*marine plan authorities and decision-makers should take into account and seek to minimise any negative impacts on shipping activity, freedom of navigation and navigational safety and ensure that their decisions are in compliance with international maritime law*'.

The long-term trend is for sustained growth of 3% to 4% on average per year in the container and Ro-Ro sectors. Against the background of strong industry growth at the global level, the UK Government expects that the market will be ready to fund further expansion, especially as no substantive change to the regulatory and operating framework for ports is proposed (Department for Transport 2007). International shipping companies, including the Ro-Ro and container lines, are continually seeking to achieve economies of scale in the transportation of goods. As the proportions

of large vessels increase, however, access to ports, which are largely dependent on suitable tidal conditions (or substantial capital dredging campaigns), has become increasingly constrained.

A key issue is also to maintain unimpeded and safe access to ports, with water deep enough for the largest vessels to prevent delays to commercial traffic impacting upon efficient berth utilisation and causing congestion. With the increase in deeper-drafted and wider vessels dredging is required to deepen and/or widen access to ports (UKMMAS 2010a) as well as to maintain safe channel depths through maintenance dredging.

5.9.3 Current Policy (Ports and Shipping)

Other than for small fisheries and leisure harbours, ports policy is not devolved to Wales. UK ports policy is contained in the Ports Policy Review – Interim Report (Department for Transport 2007), and the NPS for Ports. UK Government policy is one of non-intervention. Welsh Government freight policy is contained in the 2008 Wales Freight Strategy (Welsh Assembly Government 2008d). However, as noted in a recent Welsh Government report (Welsh Government 2012b), although '*ports and aviation policy might lie with the UK Government and may be market-driven, but through its own powers and policies there is much that the Welsh Government can do to develop Welsh ports and airports going forward*'.

It is, however, important that investment in port and marina infrastructure is considered in their wider Welsh strategic policy context:

- *Programme for Government* – which states that investing in high quality and sustainable infrastructure is a priority in order to underpin economic growth and wellbeing.
- *Wales Transport Strategy* (Welsh Assembly Government 2008d) - which sets out the Welsh Government's policies to support and promote safe, integrated, sustainable, efficient and economic transport facilities and services to, from and within Wales.
- *Wales Infrastructure Investment Plan* (WIIP) (Welsh Government 2012c) – which is designed to prioritise, scope and coordinate delivery of major infrastructure investments, providing greater clarity and certainty to its delivery partners over a 10 year period as well as setting out a pipeline of priority projects.
- *Regeneration Framework for Wales - Vibrant and Viable Places* (Welsh Government 2013f) was launched in March 2013 and prioritises intensive and targeted regeneration investment in a small number of key places in order to support local growth in town centres, coastal communities and Communities First clusters.

- *Enterprise Zones* - aims to strengthen the competiveness of the Welsh economy through areas focused on key target sectors.
- *Wales Freight Strategy* - developed with the freight industry it identifies the key actions required to improve freight transport in Wales and to support modal shift.
- *The National Strategy for Flood and Coastal Erosion Risk Management* (Welsh Government 2011b) - sets out the overarching objectives for managing flood and coastal erosion risk in Wales that will need to be considered as part of wider infrastructure investments.
- *Planning Policy Wales* (PPW) (Edition 6) (Welsh Government 2012d) - sets out the land use planning policies of the Welsh Government. With regards to ports, it outlines how planning authorities should seek to promote their use by the protection or provision of access to them and by the retention or provision of appropriate wharf, dock, harbour and rail transfer facilities.
- *The Economic Impact of Low Carbon Energy on Welsh Ports* (Welsh Government 2011a) - reviewed likely low carbon energy developments and assessed the potential economic implications and opportunities for Welsh Ports over the period 2010 to 2030. Port infrastructure is expected to be fundamental to unlocking economic opportunities within the low carbon energy sector.

A recent inquiry by the House of Commons Welsh Affairs Committee (Welsh Affairs Committee 2010) found that Welsh ports are clearly under-exploited resources and could play a far greater role in Wales's economic development. In brief the Committee called for:

- A coherent and distinctive ports strategy for Wales that identifies where investment should be targeted to enable the port sector to thrive.
- The development of the cruise market.
- A better understanding of the supply chain.
- Exploitation of the opportunities provided by the energy sector.
- Improvement of cross-border connectivity.

In March 2014 The Commission on Devolution in Wales, also known as the Silk Commission, recommended that several aspects of transport policy, including ports policy, should be fully devolved to the Welsh Government (Commission on Devolution in Wales 2014). The Commission was set up to examine Welsh devolution and if the recommendations are accepted it will mean the Welsh Government taking on responsibility for port governance and consent issues.

The European Commission, subscribing to the theory that ports lagging behind need to be brought up to par with the most efficient ones, estimates that their Seaports 2030 initiative can save the EU economy up to 10 billion Euros by 2030 and reduce port costs by almost 7%. The main aim of the Trans-European Transport network (TEN-T) is to develop an integrated transport network in Europe (European Commission 2014). In their guidelines a network of 319 ports has been identified as being essential to the functioning of the internal market and Europe's economy (83 ports in the core TEN-T network and 239 in the comprehensive network). Together these 319 TEN-T ports are thought to be crucial to further optimise European transport by means of modern logistics operations. As the modal nodes at both ends of the shipping lanes, they are also essential to develop short sea shipping.

In November 2013, MEPs endorsed a deal with member states on the EU's new Connecting Europe Facility (CEF), which aims to speed up funding to complete key trans-European transport, energy and telecoms links. MEPs also approved guidelines for developing the TEN-T. The funding will help to develop sustainable railways and 'Motorways of the Seas' as well as improving interoperability. The EU views TEN-T and Connecting Europe as '*providing a genuinely European approach to transport finance and development, instead of the current patchwork of national approaches, develop key transport arteries in Europe and give better access to European citizens to infrastructure in the future*' (European Parliament 2013).

For the 319 ports considered 'key', the improvements need to be competitive, with the need to improve their interconnections by road and rail, for which they may be eligible for support from the European mechanism. Although yet to be ultimately defined, out of a total of 319 ports identified for upgrade by the European Commission, 47 are in the UK, of which the following are in Wales: Cardiff (core port); Fishguard; Holyhead; Milford Haven (core port); Newport (core port) and Port Talbot.

5.9.4 Current Status (Ports and Shipping)

In Wales during 2012 there was total freight traffic through Welsh ports of 54.6 million tonnes (Mt); of this, 36.5 Mt were goods inwards and 18.1 Mt were goods outwards. Welsh ports accounted for 11% of the total United Kingdom (UK) port traffic of 500.9 Mt (Statistics for Wales 2014).

There are three International Maritime Organisation (IMO) Traffic Separation Schemes (TSS) in the Welsh Marine Area, one to the west of Milford Haven, one to the north west of Anglesey and one to

north of Colwyn Bay. Actual shipping activity is much more dispersed than just in these TSS areas. Together with port-related and ferry traffic, the Welsh Marine Area is one of the busiest areas for shipping. Figure 35 illustrates shipping density and major ports for the Welsh coast. Operation information on selected ports is shown in Table 16.

Along the length of the coast of the Welsh Marine Area there are eight major ports, with shipping routes covering a significant area of the Welsh Marine Area. Ports and shipping make a significant contribution to the Welsh economy and are expected to continue to do so. According to Welsh Government Statistics there are approximately 575 enterprises in the core marine sector which employ almost 5,000 people in Wales, of which the value to the economy is estimated to be worth £726 million[9]. In a recent study[10] it was found that in Wales:

- 52,000 people are directly employed in coastal / marine activity.
- 40,000 are indirectly employed.
- £4.8 bn in direct income is generated.
- £2 bn is raised in indirect and induced activity.
- £1.5 bn of Gross Domestic Product (GDP) is contributed to the Welsh economy.

There are 14 ports in Wales which currently handle commercial traffic (Welsh Government 2011a). Collectively they have handled between 50-65 million tonnes of cargo per annum for the last decade, though it is notable that there was a rise from 61 million tonnes to 66 million tonnes from 2010 to 2011 (Department for Transport 2012b).

Milford Haven is by far the largest port in Wales (handling 74% of all traffic), and the third largest by tonnage in the UK, with 9% of the total UK shipping tonnage in 2011 (52 million tonnes) (Department for Transport 2012b). It is also one of the largest oil and gas ports in Northern Europe. With 25% of the UK's petrol and diesel provisions, as well as up to 30% of the UK's gas requirements being handled through the Port's waterways, Milford Haven is at the centre of a developing UK energy hub (MDS Transmodel Limited 2007; Anthony D Bates Partnership LLP 2011). Other significant ports in Wales include Port Talbot (handling 10% total Welsh port throughput in 2009), Holyhead (5%), Newport (5%) and Cardiff (4%) (Welsh Government 2011a).

[9] Welsh Government Statistics, January 2014.

[10] Valuing our Environment (2011), Wales Environment Research Hub (Bangor) and National Trust

Table 16 Selected Welsh ports - operations and ownership (UK Parliament 2009; Welsh Ports Group 2010)

Name	Ownership	Location & Transport links	Operations / Cargo	Throughput in 2009 (tonnes)
Newport	Associated British Ports	Mouth of the River Usk; Severn Estuary / Bristol Channel; near J28 M4. Road and rail links.	Timber, cars, non-ferrous metals, building materials, steel, minerals and ores especially coal, grain, animal feed, sand, forest products. Limited cruise market but with potential.	2734
Cardiff	Associated British Ports	Mouth of the River Taff south east of the Cardiff Bay development; Severn Estuary / Bristol Channel. Road and rail link; single carriageway to M4.	Containers, dry bulk forest products, fresh produce, general cargo and steel. Limited cruise market but with potential.	1992
Barry	Associated British Ports	Near Barry town; Severn Estuary/Bristol Channel. Limited capacity road and rail links	Dry bulks, containers, forest products, general cargo including roll-on roll-off, liquid bulk, steel, recycled materials	327
Port Talbot	Associated British Ports	Adjacent to M4 with direct access. Road and rail link	Mainly Corus imports of coal and iron ore, third party coal for power stations; processed slag. The port has one of the deepest berths in the UK (tidal harbour).	5156
Swansea	Associated British Ports	Seaward end of Severn estuary; east of Swansea city centre. Direct Road to M4 and direct rail connection.	Dry bulks, coal, plywood, steel, copper, roll-on roll-off. Limited cruise market but with potential. Passenger ferry to Cork will resumed from 1st March 2010.	401
Milford Haven	Milford Haven Port Authority (a trust port)	Both sides of the Cleddau estuary. Milford Haven on North Bank and Pembroke Port and Chevron Oil refinery to the South. Direct rail link with low line speeds and single track in some places. Limited capacity road links; 28 miles from dual carriageway.	Oil, liquid natural gas, roll-on roll-off cargo from Ireland. Major link to Ireland with Irish Ferries. Marina development.	39293
Fishguard	Stena Line Ports Ltd	West Pembrokeshire Coast. Single carriageway road link and rail for foot passengers	Roll-on roll-off cargo.	366
Caernarfon	Caernarfon Harbour Trust	Gwynedd Coast. Access by the A487 on the eastern Menai Strait.	Leisure, Fishing, Commercial	-
Holyhead	Stena Line Ports Ltd	Ynys Môn. Road link to A55 expressway and rail link. On Trans European Network.	Roll-on roll-off cargo off via Stena Line and Irish Ferries, and foot passengers; deep water quay side bulk facility. 7/8 cruise ships per annum, from 15 per annum in 2006.	2852
Mostyn	Private ownership	Dee estuary. North Wales main line adjacent. Road link to A55 expressway/ main motorway network.	General cargo and airbus A389 wing transfer facility. Roll-on roll-off for accompanied and unaccompanied trailers.	21

5.9.5 The future (Ports and Shipping)

For an island economy, there are limited alternatives to the use of sea transport for the movement of freight and bulk commodities (freight by air and train is constrained by capacity). Consequently, shipping will continue to provide the only effective way to move the vast majority of freight in and out of the UK, and the provision of sufficient sea port capacity will remain an essential element in ensuring sustainable growth in the UK economy.

A recent study by RSA, the UK's largest commercial insurer and one of the world's leading marine insurers, and the Centre for Economics and Business Research (CEBR) revealed that the importance of UK sea trade will continue, with forecasts indicating it will grow by 37% in six years, contributing £700 billion to UK GDP by 2017 (RSA 2012).

An important aspect of shipping in the future will also be the Sustainable Shipping Initiative (SSI), a four stage initiative designed to help the industry analyse the environmental and economic challenges shipping faces, and develop plans to ensure the industry remains resilient, profitable and socially and environmentally responsible (Forum for the Future 2011a; 2011b).

The shipping industry will remain strongly linked to the state of the Welsh economy, and will be limited to the effectiveness of the ports industry to accommodate demand for import and export of goods (and vulnerable to global scale macro-economic trends). However, the ports and shipping sector will continue to grow due to demand from sectors that are able to operate independently of the economy, e.g. renewable energy.

The growing renewable energy industry will have port requirements for activities including manufacture, installation and maintenance, particularly for ports in relatively close proximity to proposed future offshore wind farm developments. Holyhead, Mostyn, Milford Haven (including Pembroke Dock), Port Talbot, Newport and Swansea have all been identified as having the greatest competitive advantage in exploiting the opportunities from low carbon energy sectors, although this doesn't preclude niche roles for other ports in Wales (Welsh Government 2011a). There is, however, likely to be serious competition from ports in both England and Ireland. Under a moderate low carbon growth scenario it is anticipated that the FTE jobs will rise by some 1,250 by 2020, largely driven by offshore wind projects. Economic outcomes will vary significantly depending on the choice of port for construction/operations/maintenance activities and limiting factors such as planning/environmental issues, financing, logistics etc. which may cause delays or worse.

While a portion of the sector does depend on the health of the economy, the strong growth in renewable energy will allow the sector to continue to grow over the coming years. In light of this, the growth rate of the sector has been set identical to the Ports sector, an annual growth rate of 2%.

The UK Government believes that there is a compelling need for substantial additional port capacity over the next 20 - 30 years, to be met by a combination of development already consented and those for which planning applications have yet to be received (Department for Transport 2012a).

The MDS Transmodal forecasts of demand for port capacity suggested that from the baseline year of 2005, growth required by 2030 includes 182% increase in containers from 7 to 20 million teu[11], 101% increase in roll-on roll-off (Ro-Ro) traffic from 85 to 170 million tonnes, and a 4% increase in non-unitised traffic from 411 to 429 million tonnes (MDS Transmodel Limited 2007).

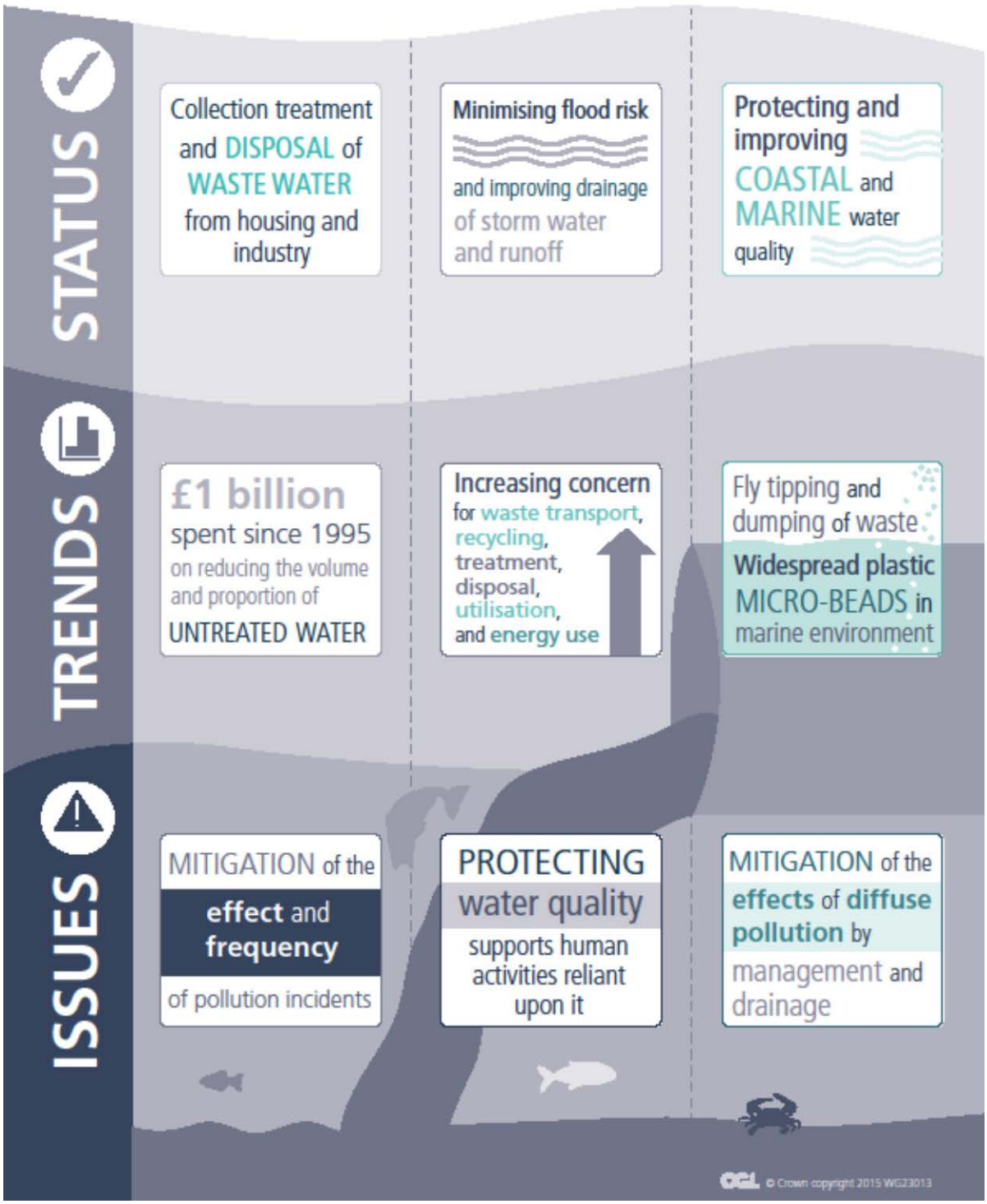
In addition, the Enterprise Zones of Anglesey and Haven Waterway include the ports of Holyhead and Milford Haven with a specific focus on the energy sector. These zones offer specific incentives to attract new businesses and industry to these prime locations.

Ports located in North Wales are also investigating the potential to attract more cruise ship visits through investing in new port infrastructure. The electrification of the railway line between Cardiff and Swansea to the Welsh valleys has the potential to unlock port development on the south coast through the capability to transport larger containers due to wider gauge clearance.

In summary, the growth in the shipping industry is strongly linked to the UK economy, as well as other activities which are set to receive financial incentives to operate which are not strongly linked to the economic situation, i.e. the renewable energy sector. In light of the above aspects, the growth rate of the Ports sector has been set an annual rate of 2%, partially independent of the state of the overall economy.

[11] teu = twenty-foot equivalent unit. An inexact unit of measurement of cargo capacity based on the volume of a 20-foot-long intermodal container.

SURFACE and WASTE WATER



5.10 Surface water management and waste water treatment and disposal

5.10.1 Overview and background

The objective shared by the UK Administrations is to contribute to sustainable development including the health and well-being of the community and the protection of the environment by maintaining and developing a policy and regulatory system which provides modern, high quality management and treatment of surface and waste water (HM Government 2011). The collection, treatment and disposal of waste water from housing and industry, the effective drainage of storm water and runoff to the sea, mitigating the effects of diffuse pollution from urban areas and agriculture by improved management and improvements to drainage design are key activities to achieve this. An important aim is ensuring that infrastructure is in place and maintained for necessary disposal activity to be carried out in compliance with EU legislative requirements[12]. Sewerage infrastructure and drainage is also essential in supporting economic and social development, and for reducing the risk of flooding in urban areas [13].

5.10.2 Key issues for Marine Planning (Surface and Waste Water)

Although untreated waste water is mostly water, (generally less than 0.1% is solid material), without treatment the waste water produced every day would cause significant damage to the environment. The impacts of untreated waste water range from, chronic ecosystem damage due to oxygen depletion of receiving waters from the biodegradation of organic matter; ecosystem damage of eutrophication of waters resulting from excessive inputs of nutrients present in waste water; potential health risks from water-borne pathogens from discharges to waters used for recreational activities, such as swimming and canoeing. Untreated waste water also contains sewage litter and other sewage solids that can impact the environment, for example, through the smothering of river beds or posing a hazard through its ingestion by wildlife. Sewage solids can also damage commerce by making beach and riverside resorts unattractive to potential visitors (Defra 2012). However, it is recognised that it is not possible to construct sewerage systems that will treat all waste water during situations such as unusually heavy rainfall. At such times, overflows of dilute untreated waste water have to be discharged from the sewerage network to reduce the risk of flooding from overloaded sewers. Such discharges are inevitable, well regulated, largely benign and subject to review and improvement if it is found they are having significant adverse impacts.

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[12] This includes compliance with the requirements of the Urban Waste Water Treatment Directive, Water Framework Directive, Shellfish Waters Directive, Bathing Waters Directives and the Marine Strategy Framework Directive.

[13] Specific objectives for water and sewerage services are set out in guidance issued to the industry for each price review or price control period and in England, the government's future water strategy 'Future Water'.

5.10.3 Current Policy (Surface and Waste Water)

Welsh Water has developed a *Surface Water Management Strategy* to address the problems associated with increased flows of surface water. It aims to raise awareness of the issue and enable engagement with interested bodies, in order to work together to deliver a solution (Welsh Water 2008). The Surface Water Management Strategy fits well with Government Environment Strategy policies on sustainability and climate change. The intention of the Surface Water Strategy is, therefore, to explore the potential for any legal changes by the Welsh Government and UK Government that will facilitate a reduction in surface water flows.

The importance of effective sewerage and wastewater treatment for public health and the environment means that our sewerage activities are highly regulated (Welsh Water 2014), via the EU *Urban Waste Water Treatment Directive 91/271/EEC*. Urban waste water is defined in the Directive as the mixture of domestic waste water from kitchens, bathrooms and toilets, the waste water from industries discharging to sewers and rainwater run-off from roads and other impermeable surfaces such as roofs, pavements and roads draining to sewers (Defra 2012). Wales has a long coastline and having high quality coastal water quality is especially important for the Welsh tourism industry which employs an average of 100,000 people and makes a significant contribution to the Welsh economy. Since 1995 over £1 billion has been invested on upgrading or building new wastewater treatment works right across Wales which has helped Wales secure European blue flag awards.

5.10.4 Current Status (Surface and Waste Water)

Surface water is the rainwater that runs from roofs, highways and paved areas into the public sewerage system. For a number of reasons, including more frequent severe storms and the growth of built-up areas, Welsh Water's sewer network has to deal with increasing flows of surface water. Occasionally, the capacity of the network is exceeded in some areas and results in incidents of sewage flooding homes, gardens and roadways and can cause pollution incidents in streams and rivers.

In rural areas a high proportion of water that falls as rain soaks into the ground, then seeps into streams and rivers and flows to the sea. However, in urbanised areas there is much less green and open space. Land in villages, towns and cities has ever more houses and other buildings, tarmac roads and paths, paved patios and driveways. Natural drainage is therefore impeded.

5.10.5 The future (Surface and Waste Water)

Increasing waste water pollution events in the future may arise due to (MMO 2013d):

- More frequent and intense storm events linked to climate change, resulting in an increased frequency of potential storm overflows;
- Population growth putting more demand on sewage network and water companies to dispose of waste water;
- Urban creep increasing the impermeable nature of the catchment and thus promoting the rapid response of watercourses to rainfall events;
- Diffuse urban and rural pollution from wider catchment areas.

6 Social Considerations

6.1 Introduction

One of the UK Marine Policy Statement's high level objectives is to contribute to the societal benefits of the marine area, including the sustainable use of marine resources to address local social and economic issues.

The Welsh Government's 'Programme for Government' states clearly that all policy and decision making (www.wales.gov.uk/about/programmeforgov):

- aims to improve the well-being of people in Wales, and
- is directly aligned to sustainable development which is the central organising principle.

All levels of government need to work together for the benefit of current and future generations. The Welsh National Marine Plan will provide direction and clarity on marine governance, as will the wider direction of travel being put in place by the Well-being of Future Generations (Wales) Bill.

The Bill was introduced into the National Assembly for Wales for consideration on 7th July 2014. The Bill sets ambitious, long-term goals for a prosperous, resilient, healthier, more equal Wales; with cohesive communities and a vibrant culture and thriving Welsh language. It clarifies that the aim of the listed public bodies is to improve the economic, social and environmental well-being of Wales in accordance with the sustainable development principle. The Bill strengthens existing governance arrangements for improving the well-being of Wales in order to ensure that the needs of the present are met without compromising the ability of future generations to meet their own needs.

The Welsh Government's Report on the well-being of people and communities in Wales highlighted that there are a number of factors that effect well-being, including age, health, gender and work or financial strain. Local social cohesion is seen as an important predictor of well-being. The report highlighted that Wales has narrowed the gap in employment rates with the UK averages but that there was still improvement needed in youth employment. Across Wales, a mixed picture was reported for education and skills with action planned to identify gaps and specific initiatives to target improvement. There were encouraging signs for the future in that a high and increasing proportion of children were achieving expected outcomes. The National Survey for Wales generates further information on social considerations based on a survey of a representative sample of 14,500 people (see http://wales.gov.uk/statistics-and-research/nationals-survey/?lang=en).

'Creating an Active Wales' (Welsh Assembly Government 2009a) is an important cross-cutting theme of Welsh Government policy, stating that: '*Regular physical activity has many benefits to health, including mental health and well-being. People who are physically active have up to a 50% reduced risk of developing the major chronic diseases such as coronary heart disease, stroke, diabetes and some cancers and a 20-30% reduced risk of premature death. It has been estimated that the cost of physical inactivity to Wales is about £650 million per year*.' Enhancements to recreation opportunities at the coast, therefore, also has the potential to reduce healthcare costs.

In 2008-2010 the Wales Activity Mapping project (WAM) was carried out in Pembrokeshire. This is the only known project in the UK to provide consistent spatial coverage and participant usage for all known marine recreation activities within the region. The project has mapped, in a high level of detail, information on activities, including: land-based (beach, caving, climbing, coasteering, cycling, quad biking, horse riding, kite boarding, land yachting, power kites, shooting, walking, wildlife watching, dog walking); water based (body boarding, canoeing and kayaking, kite surfing, snorkelling, surfing, swimming, wind surfing, angling); and boat-based (diving, jet skiing, power boats, cruiser sailing, wake boarding, water skiing, wildlife boat tours, dinghy sailing, rowing). Also mapped are: alert layers; conservation designations; European marine site plans and projects and marine code.

The Welsh National Marine Plan will take into account the wider picture on the health and well-being of the people and communities of Wales by recognising the social importance of recreation and leisure activities in the marine area and coastal zone. Statistics in specific areas of interest such as health and education are not always disaggregated to the marine area and, where possible, gaps will be identified and addressed.

There will be a formal impact assessment undertaken on equality and diversity as well as on the implications and opportunities to promote the Welsh language. Development will also consider Children's rights. Progress on these assessments will be shared for comment via the Welsh Government's website. The Welsh National Marine Plan will need to cater for diverse interests with various individual and organisations.

The Welsh Government commissioned a report investigating the typology of Welsh coastal communities to consider how activities in the marine environment can support socio-economic development of Welsh coastal communities (OCSI 2014). As part of this report, a typology of Welsh

coastal areas has been developed, based on their socio-economic characteristics. A full description of the coastal typologies used in this report can be found in section 3.6.

This SSE presents the evidence base and key social considerations for Wales in the context of marine planning.

6.2 Key Issues for Marine Planning

One of the key issues in the marine environment primarily relates to ensuring economic growth in coastal areas benefits the wide range of coastal communities in Wales. For example, marine planning exercises could identify the needs of particular communities and target the benefits to those who need support most. Opportunities could include:

- helping to encourage employment opportunities;
- helping to achieve a balance of part time and full time work (i.e. move the dependence away from seasonal work); and
- helping to retain and attract high skill levels in the workforce.

6.3 Current Status

The overall employment rate in coastal areas is slightly higher than across Wales as a whole (61.8% for coastal communities compared to 60.8% for non-coastal communities).

Of the different coastal community categories (see Table 17), D1 (67%) and D2 (66.7%) have the highest overall employment rates while employment rates are lower in B1, B2 and B3 (between 52.6% and 60.9%) C (58.8%) areas in 2011. The largest employment sector in both coastal and non-coastal areas is the retail sector, although people are more likely to be employed in part time roles in coastal areas than non-coastal areas. Seven of the nine typology groups have a higher proportion of employed people working part-time compared with the average in non-coastal areas; with the highest part-time employment levels in B2 and B3 which both report over a third (34%) of all employed being part time workers. This is closely linked to a greater proportion of people in coastal areas being employed in the hospitality sector, which is typically connected with coastal tourism and seasonal employment.

Table 17 Overview of Coastal Typologies (OCSI 2014)

Typology Category	Overview
A1	Retirement areas primarily located in smaller market towns, less developed resorts
A2	Predominantly rural areas, sparsely populated or in smaller settlements , with people employed in tourism sectors
A3	Predominantly rural areas, sparsely populated or in smaller settlements, with a well-qualified population
B1	Towns and cities which have lost their primary markets, and are facing the challenge to find new ones. This group includes a range of single industry coastal towns, including mining areas, industrial heartlands and former agricultural centres
B2	Challenges relating to poor skills and high levels of worklessness often in older poor quality housing. This group includes a range of single industry coastal towns, including seaside resorts and ports. Some evidence of jobs growth in recent years
B3	High levels of deprivation across all indicators, and a very high proportion of people living in social rented accommodation
C	City and market town service centres with highly skilled populations and dynamic economies, but relatively high levels of deprivation among older people and children
D1	Affluent areas predominantly on the edge of towns and in satellite towns around larger coastal cities
D2	Towns characterised by high levels of employment typically in industrial sectors, and a stable population

In relation to overall employment rates, the proportion of people receiving out of work benefits (Jobseekers Allowance, Employment Support Allowance or Incapacity Benefit) is lower in coastal areas (8.0%) than non-coastal areas (9.9%). This is likely to be linked to the lower levels of poor health and disability found in coastal areas of Wales, in contrast to higher prevalence of work-limiting illness in historic agriculture, mining and manufacturing areas predominantly located in inland areas of Wales.

In general, a higher proportion of people in coastal areas are qualified to degree level than across non-coastal areas (25.9% vs 21.3%). Skill levels are highest in D1, C and A3 areas (where 40.1%, 31.4% and 31.3% respectively have a degree or higher level of qualification). Areas with higher than average skill levels are also more likely to have a higher proportion of people working in professional occupations. The higher skill profile of coastal areas in Wales relative to non-coastal areas is likely to be related to the concentration of larger populations such as Cardiff, as well as the majority of higher education institutions, being located in coastal areas of Wales.

While coastal areas as a whole have not been impacted as badly by increases in unemployment as non-coastal areas, the most deprived coastal areas are becoming increasingly deprived relative to non-coastal areas.

6.3.1 Current Policy

The UK Marine Policy Statement (MPS) makes clear that positive impacts on coastal communities is one of its High Level Marine Objectives. Marine planning should contribute 'to securing sustainable economic growth both in regeneration areas and areas that already benefit from strong local economies. Through well-placed and well-designed development, Marine Plans should promote economic growth and sustain local jobs.' The MPS goes on to discuss the need for interaction, consistency and complementarily between marine and terrestrial planning processes and the opportunities for liaison and sharing of evidence bases and data.

6.3.2 Future Trends

The typology categories reflect how areas fare, at a point in time, on a range of social and economic indicators available on a consistent basis all around the Welsh coast. They do not reflect future plans that Local Authorities or local communities may have for such areas, or reflect issues for which data is not available on a consistent basis around the coastline, such as local well-being, needs or aspirations. Forecasting the trends in social changes is inherently challenging, however, the level and type of economic activity generated by different sectors in different areas will no doubt have an impact on the well-being and prosperity of coastal communities and can be used as a proxy for forecasting some of the changes in the future.

7 Economic Considerations

7.1 Introduction

As highlighted above, there are a wide range of economic activities currently being undertaken in Wales's marine environment. From single employee businesses to large multinational companies, the marine environment in Wales is host to a diverse range of activities across a number of economic sectors. Detailed information on the range, nature and location of such activities varies considerably depending upon the sector. Additionally, the marine environment in Wales provides other benefits which have economic significance but are not delivered through specific industries.

7.1.1 Valuing the Marine Economy

In the following sections the economic value of the goods and services produced in the Welsh marine environment, as ecosystem services or as products of industries as measured by their contribution to the economy, is estimated. Where evidence is available, estimates are made for both the goods and services currently being delivered, and those expected to be delivered in 20 years' time.

7.1.2 Marine Ecosystem Services

In recent years there have been a series of attempts to describe and value the ways in which humans benefit from natural resources and environments which are not explicitly captured in markets. The diverse range of benefits that we derive from the natural environment comes from ecosystem services[14]. Examples of these services include the supply of food and water (provisioning services); the regulation of climate, water quality and flood risk (regulating services); opportunities for recreation, tourism and education (cultural services) and essential underlying functions such as soil formation and habitat for wildlife (supporting services). Table 18, presents marine and coastal ecosystem services benefits as classified in Work Package 4 of the UK National Ecosystem Assessment Follow-on (Turner et al. 2014).

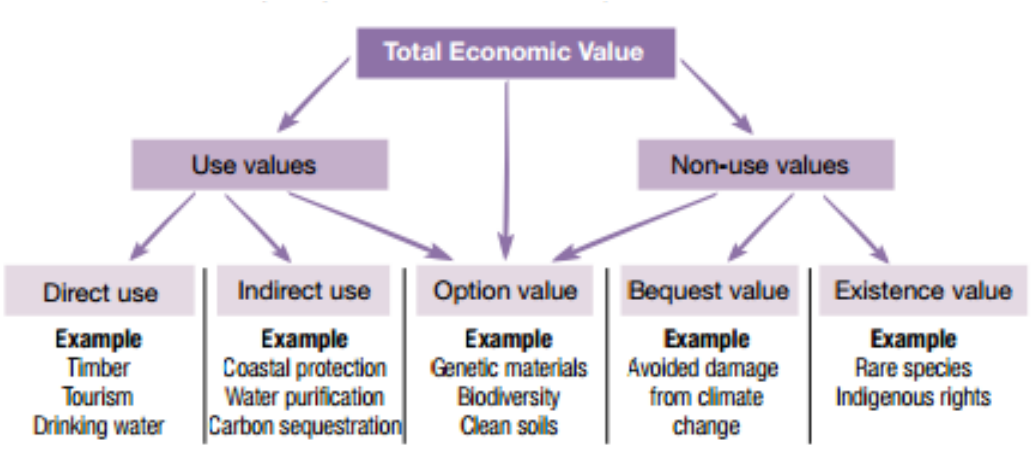
[14] Ecosystem services include ecosystem stocks (e.g. fish), processes and/or functions (e.g. carbon sequestration) that are directly or indirectly consumed by people.

Table 18 Marine and Coastal Ecosystem Service Framework

Classification of ecosystem services	Goods/ benefits
Provisioning service	Food (fish, shellfish, seaweed)
	Fish feed
	Fertiliser and biofuels
	Ornaments and aquaria
	Medicines and blue biotechnology
Regulating service	Healthy climate
	Prevention of coastal erosion
	Sea defence
	Waste burial/removal/neutralisation
Cultural service	Tourism and nature watching
	Spiritual and cultural well-being
	Aesthetic benefits
	Education

The concept of Total Economic Value (TEV) has proven useful as a conceptual framework for keeping track of the wide range of complex and interrelated physical and value flows involved in valuing the natural environment. It reflects the use humans make of the natural environment (through markets or informally) and also the value they may attribute to it unrelated to their current or future use. In other words, TEV consists of *use value* and *non-use value* (see Figure 36).

Figure 36 The Total Economic Value Framework



Source: van Beukering, P., Brander, L., Tompkins, E. and McKenzie, E. (2007) Valuing the Environment in Small Islands - An Environmental Economics Toolkit, 2007

Some *use values* can be expressed in monetary terms using data from actual markets – these would represent the financial value of the goods and services. Use values derived from environmental goods and services that are not traded in markets (i.e. are non-market) and non-use values in general are not reflected in market transactions, unless there has been a government intervention in

the form of taxation or another policy that forces the market price to incorporate these values. Data on *use values* from actual markets are the most prevalent form of economic data available.

Various methods have been used to estimate both the market and non-market components of the value of ecosystem services, and these are further detailed in Appendix B.

The 2011 UK National Ecosystem Assessment has made an initial assessment of the benefits that the natural environment, including marine and coastal environments, provides to society[15]. The final report includes a chapter on the status and changes to the Welsh environment and ecosystem service provision[16], however, the discussion on marine ecosystem services is limited in so far as it only presents the volume and value of fish and shellfish harvest brought into Welsh ports.

Undoubtedly the natural environment is critical to supporting human welfare and therefore is seen as being 'valuable'. Some of the key features identified by Eftec (2006) in describing the value can be identified as follows:

- it underpins and supports all human activity, and in this sense is of immeasurable total value;
- more pertinently for policy, small changes in environmental goods and services will have consequences for human activities; affecting welfare both through markets and externally to markets, i.e. market and non-market impacts;
- humans may ascribe value to possible states of the natural environment over and above any personal or societal human use that may be made of those environments; and
- there may be senses in which environments are of intrinsic value over and above any value they have for human welfare (notwithstanding the associated impossibility of measuring this).

However, as noted by Eftec (2006), the fact that something is 'valuable' does not in itself justify the decision to attempt to place a monetary value on it. The need to value the natural environment arises from the need to better integrate natural and social sciences in managing the impacts on the natural environment and helping the policy-making process. Thus, valuation aims to provide a means by which the contributions that the natural environment makes to human welfare can be better taken into account in decision-making procedures (The World Bank 2008).

[15] http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx
[16] http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=StRD4fVq72c%3d&tabid=82

Whilst progress has, and is still being, made to value marine ecosystem services and there are areas where evidence is more robust (e.g. the benefits of provisioning services of fisheries), evidence on the non-market value of marine (and coastal) ecosystem services is still incomplete. This is highlighted in the review of available (peer-reviewed) valuation studies for coastal and marine ecosystem services in Work Package 4 of the UK National Ecosystem Assessment Follow-on (Turner et al. 2014). With regards to evidence on the *market and non-market* and *use* and *non-use* value of coastal and marine ecosystem service benefits specific or applicable to Wales, the review has found three peer-reviewed studies published since 2000, and this is presented in Table 19.

Table 19. Available evidence on the value of coastal and marine ecosystem services in Wales

Ecosystem service benefits specific or applicable to Wales	Value inflated to 2012 prices (£/yr unless stated otherwise)	Market/non-market; use/non-use values	Reference (original study)
Sea defence from dunes	£56 bn	Non-market and use values	Beaumont et al, (2010)
Spiritual and cultural well-being related to biodiversity (excluding recreational benefits)	Halting loss of biodiversity £116/household; Increasing biodiversity: £66/household	Non-market and non-use values	McVittie and Moran, (2010)
Biodiversity related recreation	Diving: £8.4M; kayaking: £2.7M; boating: £14.5M; seabird watching: £3.9M	Market and use values	Ruiz-Frau et al, (2013)

Due to the spatial scale of this assessment (relating to Wales), there is a lack of reliable evidence which can enable valuation of the entire suite of ecosystem services since values of this nature may be highly location specific (so approaches based upon benefits transfer may have limited validity). Thus, the assessment in the next sub-section focuses primarily on the economic value of marine sectors in Wales, as measured by their contribution to the economy, where reliable monetary data can be obtained from actual markets. The methodology used to generate the economic values for each marine sector is described in full in Appendix B, in addition to discussing the assumptions and limitations of the data available.

7.2 Key issues for Marine Planning

The key issues for economic activities primarily relate to:

- The amount of growth possible, optimising economic, social and environmental benefits from the use of marine resources;
- Interactions between different marine sectors, for example impacts upon coastal tourism through inappropriate developments;
- Maintaining the competitiveness of businesses, such as ports and shipping; and
- The ability to maximise benefits for deprived areas from expansion in marine sectors.

Sectors that are expected to grow need space to do so and have particular requirements and individual issues. For example, developmental work is underway to develop technologies for the capture of tidal energy for electricity generation, however, suitable locations for where such technologies may be deployed are limited spatially. As such a consideration for marine planning may be ensuring that future development opportunities of such locations for tidal energy harvesting is not compromised by use of the location for other activities – 'safeguarding'. Part of this consideration may be exploring opportunities for overlapping more than one activity in an area, for example, tidal lagoons can also represent marine recreation and coastal tourism opportunities.

The aquaculture sector, whilst not one of the most important contributors to the Welsh economy at present, is expected to see significant growth in future years. This growth could be seen through the development of offshore aquaculture and / or the production of macro-algae as a form of biomass energy production. Depending on the scale of the activity, this potential growth could require a significant spatial area.

As the largest sectors in the Welsh marine plan areas, in terms of Gross Value Added (GVA), the growth of ports and shipping are also a key consideration. An increased demand for capital dredging may be a result of the trend towards larger ships, particularly in bulk and container shipping or for oil and gas transportation. The current marine aggregate dredging fleet are coming to the end of their lifecycle, therefore, the decisions made within marine plans will influence the marine aggregate industry's next cycle of capital investment, estimated to be £1billion.

Awareness of the potential interaction between ports and other sectors is also essential. For instance, an increase in channel depth to accommodate larger ships may be challenging due to environmental considerations; development in existing ports may be confined to limited space due

to designations of land or other established or planned uses of the coast; and the interaction of offshore renewable energy extraction areas with shipping lanes must be considered carefully.

The development and expansion of industries operating along the coastline would potentially have implications for tourism and recreation activities. Both of these sectors are dependent on access to a healthy marine and coastal environment, which may also be affected by the development of other sectors in the coastal area, or indeed from an increase in tourism and recreation activities themselves.

The overall growth of all industries is likely to have an increased impact on the environment, particularly in areas already under significant pressure. Sectors and aspects within the marine plan area that will be sensitive to a negative impact on the environment include:

- Tourism
- Recreation
- Fishing
- Aquaculture
- Seascape / visual resource
- Heritage / cultural assets.

7.3 Current Status

Based on the information presented in the earlier sections, a best estimate of the total value of the economic activity within the plan areas is estimated to be approximately £2.1bn of GVA, with an estimated 31,000 people directly employed and a further 56,000 indirectly employed. It should be noted that these are likely to be underestimates, as some economic activities have been unable to be quantified due to lack of reliable evidence.

A summary of the economic value associated with each sector is outlined in Table 20. The largest sector is estimated to be the ports sector (£0.9bn GVA), with the shipping sector the second largest (£0.4bn GVA). Milford Haven is the largest port in Wales (handling 73% of all traffic in 2012), and the third largest by tonnage in the UK, with 8% of the total UK shipping tonnage in 2012 (40 million tonnes) (Department for Transport 2013). It is also one of the largest oil and gas ports in Northern Europe, with approximately 25% of the UK's petrol and diesel provisions, as well as up to 30% of the UK's gas requirements being handled through the Port's waterways. Milford Haven is at the centre of a developing UK energy hub ((ADBP 2011) and (MDS Transmodel Limited 2007).

Table 20 Total GVA for all Economic Sectors (2013/14)

Economic Sector	Estimated GVA (£)
Aggregates	£4,191,168
Aquaculture	£3,702,328
CCS	Not Quantified
Coastal Protection	Not Quantified
Coastal Tourism	£332,398,403
Dredging	£872,209
Fisheries	£11,846,630
Marine Recreation	£22,586,619
Military Defence	Not Quantified
Oil and Gas	Not Quantified
Ports	£922,918,355
Renewable Energy	£127,181,650
Shipping	£403,614,432
Telecoms	£222,027,166
Total	**£2,051,338,959**

The Milford Haven Waterway supports over 5,000 jobs in Wales as a whole, directly and indirectly; 80% of which are in Pembrokeshire (including jobs in oil refining, gas processing, power generation and sea transport services). £324m of gross value added (GVA) is injected into the Pembrokeshire economy by activities dependent on the Waterway of which £88.5m of GVA is put into the Welsh economy, (Milford haven Port Authority (MHPA) 2012;).

The coastal tourism sector is also forecast to make a large contribution to the marine economy with an estimated GVA of £0.3bn and this contribution has the potential to grow significantly. The Welsh Marine Area has a strong tradition of coastal tourism, with approximately 2,740 km of coastline which includes many beaches, coves, headlands and other areas for recreation and leisure. Within the regions, seaside tourism is particularly important for North and South West Wales, where it accounts for half of all activity (57% and 48% of tourism spend respectively) (Welsh Assembly Government 2008a). Coastal tourism is, therefore, a well-established sector but also has the potential to grow. The Welsh Government Strategy for Tourism 2013 - 2020 seeks to drive higher tourism earnings to deliver maximum value for the Welsh economy (Welsh Government 2013e). To

illustrate the importance of the coast, between October 2012 and September 2013 use of the Wales Coastal Path resulted in an estimated £23.6 million net injection into the Welsh Economy (Natural Resources Wales 2013e).

In 2008-2010, the Wales Activity Mapping project (WAM) was carried out in Pembrokeshire. This is the only known project in the UK to provide consistent spatial coverage and participant usage for all known marine recreation activities within the region. The project has mapped in a high level of detail information on activities, including: land-based (beach, caving, climbing, coasteering, cycling, quad biking, horse riding, kite boarding, land yachting, power kites, shooting, walking, wildlife watching, dog walking); water based (body boarding, canoeing and kayaking, kite surfing, snorkelling, surfing, swimming, wind surfing, angling) and boat-based (diving, jet skiing, power boats, cruiser sailing, wake boarding, water skiing, wildlife boat tours, dinghy sailing, rowing). Also, mapped are: alert layers; conservation designations; European marine site plans and projects and marine code.

Following the initial WAM project, a pilot study was undertaken by Marine Planning Consultants in partnership with Atkins and Pembrokeshire Coastal Forum, commissioned by Welsh Government's Sustainable Development Fund and Port of Milford Haven, to place a monetary value on the individual marine recreation activities previously set out in the WAM project (Marine Planning Consultants 2013). The approach taken for this project was to source an individual expenditure per person per day value for each activity, and apply this to the number of participant days per year for a given location where the activity takes place. This, therefore, provides the total value of an area per year for each activity; by combining all activities the total recreation value for any unique location can be calculated.

As this level of marine recreation valuation has not been carried out to date in Wales, the project methodology developed may help enable relatively rapid recreation valuations in the future across broad areas for multiple activities. As this project covers only a regional level the information cannot be applied consistently across the area covered by the SSE. However, it demonstrates the key benefits of developing an aggregated approach based on a reliable dataset to provide an economic valuation of each sector in the marine environment. Also of relevance is a consumer research commissioned by WWF Cymru on the topic of valuing Wales's seas and coasts (Beaufort Research Ltd 2012), which emphasises the value of Welsh seas to the people of Wales, but does not seek to quantify this value.

Marine renewable energy generation is a relatively young sector compared to other activities that have taken place in the marine environment for decades. Nonetheless, this sector is of strategic importance to Wales, having developed the UK's first major offshore renewable power project (North Hoyle). With two offshore wind farms in operation, one under construction and another proposed, the sector retains importance for the Welsh economy and as a contribution to reducing carbon emissions. Additionally, a Development Consent Order has been applied for by Tidal Lagoon Swansea Bay Ltd, who plan to build a 240MW tidal lagoon by 2018; if approved, this will be the first commercial scale tidal lagoon deployed in the UK. The estimated GVA of the renewable energy sector is currently (£0.1bn).

7.4 Current policy

At the UK level current policy has a strong focus on economic growth, as the means, along with deficit reduction, to move the economy further out of recession and tackle public debt. The range of policy to enable this includes:

- *The Strategy for Growth*, which looks to rebalance employment from the public to the private sector, as well increasing productivity;
- *The Spending Review 2013* and associated infrastructure plan, '*Investing in Britain's Future*', which set out spending priorities, including a single growth fund for investment in projects to grow the economy;
- Delegation of European funding for economic development to local enterprise partnerships, subject to suitable strategic economic plans; and
- Sector strategies for renewable energy, oil and gas and nuclear, which look to further maximise the use of resources provided by marine and coastal areas.

At the Welsh level, current policy priority focuses on sustainable jobs and the economy. This is emphasised in the Programme for Government, which contains the overriding policy priorities of promoting jobs and growth and tackling poverty (see Welsh Government 2014a). These policy aims are pursued within the framework of sustainable development (Government of Wales Act 2006).

A strategic goal of the WNMP will be to help achieve a sustainable marine economy and specifically that:

- Infrastructure is in place to support and promote safe, profitable and efficient marine businesses.

- The marine environment and its resources are used to maximise sustainable activity, prosperity and opportunities for all, now and in the future.
- Marine businesses are taking long-term strategic decisions and managing risks effectively. They are competitive and operating efficiently.
- Marine businesses are acting in a way which respects environmental limits and is socially responsible. This is rewarded in the marketplace.

The WNMP will also take account of the emerging Green-Blue economic policy agenda and the evidence based opportunities these present. The EU Blue growth Strategy aims to ensure the sustainable development of EU marine and coastal sectors through three components based on economic potential, knowledge and cooperation. These components are in line with existing UK and Welsh policy drivers as referenced to in section 3.4. The Welsh Government 'Green Growth Wales: investing in the future' Prospectus (July 2014) further highlights the economic opportunities available in Wales linked to the sustainable use of natural resources as an economic driver and specifically highlights the economic importance of the Welsh marine and coastal resource (Welsh Government 2014f).

The Welsh Government Environment Bill – White Paper describes Natural Resource Management as the means to deliver the Welsh Governments priorities that Wales has increasingly resilient and diverse ecosystems that deliver economic, environmental and social benefits.

The sustainable development vision for Wales was set out in One Wales: One Planet (Welsh Assembly Government 2009b). The main outcomes of this vision include:

- A sustainable economy for Wales that is resilient to changes in the global economy;
- A long term economic future secured by achieving the transition to a low carbon, low waste economy;
- Wales is the best place for business to locate, start up, grow and prosper; and
- Regeneration involves and engages with local communities and is firmly based on sustainability principles, creating an infrastructure for the future that favours sustainable ways of living and working (Welsh Assembly Government 2009b).

7.4.1 Future trends

The future economic activity within the marine plan areas will be driven by a large number of factors, including macroeconomic drivers, future policy drivers and technological changes and

innovations. Therefore, accurately forecasting the total value and employment within each of the economic sectors considered in this analysis is challenging – most economic forecasts do not look beyond four years into the future, due to the high degree of uncertainty with forecasting further than this. Influential factors that cannot be accurately predicted in the long term, but that still have an impact on marine economic activity in Wales, include trends in port activity, shipping, and energy, on both UK and global scales. Whilst global trends may influence these sectors, for the purpose of this report it has been assumed that the ports and shipping sectors are linked to the state of the wider UK economy. Under the proposals for the Well-being of Future Generations (Wales) Bill Welsh Ministers will be under a duty to prepare a future trends report that contains predictions of likely future trends in the economic, social and environmental well-being of Wales. In 2012 the Welsh Government published 'Understanding Wales' Future' (Welsh Government 2012e).

It is important to understand, however, the general trajectory of the marine economy in Wales. Based on the growth rates ascribed in the economic sections outlined above, we have provided an indicative estimate of the value of the marine activities through to 2033/34. By 2033/34 it is estimated that the value of the marine economy would rise to £2.9bn, £0.8bn (40%) larger than that in 2013/14. An estimate for each economic sector is outlined in Table 21.

Table 21 Total GVA for all Economic Sectors (2032/33)

Economic Sector	Estimated GVA (£)
Aggregates	£6,160,651
Aquaculture	£5,237,021
CCS	Not Quantified
Coastal Protection	Not Quantified
Coastal Tourism	£531,911,380
Dredging	£1,282,070
Fisheries	£11,846,630
Marine Recreation	£33,200,355
Military Defence	Not Quantified
Oil and Gas	Not Quantified
Ports	£1,371,408,127
Renewable Energy	Not Quantified
Shipping	£599,749,814
Telecoms	£326,360,523
Total	**£2,887,156,570**

One of the key long term aims within One Wales: One Planet is for 'Wales's economy to be resilient, through sustainable growth in new and existing businesses that are resource efficient and 'future proofed' against the challenges of energy security and the scarcity of natural resources.'

To help achieve the Welsh Government's economic policy aims there is a focus on supporting nine sectors which are, or have the potential to be, key to the economy of Wales. This strategic approach complements wider cross economy efforts (for example Entrepreneurship) both within the Department of Economy, Science and Technology and across the Welsh Government to deliver the Programme for Government commitments. Each sector has a private sector-led panel which advises the Welsh Ministers on the strategic priorities for the sectors and measures to inform Welsh Government policy making and future resource allocation.

The nine key sectors are:

- Energy and Environment
- Construction
- Creative Industries
- Advanced Materials & Manufacturing
- Financial and Professional Services
- Food and Farming
- Information & Communication Technologies (ICT)
- Life Sciences
- Tourism

Seven locations have been confirmed as 'Enterprise Zones' in Wales, where businesses are supported to encourage economic development. Four of these zones are in coastal locations, each focusing on a key target sector:

- Cardiff - focusing on financial and professional services sector;
- Anglesey - focusing on the energy sector;
- St Athan / Cardiff Airport: focusing on the aerospace sector; and
- Haven Waterway - focusing on the energy and environment sector.

As the priorities for economic development in these areas, it can be assumed that these sectors will be subject to future efforts to stimulate and increase growth over and above that anticipated or planned for currently. The focus on these sectors suggests there will be increased levels of activities related to energy, over a larger area of the coast.

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Appendix A

Sustainability Appraisal of Welsh National Marine Plan - Review of Policies, Plans, and Programmes

Introduction

The Welsh Government is preparing the Welsh National Marine Plan in accordance with the Marine and Coastal Access Act (MCAA) 2009. In preparing the plan, the Welsh Government is required to use the best available evidence and has commissioned a Strategic Scoping Exercise (SSE) to assess the spatial distribution of natural resources and human activities within Wales's marine area and to understand at a strategic level the key issues that marine planning may be able to address.

The Welsh Government is undertaking a Sustainability Appraisal (SA) of the Welsh National Marine Plan, which is also a requirement of the MCAA. In meeting this requirement, Welsh Government must also address the requirements of the European Union Directive 2001/42/EC on the Assessment of Certain Plans and Programmes on the Environment, more commonly known as the Strategic Environmental Assessment (SEA) Directive. This has been transposed into UK regulations as the Environmental Assessment of Plans and Programmes Regulations 2004 (SI 2004 No. 1633) hereafter referred to as the SEA Regulations. This is a law that sets out to integrate environmental considerations into the development of plans and programmes.

Further details concerning the development of the Welsh National Marine Plan and how SA and SEA of the plan are being undertaken can be found within the SSE.

Purpose of this document

At the scoping stage, the SEA Regulations require that: "The environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation."

Tables 1 to 5 have been prepared by AMEC as part of the SA and SEA scoping and present a summary of the review of policies, plans and programmes that are relevant to the Welsh National Marine Plan.

Table 1 International Plans, Programmes and Policies

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
The Ramsar Convention on Wetlands (1971)	The Convention on Wetlands of International Importance was signed in Ramsar, Iran in 1971. It is an intergovernmental treaty which provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources, as a means to achieving sustainable development throughout the world. The original emphasis was on the conservation and wise use of wetlands primarily to provide habitat for waterbirds, however over the years the Convention has broadened its scope to incorporate all aspects of wetland conservation and wise use, recognising wetlands as ecosystems that are extremely important for biodiversity conservation and for the well-being of human communities. 'The Convention's mission is the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world' (Ramsar COP8, 2002). A Strategic Plan 2009-2015 has been adopted to provide guidance on how efforts for implementing the Convention on Wetlands should be focussed. The strategy has 5 goals: Wise use: The wise use of all wetlands being achieved in all Parties, including more participative management of wetlands, and conservation decisions being made with an awareness of the importance of the ecosystem services provided by wetlands; Wetlands of International Importance: Parties designating and managing Ramsar sites within their territories with a view to supporting an international network of Wetlands of International Importance, fully implementing their reporting commitments under Articles 3 and 8.2, and using the Montreux Record as part of the Convention's governance process, as appropriate; International cooperation: Parties developing their coherent national approaches to the implementation of the Ramsar Convention in such a way as to benefit from developing effective partnerships with related conventions and international agencies and with other Parties to the Convention on Wetlands; Institutional capacity and effectiveness: Increasing success of the Convention in achieving the conservation and wise use of wetlands, as measured by agreed effectiveness indicators, and increased recognition of the Convention's achievements by other sectors of governments and civil society; Membership: All countries eligible for accession to have joined the Ramsar Convention by 2015. A number of strategic key results are set out in the strategy against each of the 5 goals, e.g. by 2015 global wetland distribution and status data and information should be available through Webportal mechanisms, Ramsar guidance on the maintenance of ecological character to be have been applied with a priority upon recognized internationally important wetlands not yet designated as Ramsar sites.	The Welsh National Marine Plan should ensure the protection and wise use of wetlands. The SA assessment framework should incorporate the protection of wetland sites listed under the Ramsar convention.
UNESCO (1972) Convention Concerning the Protection of the World Cultural and Natural Heritage	The UNESCO World Heritage Convention was adopted in 1972, and came into force three years later in 1975. It has been adopted by 190 states, including the UK who ratified the convention in 1984. The convention links the concepts of nature conservation and the preservation of cultural properties, and sets out the type of sites that can be considered for the World Heritage List and the duty of states party to the convention. It requires states to conserve World Heritage sites and protect their country's natural heritage, including integration in regional planning programmes. States also must aim to give heritage a function in day-to-day life, strengthen public appreciation of heritage and report to the World Heritage Committee on the status of conservation sites.	The Welsh National Marine Plan should take account of natural heritage and World Heritage Sites. The SA assessment framework should include effects on cultural heritage.
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972) and Protocol to the Convention on the	This convention covers the deliberate disposal of wastes from vessels, aircraft and platforms to the sea to control pollution. This convention does not cover discharges from land-based sources. "1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972" replaced the 1972 convention and came into force in 2006. In the 1972 convention, parties were prohibited from dumping certain listed hazardous material. In the 1996 Protocol a precautionary approach has been adopted, prohibiting the dumping	The Welsh National Marine Plan and actions therein should be compliant with this convention and should not result in the dumping of prohibited wastes to sea.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 ("the London Protocol"), which entered into force in 2006	of all wastes except those listed in Annex 1 (under permit). These materials include dredged material, sewage sludge, fish processing waste, vessels or offshore platforms or the man-made structures, inert inorganic geological material; organic material of natural origin; and bulky items including iron, steel, concrete and similar materials for which the concern is physical impact, and limited to those circumstances where such wastes are generated at locations with no land-disposal alternatives. CO_2 streams from CO_2 capture processes were added under the amendments adopted in 2006, which entered into force in 2007.In 2013 amendments to the 1996 Protocol were adopted to permit the regulation of 'marine geoengineering'. The amendments need ratification by 2/3rds of the Contracting Parties to come into force. Furthermore, the 1996 protocol prohibits incineration at sea except for emergencies, and prohibits the exports of wastes or other matter to non-Parties for the purpose of dumping or incineration at sea.	The SA assessment framework should include protection of waters from marine dumping.
Marine Pollution Convention, MARPOL 73/78 (the International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978)	This is the primary convention covering the prevention of pollution of the marine environment by ships, either through operational or accidental causes. The 1978 Protocol was adopted as a result of tanker accidents in the late 1970's. The 1972 convention had not been adopted by the time that the 1978 Protocol was introduced. Both came into force in 1983. The convention includes six technical annexes • Annex I Regulations for the Prevention of Pollution by Oil (entered into force 2 October 1983) • Annex II Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (entered into force 2 October 1983) • Annex III Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (entered into force 1 July 1992) • Annex IV Prevention of Pollution by Sewage from Ships (entered into force 27 September 2003) • Annex V Prevention of Pollution by Garbage from Ships (entered into force 31 December 1988) • Annex VI Prevention of Air Pollution from Ships (entered into force 19 May 2005), which limits sulphur oxide and nitrogen oxide emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances; designated emission control areas set more stringent standards for SOx, NOx and particulate matter.	The Welsh National Marine Plan and actions therein should be compliant with this convention and should ensure the protection and enhancement of the marine environment from pollution from ships. The SA assessment framework should include protection and enhancement of biodiversity.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)	This voluntary agreement aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. The convention affords varying degrees of protection to over 35,000 species of animal and plants for uses including food products, exotic leather goods, wooden musical instruments, timber, tourist souvenirs and medicines	The SA assessment framework should include protection and enhancement of biodiversity.
Geneva Convention on Long Range Transboundary Air Pollution (1979)	This convention has created a framework for controlling and reducing the damage to human health and the environment caused by transboundary air pollution. The convention was signed by 34 Governments and the European Community (EC) and was the first international legally binding instrument to deal with problems of air pollution on a regional basis. The Convention entered into force in 1983 and has since been extended by eight specific protocols. • The 1999 Protocol to Abate Acidification, Eutrophication and Ground-level Ozone; Status of Ratification. Entered into force on 17 May 2005. • The 1998 Protocol on Persistent Organic Pollutants (POPs); Status of Ratification. Entered into force on 23 October 2003. • The 1998 Protocol on Heavy Metals; Status of Ratification. Entered into force on 29 December 2003. • The 1994 Protocol on Further Reduction of Sulphur Emissions; Status of Ratification. Entered into force 5 August 1998. • The 1991 Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes; Status of Ratification. Entered into force 29 September 1997. • The 1988 Protocol concerning the Control of Nitrogen Oxides or their Transboundary Fluxes; Status of Ratification. Entered into force 14 February 1991. • The 1985 Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent; Status of Ratification. Entered into force 2 September 1987. • The 1984 Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the	The Welsh National Marine Plan and actions therein should be compliant with this convention and should ensure the protection and enhancement of air quality. The SA assessment framework should include protection and enhancement of air quality.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	Long-range Transmission of Air Pollutants in Europe (EMEP); Status of Ratification. Entered into force 28 January 1988.	
Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention, 1979)	The Convention on the Conservation of Migratory Species of Wild Animals (also known as the Bonn Convention or CMS) is an intergovernmental treaty under the United Nations Environment Programme. The convention was signed in 1979 ratified in the UK in 1985. The convention aims to ensure contracting parties work together to conserve terrestrial, marine and avian migratory species and their habitats (on a global scale) by providing strict protection for endangered migratory species. Overarching objectives set for the Parties are: ▪ Should promote, co-operate in and support research relating to migratory species; ▪ Shall endeavour to provide immediate protection for migratory species; and ▪ Shall endeavour to conclude Agreements covering the conservation and management of migratory species included in Appendix II. ▪ Setting targets is the responsibility of member states.	The Welsh National Marine Plan should take into account the habitats and species that have been identified under this directive, and should include provision for their protection, preservation and improvement. The SA assessment framework should include biodiversity, incorporating the importance of conserving migratory species.
European Commission (1981) The Bern Convention	The Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention) was adopted in Berne, Switzerland in 1979, and came into force in 1982. The principle objectives are: • To conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the co operation of several States; and • To promote such co operation. Particular emphasis is given to endangered and vulnerable species, including endangered and vulnerable migratory species; In order to achieve this the Convention imposes legal obligations on contracting parties, protecting over 500 wild plant species and more than 1000 wild animal species. Targets for Contracting Parties are: • Promoting national policies for the conservation of wild flora, wild fauna and natural habitats, with particular attention to endangered and vulnerable species, especially endemic ones, and endangered habitats, in accordance with the provisions of this Convention; • Undertaking in its planning and development policies, and in its measures against pollution, to have regard to the conservation of wild flora and fauna; and • Promoting education and disseminating general information on the need to conserve species of wild flora and fauna and their habitats.	The Welsh National Marine Plan should take into account the habitats and species that have been identified under the Convention, and should include provision for the preservation, protection and improvement of the quality of the environment as appropriate. The SA assessment should incorporate the conservation provisions of the Convention particularly the protection of wild flora, fauna and natural habitats.
UNCLOS (1982) United Nations Convention on the Law of the Sea	This convention sets law and order in the world's oceans and seas establishing rules governing all uses of the oceans and their resources. It enshrines the notion that all problems of ocean space are closely interrelated and need to be addressed as a whole and entered into force in 1994. The Convention comprises 320 articles and nine annexes, governing all aspects of ocean space, such as delimitation, environmental control, marine scientific research, economic and commercial activities, transfer of technology and the settlement of disputes relating to ocean matters. Key features of the Convention include • Coastal States exercise sovereignty over their territorial sea which they have the right to establish its breadth up to a limit not to exceed 12 nautical miles; foreign vessels are allowed "innocent passage" through those waters; • Ships and aircraft of all countries are allowed "transit passage" through straits used for international navigation; States bordering the straits can regulate navigational and other aspects of passage; • Archipelagic States have sovereignty over a sea area enclosed by straight lines drawn between the outermost points of the islands; the waters between the islands are declared archipelagic waters where States may establish sea lanes and air routes in which all other States enjoy the right of archipelagic passage through such designated sea lanes; • Coastal States have sovereign rights in a 200-nautical mile exclusive economic zone (EEZ) with respect to natural	The Welsh National Marine Plan should be compliant with the law of the sea. The SA assessment framework should consider economic uses of the sea.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	resources and certain economic activities, and exercise jurisdiction over marine science research and environmental protection; • All other States have freedom of navigation and overflight in the EEZ, as well as freedom to lay submarine cables and pipelines; • Land-locked and geographically disadvantaged States have the right to participate on an equitable basis in exploitation of an appropriate part of the surplus of the living resources of the EEZ's of coastal States of the same region or sub-region; highly migratory species of fish and marine mammals are accorded special protection; • Coastal States have sovereign rights over the continental shelf (the national area of the seabed) for exploring and exploiting it; the shelf can extend at least 200 nautical miles from the shore, and more under specified circumstances; • Coastal States share with the international community part of the revenue derived from exploiting resources from any part of their shelf beyond 200 miles; • The Commission on the Limits of the Continental Shelf shall make recommendations to States on the shelf's outer boundaries when it extends beyond 200 miles; • All States enjoy the traditional freedoms of navigation, overflight, scientific research and fishing on the high seas; they are obliged to adopt, or cooperate with other States in adopting, measures to manage and conserve living resources; • The limits of the territorial sea, the exclusive economic zone and continental shelf of islands are determined in accordance with rules applicable to land territory, but rocks which could not sustain human habitation or economic life of their own would have no economic zone or continental shelf; • States bordering enclosed or semi-enclosed seas are expected to cooperate in managing living resources, environmental and research policies and activities; • Land-locked States have the right of access to and from the sea and enjoy freedom of transit through the territory of transit States; • States are bound to prevent and control marine pollution and are liable for damage caused by violation of their international obligations to combat such pollution; • All marine scientific research in the EEZ and on the continental shelf is subject to the consent of the coastal State, but in most cases they are obliged to grant consent to other States when the research is to be conducted for peaceful purposes and fulfils specified criteria; • States are bound to promote the development and transfer of marine technology "on fair and reasonable terms and conditions", with proper regard for all legitimate interests; • States Parties are obliged to settle by peaceful means their disputes concerning the interpretation or application of the Convention; • Disputes can be submitted to the International Tribunal for the Law of the Sea established under the Convention, to the International Court of Justice, or to arbitration. Conciliation is also available and, in certain circumstances, submission to it would be compulsory. The Tribunal has exclusive jurisdiction over deep seabed mining disputes.	
NEAFC (1982) Convention on the Future Multilateral Cooperation in North-East Atlantic Fisheries	The NEAFC's principal objective is to *"promote the conservation and optimum utilisation of the fishery resources of the North-East Atlantic area within a framework appropriate to the regime of extended coastal state jurisdiction over fisheries, and accordingly to encourage international cooperation and consultation with respect to these resources"*. The convention also promotes the exchange of scientific information and data on the state of the fishery resources in the area and on management policies. Within NEAFC, there are two schemes currently operating with regard to control: • The Scheme of Control and Enforcement which is an electronic surveillance scheme to control the fishing activities of vessels in the Regulatory Area - outside the fishing zones of the coastal States) • The non-contracting party Scheme to address the problem of non-contracting party fishing activity in the NEAFC	The Welsh National Marine Plan should consider the need to protect and enhance fisheries in the Marine Plan area. The SA assessment framework should include protection and enhancement of fisheries.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	Regulatory Area.	
North Atlantic Salmon Conservation Organization (NASCO) (1983) Convention for the Conservation of Salmon in the North Atlantic Ocean.	This Convention created the inter-governmental organization, the North Atlantic Salmon Conservation Organization (NASCO). NASCO's objective is to conserve, restore, enhance and rationally manage w ild Atlantic salmon. The Convention created a large protected zone, free of targeted fisheries for Atlantic salmon in most areas beyond 12 nautical miles from the coast.	The Welsh National Marine Plan should consider the need to protect and enhance fisheries and ensure that the passage of migratory species is not affected in the Marine Plan area. The SA assessment framework should include protection and enhancement of fisheries.
Montreal Protocol on substances that deplete the ozone layer (1987) and subsequent updates and adjustments	This Protocol w as designed to reduce the production and consumption of ozone depleting substances in order to reduce their abundance in the atmosphere, affording protection of the earth's ozone Layer. The Protocol entered force in January 1989.	The Welsh National Marine Plan should contribute to the reduction of pollution to the atmosphere through consideration of marine development and activities. The SA assessment framework should include objectives for the minimisation of pollution and the protection and enhancement of air quality.
International Convention on Oil Pollution Preparedness, Response and Co-operation (1990)	Parties to the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) are required to establish measures for dealing w ith pollution incidents, either nationally or in co-operation w ith other countries. Under this convention: • Ships are required to carry a shipboard oil pollution emergency plan; • Operators of offshore units under the jurisdiction of Parties are also required to have oil pollution emergency plans or similar arrangements which must be co-ordinated with national systems for responding promptly and effectively to oil pollution incidents; • Ships are required to report incidents of pollution to coastal authorities and the convention details the actions that are then to be taken; • Stockpiles of oil spill combating equipment should be established; • Oil spill combating exercises should be held; • Detailed plans for dealing w ith pollution incidents should be developed. Parties to the convention are required to provide assistance to others in the event of a pollution emergency and provision is made for the reimbursement of any assistance provided. A Protocol to the OPRC relating to hazardous and noxious substances (OPRC-HNS Protocol) w as adopted in 2000.	The Welsh National Marine Plan should contribute to the protection and enhancement of the marine environment from oil pollution. The SA assessment framework should include objectives for the protection and enhancement of the marine environment from oil pollution.
Espoo Convention on Environmental impact Assessment in a Transboundary Context (1991)	This Convention sets out the obligations of Parties to assess the environmental impact of certain activities at an early stage of planning. It also lays dow n the general obligation of States to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact across boundaries. It came into force in 1997 and there have since been tw o amendments: . • First amendment (not in force) will open the Convention to accession upon approval by UN Member States that are not members of the UNECE; • Second amendment (not in force), will: o Allow , as appropriate, affected Parties to participate in scoping; o Require review s of compliance; o Revise the Appendix I (list of activities);	The Welsh National Marine Plan should contribute to the protection and enhancement of the marine environment from oil pollution. The SA assessment framework should include objectives for the protection and enhancement of the marine environment from oil pollution.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	o Make other minor changes.	
United Nations Convention on Biodiversity (the Rio Convention, 1992)	The Convention on Biodiversity called for the development and enforcement of national strategies and associated action plans to identify, conserve and protect existing biological diversity, and to enhance it wherever possible. In the UK, the UK Biodiversity Action Plan was then established to conserve and enhance biodiversity in the UK through the use of Habitats and Species Action Plans to help the most threatened species and habitats to recover and to contribute to the conservation of global biodiversity.	The Welsh National Marine Plan and actions therein should be compliant with this convention and should ensure the protection and enhancement of endangered species. The SA assessment framework should include protection and enhancement of biodiversity.
The United Nations Framework Convention on Climate Change (1994)	This Convention sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognises that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. Under the Convention, governments: • Gather and share information on greenhouse gas emissions, national policies and best practices; • Launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; • Cooperate in preparing for adaptation to the impacts of climate change. The Convention entered into force on 21 March 1994.	The Welsh National Marine Plan and actions therein should aim to reduce emissions of greenhouse gas emissions. The SA assessment framework should include objectives concerning the reduction of emissions of greenhouse gases.
UNEP (1994) Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS)	The aim of ASCOBANS is to promote close cooperation amongst its Parties in order to achieve a favourable conservation status for small cetaceans. This includes dolphins, porpoises and certain small whale species. The marine area covered by the agreement was extended in 2008 to cover waters adjacent to Ireland, Portugal and Spain. The ASCOBANS Conservation and Management Plan, which forms part of the Agreement, obliges Parties to focus on the following issues: • Habitat conservation and management; • Surveys and research; • Evaluation of bycatch and stranding data; • Improving legislation; • Information and education.	The Welsh National Marine Plan should support the conservation of marine species. The SA assessment framework should include the protection of biodiversity.
Food and Agriculture Organisation of the United Nations (1995) Code of Conduct for Responsible Fisheries	This voluntary code was developed promote long-term sustainable fisheries. It is global in scope, and is directed toward members and non-members of FAO, fishing entities, subregional, regional and global organisations, whether governmental or non-governmental, and all persons concerned with the conservation of fishery resources and management and development of fisheries, such as fishers, those engaged in processing and marketing of fish and fishery products and other users of the aquatic environment in relation to fisheries. It provides principles and standards applicable to the conservation, management and development of all fisheries. It also covers the capture, processing and trade of fish and fishery products, fishing operations, aquaculture, fisheries research and the integration of fisheries into coastal area management.	The Welsh National Marine Plan should contribute to the protection of sustainable fish stocks. The SA assessment framework should include conservation and sustainable use of fish stocks.
Kyoto Protocol to the UN Framework Convention on Climate Change (1997)	This international agreement linked to the United Nations Framework Convention on Climate Change, which commits its Parties by setting internationally binding emission reduction targets. The Protocol places a heavier burden on developed nations under the principle of *"common but differentiated responsibilities".* It entered into force in 2005. The detailed rules for the implementation of the Protocol were adopted in Marrakesh, Morocco, in 2001, and are referred to as the "Marrakesh Accords". In 2012 in Doha, Qatar, the "Doha Amendment to the Kyoto Protocol" was adopted which includes: • New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1 January 2013 to 31 December 2020; • A revised list of greenhouse gases (GHG) to be reported on by Parties in the second commitment period; and	The Welsh National Marine Plan and actions therein should aim to reduce emissions of greenhouse gas emissions. The SA assessment framework should include objectives concerning the reduction of emissions of greenhouse gases.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	• Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.	
The Convention for the Protection of the Marine Environment of the North East Atlantic (OSPAR) 1998	The OSPAR Convention entered into force on 25 March 1998 and replaces earlier Oslo and Paris Conventions but Decisions, Recommendations and all other agreements adopted under those Conventions will continue to be applicable, unaltered in their legal nature, unless they are terminated by new measures adopted under the 1992 OSPAR Convention. Contained within the OSPAR Convention are a series of Annexes which deal with the following specific areas: • Annex I: Prevention and elimination of pollution from land-based sources; • Annex II: Prevention and elimination of pollution by dumping or incineration; • Annex III: Prevention and elimination of pollution from offshore sources; and • Annex IV: Assessment of the quality of the marine environment. In 2000 a first comprehensive Quality Status Report on the quality of the marine environment of the OSPAR maritime area was published (under Annex IV).	The Welsh National Marine Plan should contribute to the protection and enhancement of the marine environment from pollution. The SA assessment framework should include objectives for the protection and enhancement of the marine environment from pollution sources.
United Nations Economic Commission for Europe (1998) Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (The Aarhus Convention)	To contribute to the protection of present and future generations to live in an environment adequate to his or her health and well-being. This will be achieved through each Party subject to the convention guaranteeing the rights of access to information, public participation in decision-making, and access to justice in environmental matters in accordance with the provisions of this Convention. To establish and maintain a clear, transparent and consistent framework to implement the provisions of this Convention. This will be achieved through each Party taking the necessary legislative, regulatory and other measures, including measures to achieve compatibility between the provisions implementing the information, public participation and access-to-justice provisions in this Convention, as well as proper enforcement measures. Responsibility for implementation is deferred to the member states.	The development of the Welsh National Marine Plan needs to be a transparent process. Sufficient time should be provided for consultation on the SA documents in line with the Aarhus convention of establishing and maintaining a transparent clear framework for public participation. The SA should contain a Non Technical Summary and all documentation should be in Welsh and English.
Council of Europe (2000) European Landscape Convention	The European Landscape Convention was adopted on 20 October 2000 in Florence and came into force on 1 March 2004 (Council of Europe Treaty Series no. 176). It is open for signature by member states of the Council of Europe and for accession by the European Community and European non-member states. The UK Government signed the European Landscape Convention in 2006 and it became binding from March 2007. The aims of the Convention are to promote landscape protection, management and planning, and to organise European co-operation on landscape issues. Responsibility for implementation has been deferred to the signatories. Articles 5 (general measures) and 6 (specific measures) set out measures that the signatories will undertake, e.g. integrating landscape into policies with possible direct or indirect impact on landscape and to introduce instruments aimed at protecting, managing and/or planning the landscape. Natural England is leading the implementation of the ELC in England and has worked with Defra and English Heritage to produce 'A Framework for Implementation in England', published in October 2007. This framework seeks to further strengthen the protection, management and planning of England's landscapes, by providing a structure for action plans that will be prepared by any interested partners and stakeholders. NRW note that in Wales the European Landscape Convention commitments are implemented within existing mechanisms that are in place for dealing with Welsh landscapes, building on work completed to date.	The Welsh National Marine Plan should take landscape and seascape into account. The SA assessment framework should include protection and enhancement of landscape and seascape.
Stockholm Convention on Persistent Organic Pollutants (2001)	Persistent Organic Pollutants (POPs) can be transported over long distances and for this reason, no one government acting alone can protect its citizens or its environment from POPs. This Convention entered into force in 2004 and is a global treaty to protect human health and the environment from chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of humans and wildlife, and have harmful impacts on human health or on the environment.	The Welsh National Marine Plan should contribute to the protection and enhancement of the marine environment from pollution. The SA assessment framework

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	The main provisions require each party to: • Prohibit and/or eliminate the production and use, as well as the import and export, of the intentionally produced POPs that are listed in Annex A to the Convention (Article 3); • Restrict the production and use, as well as the import and export, of the intentionally produced POPs that are listed in Annex B to the Convention (Article 3); • Reduce or eliminate releases from unintentionally produced POPs that are listed in Annex C to the Convention (Article 5). The Convention also promotes the use of best available techniques and best environmental practices for preventing releases of POPs into the environment: • Ensure that stockpiles and wastes consisting of, containing or contaminated with POPs are managed safely and in an environmentally sound manner (Article 6); • The Convention requires that such stockpiles and wastes be identified and managed to reduce or eliminate POPs releases from these sources. The Convention also requires that wastes containing POPs are transported across international boundaries taking into account relevant international rules, standards and guidelines; • To target additional POPs (Article 8). Other provisions include the development of implementation plans (Article 7), information exchange (Article 9), public information, awareness and education (Article 10), research, development and monitoring (Article 11), technical assistance (Article 12), financial resources and mechanisms (Article 13), reporting (Article 15), effectiveness evaluation (Article 16) and non-compliance (Article 17).	should include objectives for the protection and enhancement of the marine environment from pollution sources.
UNESCO (2001) Convention on the Protection of Underwater Cultural Heritage	This Convention • Sets out basic principles for the protection of underwater cultural heritage; • Provides a detailed State cooperation system; and • Provides widely recognized practical Rules for the treatment and research of underwater cultural heritage. The main principles are • Obligation to Preserve Underwater Cultural Heritage; • Preservation as first option; • No Commercial Exploitation; • Training and Information Sharing.	The Welsh National Marine Plan should recognise the need to protect underwater cultural heritage. The SA assessment framework should include objectives for the protection of underwater cultural heritage.
United Nations (2001) United Nations Fish Stocks Agreement	The objective of the UN Fish Stocks Agreement is to ensure the long-term conservation and sustainable use of straddling and highly migratory fish stocks. The Agreement elaborates upon provisions of United Nations Convention on the Law of the Sea (UNCLOS) and aims to greatly improve the international management of fishing on the high seas. In particular, the Agreement strengthens the legal regime for conservation and management of highly migratory and straddling fish stocks implemented through global, regional and sub-regional fisheries management organisations (RFMOs).	The Welsh National Marine Plan should contribute to the protection of sustainable fish stocks. The SA assessment framework should include conservation and sustainable use of fish stocks.
The World Summit on Sustainable Development, Johannesburg (2002)	The World Summit resulted in the Johannesburg Declaration on Sustainable Development and a Plan of Implementation. The declaration reaffirms principles already agreed upon at the Rio Earth Summit UNCED in 1992 and the UN Millennium Summit in 1999. It recognises that poverty eradication is a key condition for sustainable development and addresses issues such as cultural diversity, patterns of production and consumption, health issues, armed conflicts, the new dimension created by globalisation, gender issues and financing for development. The implementation plan sets out actions to achieve sustainable development such as poverty eradication, changing unsustainable patterns of consumption and production, protecting and managing the natural resource base of economic and social development, sustainable development in a globalizing world and health and sustainable development. Sustainable development in England is delivered through the sustainable development strategy, Securing the Future.	The Welsh National Marine Plan should promote sustainable development. The SA should help to deliver sustainable development through identifying the optimum ways in which the Plan can contribute towards sustainable development in Wales..
OSPAR (2003) Recommendation 2003/3 on a Network of Marine	The 2003 OSPAR Ministerial Meeting in Bremen adopted Recommendation 2003/3 on a network of marine protected areas with the purpose of establishing an ecologically coherent network of well-managed MPAs in the North-East Atlantic by	The Welsh National Marine Plan should ensure the protection of

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
Protected Areas	2010.The aims of the OSPAR network of MPAs are: • to protect, conserve and restore species, habitats and ecological processes which have been adversely affected by human activities; • to prevent degradation of, and damage to, species, habitats and ecological processes, following the precautionary principle; • to protect and conserve areas that best represent the range of species, habitats and ecological processes in the maritime area. The UK has nominated 183 MPAs, which are all designated as SAC or SPA	MPAs. The SA assessment framework should include protection and enhancement of biodiversity.
IMO (2003) International Convention for the Control and Management of Ships' Ballast Water and Sediments	However, the Ballast Water Management Convention, adopted in 2004, aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Under this Convention, all ships in international traffic are required to manage their ballast water and sediments to a certain standard, according to a ship-specific ballast water management plan. All ships will also have to carry a ballast water record book and an international ballast water management certificate. The ballast water management standards will be phased in over a period of time. As an intermediate solution, ships should exchange ballast water mid-ocean. However, eventually most ships will need to install an on-board ballast water treatment system.	The Welsh National Marine Plan should contribute to the protection and enhancement of the marine environment from pollution. The SA assessment framework should include objectives for the protection and enhancement of the marine environment from pollution sources.
OSPAR (2003) Strategy to Combat Eutrophication	This strategy has been produced to deliver OSPAR's objective to combat eutrophication in the OSPAR maritime area, in order to achieve and maintain a healthy marine environment where eutrophication does not occur. The Strategy involves the identification of areas for which actions are needed by the Common Procedure for the Identification of the Eutrophication Status of the Maritime Area (the "Common Procedure"). In the case of problem areas with regard to eutrophication: (i) measures shall be taken to reduce or to eliminate the anthropogenic causes of eutrophication; (ii) reports shall be provided on the implementation of such measures; (iii) assessments shall be made of the effectiveness of the implementation of the measures on the state of the marine ecosystem.	The Welsh National Marine Plan should be aligned with the objectives of the OSPAR Strategy to combat Eutrophication. The SA assessment framework should include protection of the marine environment from pollutants.
OSPAR (2003) Strategy on Biological Diversity and Ecosystems	This strategy has been produced to deliver OSPAR's objective to protect and conserve the ecosystems and the biological diversity of the maritime area which are, or could be, affected as a result of human activities, and to restore, where practicable, marine areas which have been adversely affected. The strategy centres on the further assessment of which species and habitats need to be protected and those human activities that are likely to have an actual or potential adverse effect on these species and habitats or on ecological processes. A series of actions are identified including the development of lists of threatened and/or declining species and habitats, the completion of the pilot project for the North Sea on ecological quality objectives and evaluating environmental quality against clear ecological quality objectives, both as a long-term system for the North Sea and in other OSPAR regions. Assessment, of the following candidate list of human activities: (i) sand and gravel extraction; (ii) dredging for navigational purposes, other than within harbours; (iii) the exploration for oil, gas and solid minerals; (iv) the placement of structures for the exploitation of oil and gas; (v) the construction or placement of artificial islands, artificial reefs, installations and structures (including offshore wind-farms); (vi) the placement of cables and pipelines. This assessment will include an assessment of the scope for action under other international laws; (vii) the introduction of alien or genetically modified species, whether deliberately or unintentionally; (viii) land reclamation; in addition, the Commission will examine specific issues relating to tourism and recreational activities which have been	The Welsh National Marine Plan should be aligned with the objectives of the OSPAR Strategy on Biological Diversity and Ecosystems. The SA assessment framework should include protection and enhancement of marine biodiversity.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	identified in the background document on tourism. Relevant data will be collected and evaluated with a view to identifying areas for restoration where practicable. This may include controlling the human activities that have an adverse impact on species and habitats that need to be protected or conserved; or restoring, where practicable, marine areas which have been adversely affected.	
OSPAR (2003) Hazardous Substances Strategy	This strategy has been produced to deliver OSPAR's objective to prevent pollution of the maritime area by continuously reducing discharges, emissions and losses of hazardous substances, with the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances. The strategy identifies a requirement to select the hazardous substances to be given priority and draw up programmes and measures to control these pollutants.	The Welsh National Marine Plan should be aligned with the objectives of the OSPAR Hazardous Substances Strategy. The SA assessment framework should include protection of the marine environment from pollutants.
OSPAR (2003) Offshore Oil and Gas Industry Strategy	The objective of the Commission with regard to the setting of environmental goals for the offshore oil and gas industry and the establishment of improved management mechanisms to achieve them is to prevent and eliminate pollution and take the necessary measures to protect the maritime area against the adverse effects of offshore activities so as to safeguard human health and to conserve marine ecosystems and, when practicable, restore marine areas which have been adversely affected. The strategy identifies activities that will be undertaken under the following four headings: • General process of establishing goals and measures • Prevention and elimination of pollution from offshore sources • Protection and conservation of the maritime area against adverse effects of offshore activities other than pollution • Implementation and enforcement	The Welsh National Marine Plan should be aligned with the objectives of the OSPAR Offshore Oil and Gas Industry Strategy. The SA assessment framework should include protection of the marine environment from pollutants.
OSPAR (2003) Radioactive Substances Strategy	In accordance with the general objective, the objective of the Commission with regard to radioactive substances, including waste, is to prevent pollution of the maritime area from ionising radiation through progressive and substantial reductions of discharges, emissions and losses of radioactive substances, with the ultimate aim of concentrations in the environment near background values for naturally occurring radioactive substances and close to zero for artificial radioactive substances. The strategy commits to develop programmes and measures to identify, prioritise, monitor and control (i.e. to prevent and/or reduce and/or eliminate) the emissions, discharges and losses of radioactive substances caused by human activities which reach, or could reach, the marine environment and which could cause pollution through ionising radiation.	The Welsh National Marine Plan should be aligned with the objectives of the OSPAR Radioactive Substances Strategy. The SA assessment framework should include protection of the marine environment from pollutants.
The Copenhagen Accord (2009)	The Copenhagen Agreement is a document that delegates at the 15th session of the Conference of Parties (COP 15) to the United Nations Framework Convention on Climate Change agreed to "take note of". The document is not legally binding and does not commit countries to agree to a binding successor to the Kyoto Protocol. The Accord Endorses the continuation of the Kyoto Protocol and recognises "the scientific view that the increase in global temperature should be below 2 degrees Celsius".	The Welsh National Marine Plan and actions therein should aim to reduce emissions of greenhouse gas emissions. The SA assessment framework should include objectives concerning the reduction of emissions of greenhouse gases.
OSPAR (Ongoing) The Co-ordinated Environmental Monitoring Programme (CEMP)	The CEMP is currently focussed on monitoring of the concentrations and effects of selected contaminants and nutrients in the marine environment. The information collected will provide the basis for assessing progress towards good environmental status and enable the evaluation of the effectiveness of actions being taken to protect the sea. Identified contaminants include: • metals (cadmium, mercury and lead) in sediment and biota; • PAHs in biota and sediment; • PCBs in biota and sediment;	The Welsh National Marine Plan should be informed by the findings of the CEMP. The SA should use findings from the CEMP, where available, to inform the baseline and the assessment of the Welsh National

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	• brominated flame retardants in biota and sediment; • the effects of tributyltin in gastropods and concentrations in sediment and/or biota; • nutrients in sea water; • eutrophication effects.	Marine Plan.

Table 2 European Plans, Policies and Programmes

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
European Commission (1980) The Groundwater Directive 80/68/EEC	The Groundwater Directive aims to protect groundwater from discharges and disposals of certain dangerous substances to groundwater. The Directive is transposed into UK law by the Groundwater Regulations 1998. The Directive will be fully integrated into the Water Framework Directive by 2013. Substances controlled by the Regulations fall into two lists - lists 1 and 2. List 1 includes chemicals that have been selected on the basis of their toxicity, persistence and bioaccumulation. List 2 includes groups and families of chemicals that have a deleterious effect on the aquatic environment. The purpose of the Directive is to eliminate pollution from list 1 substances and reduce pollution from list 2 substances. The existing Groundwater Directive is to be repealed by the Water Framework Directive 2000/60/EC (WFD) in 2013.	The Welsh National Marine Plan should ensure the protection of groundwater. The SA assessment should consider impacts on water quality.
European Commission (1991) The Nitrates Directive 91/676/EEC	The Nitrates Directive is designed to reduce water pollution caused by nitrate from agriculture. The directive requires Defra and the Welsh Government to identify surface or groundwaters that are, or could be high in nitrate from agricultural sources. Once a water body is identified as being high in nitrate all land draining to that water is designated a Nitrate Vulnerable Zone. Within these zones, farmers must observe an action programme of measures which include restricting the timing and application of fertilisers and manure, and keeping accurate records.	The Welsh National Marine Plan should be consistent with the aim to reduce water pollution caused by nitrate from agriculture. The SA assessment framework should include consideration of water quality.
European Commission (1991) The Urban Waste Water Directive 91/271/EEC	The aim of the Urban Waste Water Directive is to protect the environment from the adverse effects of waste water discharges. It sets out guidelines and legislation for the collection, treatment and discharge of urban waste water. The Directive was adopted by member states in May 1991 and is transposed into law in England and Wales by The Urban Waste Water Treatment (England & Wales) Regulations 1994 (as amended*). The Regulations require that all significant discharges are treated to at least secondary treatment. They also set standards and deadlines for the provision of sewage systems, the treatment of sewage according to the size of the community served by the sewage treatment works and the sensitivity of receiving waters to their discharges. * The Regulations were amended in 2003 by The Urban Waste Water Treatment (England & Wales) (Amendment) Regulations 2003. Responsibility for Implementation is deferred to member states.	The Welsh National Marine Plan needs to consider the implication of the Directive. The SA assessment framework should include water quality.
European Commission (1992) The Habitats Directive 92/43/EEC	The Habitats Directive seeks to conserve natural habitats. Conservation of natural habitats requires member states to identify special areas of conservation and to maintain where necessary landscape features of importance to wildlife and flora. It is required that each Member State propose a list of sites indicating which natural habitat types and which species the sites host. The information would include a map of the site, its name, location and its extent. The Commission will then establish, in agreement with each Member State, a draft list of sites of Community importance drawn from the Member States' lists identifying those which host one or more priority natural habitat type or priority species.	The Welsh National Marine Plan should take into account the habitats and species that have been identified under this Directive, and include provision for the preservation, protection and improvement of the quality of the

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
		environment as appropriate. The SA assessment framework should incorporate sites protected for their nature conservation importance.
Council of Europe (1992) European Convention on the Protection of the Archaeological Heritage	The Convention creates a framework for cooperation across Europe on the protection of archaeological heritage. It makes the conservation and enhancement of the archaeological heritage one of the goals of urban and regional planning policies, and also addresses other threats such as natural disasters, excavations and lack of public awareness. It is concerned in particular with arrangements to be made for co-operation among archaeologists and town and regional planners in order to ensure optimum conservation of archaeological heritage. The Convention sets guidelines for the funding of excavation and research work and publication of research findings. It also deals with public access, in particular to archaeological sites, and educational actions to be undertaken to develop public awareness of the value of the archaeological heritage.	The Welsh National Marine Plan should enhance the protection of archaeological heritage. The SA assessment should include criteria relating to cultural heritage.
European Commission (1998) The Drinking Water Directive 98/83/EC	The Drinking Water Directive (DWD) concerns the quality of water intended for human consumption. The objective of the DWD is to protect the health of the consumers in the EU and to make sure that water is wholesome and clean. To do this, the DWD sets standards for 48 (microbiological and chemical) parameters that can be found in drinking water. The parameters must be monitored and tested regularly. In principle WHO guidelines for drinking water are used as a basis for the standards in the DWD. While translating the DWD into their own national legislation (transposition of the DWD), the Member States of the European Union can include additional requirements e.g. regulate additional substances that are relevant within their territory or set higher standards. However, Member States are not allowed to set lower standards as the level of protection of human health should be the same within the whole EU. Member States have to monitor the quality of the drinking water supplied to their citizens and of the water used in the food production industry. Member States report monitoring results at three yearly intervals to the European Commission. Standards constitute legal limits. Sets limits for microbiological and chemical parameters in drinking water. Also gives indicator parameters.	The Welsh National Marine Plan should ensure the protection of drinking water. The SA assessment should include impacts on water quality.
European Commission (1998) EU Biodiversity Strategy	This strategy aims to anticipate, prevent and attack the causes of significant reduction or loss of biodiversity at the source. Targets for biodiversity are set by member states.	The Welsh National Marine Plan should promote this aim by e.g. promoting biodiversity and avoiding / reducing habitat fragmentation. The SA assessment framework should include the protection of biodiversity.
European Commission (2000) The Water Framework Directive 2000/60/EC	The purpose of this Directive is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater. The framework aims to: • Protect any further deterioration and enhance the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems; • Promote sustainable water use based on a long-term protection of available water resources; • Enhance protection and improvement of the aquatic environment, *inter alias*, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances; • Ensure the progressive reduction of pollution of groundwater and prevent its further pollution; • Contribute to mitigating the effects of floods and droughts. Key targets and indicators include: • Achievement of good ecological status and good surface water chemical status by 2015; • Achievement of good ecological potential and good surface water chemical status for heavily modified water bodies	The Welsh National Marine Plan needs to consider the implication of the Directive in terms of sustainable water use, protection and improvement of the aquatic environment, and reducing and preventing pollution. The SA assessment framework should include assessment criteria relating to water quality and biodiversity.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	and artificial water bodies; • Prevention of deterioration from one status class to another; • Achievement of water-related objectives and standards for protected areas; • Achievement of good groundwater quantitative and chemical status by 2015; • Prevention of deterioration from one status class to another; • Reversal of any significant and sustained upward trends in pollutant concentrations and prevent or limit input of pollutants to groundwater; • Achievement of water related objectives and standards for protected areas.	
European Commission (1998) Fuel Quality Directive 98/70/EC as amended by Directive 2009/30/EC	The Directive includes petrol and diesel specifications relating to sulphur, lead, hydrocarbon content among others. It also requires a reduction of the greenhouse gas intensity of the fuels used in vehicles by up to 10% by 2020, and establishes sustainability criteria that must be met by biofuels if they are to count towards the greenhouse gas intensity reduction obligations. The Fuel Quality Directive applies to all petrol, diesel and biofuels used in road transport, as well as to gasoil used in non-road-mobile machinery.	The Welsh National Marine Plan should support the reduction in pollutant emissions. The SA assessment framework should include assessment criteria relating to air quality.
European Commission (2000) Port Reception Facilities Directive 2000/59/EC	The Directive aims to enhance the availability and use of port reception facilities for ship-generated waste and cargo residues, in order to reduce the discharge of pollutant waste at sea. It focuses on ship operations in EU ports and addresses the legal, financial and practical responsibilities of the different operators involved in delivery of ship-generated waste and cargo residues. The Directive covers all ships at EU Member State ports, with the exception of warships and non-commercial governmental ships. Facilities must be provided which allow waste disposal without causing abnormal delays, tailored to the size and nature of the port. Additionally, all ships are required to deliver their waste before leaving port unless it can be proven that there is sufficient storage capacity to retain the waste.	The Welsh National Marine Plan should support adequate port facilities and the prevention of pollution by ships. The SA assessment framework should include assessment criteria relating to pollutant discharges, which may be reflected through water quality or impacts on biodiversity.
European Commission (2001) National Emissions Ceiling Directive 2001/81/EC	The Directive sets upper limits for each Member State for the total emissions in 2010 of the four pollutants responsible for acidification, eutrophication and ground-level ozone pollution (sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia). The UK 2010 ceilings for each of these pollutants were 585 kilotonnes, 1,167 kilotonnes, 1,200 kilotonnes and 297 kilotonnes, respectively. This is being revised through the Thematic Strategy on Air Pollution and emissions ceilings for the four compounds and particulate matter (PM2.5) up to 2020 are anticipated.	The Welsh National Marine Plan should support the reduction in pollutant emissions. The SA assessment framework should include assessment criteria relating to air quality.
European Commission (2001) Large Combustion Plants Directive 2001/80/EC	The Directive aims to reduce emissions of acidifying pollutants, particles, and ozone precursors from large combustion plants (with rated thermal input ≥50 MW). It sets emission limit values for large combustion plants for SO2, NOx and dust, which contribute to acidification, eutrophication and ground-level ozone.	The Welsh National Marine Plan should support the reduction in pollutant emissions. The SA assessment framework should include assessment criteria relating to air quality.
European Council (2002) European Parliament and Council Recommendation Concerning the Implementation of Integrated Coastal Zone Management in Europe 2002/413/EC	The Recommendation concerns the implementation of Integrated Coastal Zone Management (ICZM) in Europe. It lists eight principles defining the essential characteristics of ICZM, such as integration across sectors and levels of governance, as well as a participatory and knowledge-based approach. The Recommendation outlines steps which the Member States should take to develop national strategies for ICZM. The Recommendation sets out the following requirements for a strategic approach to managing the zones: a) protection of the coastal environment, based on an ecosystem approach preserving its integrity and functioning, and sustainable management of the natural resources of both the marine and terrestrial components of the coastal zone; b) recognition of the threat to coastal zones posed by climate change and of the dangers entailed by the rise in sea	The Welsh National Marine Plan should support ICZM. The Welsh National Marine Plan should include criteria in line with ICZM, such as protection of the environment, climate change, cultural heritage, socio-economic factors, and community and recreation.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	level and the increasing frequency and violence of storms; c) appropriate and ecologically responsible coastal protection measures, including protection of coastal settlements and their cultural heritage; d) sustainable economic opportunities and employment options; e) a functioning social and cultural system in local communities; f) adequate accessible land for the public, both for recreational purposes and aesthetic reasons; g) in the case of remote coastal communities, maintenance or promotion of their cohesion; and h) improved coordination of the actions taken by all the authorities concerned both at sea and on land, in managing the sea-land interaction.	
European Commission (2003) Establishing a Scheme for Greenhouse Gas Emission Allowance Trading within the Community Directive 2003/87/EC	This Directive and its subsequent amendments make provisions for an emissions trading scheme to support the EU in meeting its climate change obligations under the Kyoto Protocol. Under the EU Emissions Trading System (EU ETS), a progressively lower 'cap' is set on greenhouse gas emissions. This covers installations in the energy sector, iron and steel production and processing, the mineral industry and the wood pulp, paper and board industry. Installations buy or receive allowances to cover their greenhouse gas emissions, and the installations must surrender sufficient allowances each year to cover their emissions. These can be traded as needed, enabling emission reductions to be made in the most cost-effective places.	The Welsh National Marine Plan and actions therein should support the reduction of greenhouse gas emissions. The SA assessment framework should include assessment criteria relating to climate change.
Council of Europe (2004) European Strategy on Invasive Alien Species	The Strategy on Invasive Alien Species sets out a 'road map' for member states to help reduce the dispersal of species through travel, travel or intentional introductions. Invasive species are the second greatest cause of species extension, and also affect biodiversity in isolated ecosystems. The strategy aims for member states to member state to prohibit the introduction of non-native species into the natural environment, to take preventive measures against accidental introductions and to take remedial measures where practicable. The strategy supports the development of national programmes, so that a co-ordinated effort can take place across Europe.	The Welsh National Marine Plan should avoid the introduction of invasive alien species. The SA assessment should include criteria relating to protection of biodiversity.
European Commission (2004) Environmental Liability Directive 2004/35/EC	The Directive seeks to prevent and remedy environmental damage - specifically, damage to habitats and species protected by EC law, damage to water resources, and land contamination which presents a threat to human health. Based on the 'polluter pays' principle where polluters should bear the cost of remediating the damage they cause to the environment, or of measures to prevent imminent threat of damage. No specific targets are set.	The WRMP will need to have regard to the requirements of the Directive. The SA assessment framework should include the protection and enhancement of the natural environment (to include biodiversity and water resources).
World Health Organisation (2004) Children's Environment and Health Action Plan for Europe	The Action Plan for Europe addresses health improvements for children across Europe, relating to environmental and physical factors. The priority goals of the plan are set out below: • Reduce illness by improving access to safe and affordable water and sanitation; • Reduce health impacts associated with a lack of physical activity, by promoting safe communities, playgrounds and schools; • Reduce respiratory diseases due to indoor and outdoor air pollution; and • Reduce risks from exposure to hazardous substances and agents. The Children's Environment and Health Strategy (2009) is in place in the UK to implement these requirements.	The Welsh National Marine Plan should promote the protection and enhancement of children's health. The SA assessment should include criteria relating to health.
European Commission (2005) Second Climate Change programme (ECCPii)	The European Climate Change Programme is the Commission's main instrument to discuss and prepare the further development of the EU's climate policy The ECCP II consists of 5 working groups: 1) ECCP I review: • review the implementation of climate change related EU-wide policies and measures; • assess their concrete implementation in the Member States and the resulting actual and projected emission reductions; and	The Welsh National Marine Plan should contribute towards addressing the key issues set out in the Commission's climate change programme The SA should include assessment criteria relating to emissions,

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	• identify new opportunities for potential emission reductions. 2) Aviation: In order to mitigate the climate impacts of aviation, EU has introduced legislation to include aviation in the EU emissions trading scheme (EU ETS). 3) CO_2 and cars: • Limit value curve; • Phasing-in of requirements; • Lower penalty payments for small excess emissions until 2018; • Long-term target; and • Eco-innovations. 4) Carbon capture and storage: The Commission is developing a programme of work aiming to ensure the technology of carbon capture and storage, both within the EU and internationally. 5) Adaptation: As part of exploring options to improve Europe's resilience to climate change effects and defining the European Union role in climate change adaptation the European Commission is undertaking the following activities: ECCP II working group on Impacts and Adaptation; • Impacts on water cycle and water resources management and prediction of extreme events; • Marine resources and coastal zones and tourism; • Human health; • Agriculture and forestry; • Biodiversity; • Regional planning, built environment, public and energy infrastructure, Structural funds; • Urban planning and construction; • Development cooperation; • Role of insurance industry; • Building national strategies for adaptation (country reports); • Developing the Green Paper on "Adapting to climate change in Europe - options for EU action"; • Undertaking an extensive research project into adaptation and mitigation options; • Hosting a conference on climate change adaptation; and • Hosting workshops in three European countries in 2007. 6) EU Emission Trading System review: The Commission provides guidance on the application of VAT to emission allowances. DG Environment also provides its interpretation on the use of next phase allowances under Article 16(4), second sentence, of the Emissions Trading Directive.	carbon reduction, and adaptation to climate change.
European Commission (2005) Sulphur Content of Marine Fuels Directive 2005/33/EC (amending Directive 1999/32/EC)	The Directive regulates sulphur emissions from ships by limiting the maximum sulphur content of marine fuel. Ships at berth or anchorage in EU ports must use fuels containing a maximum of 0.1% sulphur. The Baltic Sea, the North Sea and the English Channel are sulphur emission control areas (SECAs) and the maximum sulphur content of the fuels used by ships operating in these areas is limited to 1.5%. This fuel standard also applies to passenger ships operating on regular services between EU ports outside SECAs. This will be amended by Directive 2012/33/EU which will align the Directive with the latest International Maritime Organization provisions on the sulphur content of marine fuel. The amendment will come into force in 2015.	The Welsh National Marine Plan should have regard to reducing pollution from marine fuel and ensure the protection and enhancement of air quality. The SA assessment framework should include assessment criteria relating to air quality.
European Commission (2006) The Bathing Waters Directive 2006/7/EC	The Bathing Waters Directive set standards for the quality of bathing waters (with the exception of water intended for therapeutic bathing purposes and water used in swimming pools). It lays down the minimum quality criteria to be met by bathing water:	The Welsh National Marine Plan should enhance the quality of bathing waters.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	• the physical, chemical and microbiological parameters; • the mandatory limit values and indicative values for such parameters; • the minimum sampling frequency and method of analysis or inspection of such water. Member States fix the values that they apply to bathing water in accordance with the guidelines of Directive 76/160/EEC. Member States may fix more stringent values than those laid down in the Directive. Where it does not give any values for certain parameters, Member States are not obliged to fix any. The Directive is transposed into law in England and Wales through the Bathing Water (Classifications) Regulations 2003. In March 2006, a revised Bathing Water Directive was adopted and become law in the UK in March 2008. As well as stricter water quality standards, it contains a requirement to provide more detailed and standardised information about bathing waters across Europe. Directive 2006/7/EC will repeal the Directive 76/160/EEC in 2014. Bathing waters are protected areas under the Water Framework Directive. Mandatory standards are given for 10 parameters: total coliforms, faecal coliforms, salmonella, enteroviruses, pH, colour, mineral oils, surface active substances (detergents), phenols and transparency. The Directive also sets the minimum frequency at which bathing waters should be sampled.	The SA assessment should consider the impact on Bathing Waters.
European Commission (2006) Sustainable Development Strategy	This document sets out a single coherent strategy outlining how the EU will meet long-standing commitments to sustainable development. This document presents a renewed version of the 2001 EU Sustainable Development Strategy (SDS). The aim of the SDS is to identify and develop actions to enable the EU to achieve continuous improvement of quality of life both for current and for future generations, through the creation of sustainable communities able to manage and use resources efficiently, and to tap the ecological and social innovation potential of the economy, ensuring prosperity, environmental protection and social cohesion. The key objectives of the strategy are: • Environmental protection; • Social equity and cohesion; • Economic prosperity; and • Meeting our international responsibilities. The following key challenge areas include a number of targets in achieving their respective objectives: • Climate Change and clean energy; • Sustainable Transport; • Sustainable consumption and production; • Conservation and management of natural resources; • Public Health; • Social inclusion, demography and migration; and • Global poverty and sustainable development challenges.	The Welsh National Marine Plan should reflect all of the aims and targets set out in the Sustainable Development Strategy. The SA assessment framework should, where relevant, reflect the core and supporting principles of the strategy including climate change, sustainable transport, public health, social inclusion and poverty.
European Commission (2006) The Freshwater Fish Directive 2006/44/EC	The Freshwater Fish Directive seeks to protect those freshwater bodies identified by member states as being suitable to support fish populations. It sets physical and chemical water quality objectives for salmonid waters and cyprinid waters. It is implemented in England & Wales through The Surface Water (Fishlife) (Classification) Regulations 1997 (as amended*). *The Regulations were amended in 2003. The standards constitute legal limits. The existing Freshwater Fish Directive is to be repealed by the Water Framework Directive 2000/60/EC (WFD) in 2013.	The Welsh National Marine Plan should avoid negative effects on freshwaters. The SA assessment framework should consider the effects on water quality.
European Commission (2006) The Shellfish Waters Directive 2006/113/EC	The Directive aims to protect and improve shellfish waters in order to protect shellfish life and growth, therefore contributing to the quality of shellfish products directly edible by man. It sets physical, chemical and microbiological water quality requirements that designated shellfish waters must either comply with (Mandatory standards) or endeavour to meet (Guideline standards). The directive will be replaced in 2013 by the Water Framework Directive.	The Welsh National Marine Plan should have regard to protection and enhancement of shellfish waters. The SA assessment framework should include consideration of

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
		water quality.
European Commission (2006) Regulation on Registration, Evaluation, Authorisation and Restriction of Chemical Substances 1907/2006	The Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) entered into force in June 2007. It places obligations on manufacturers, suppliers and users of chemical substances, with the aim of restricting harm to health and the environment. Chemicals have to be registered and may require authorisation for use. The risks have to be assessed and managed, and certain dangerous substances may be restricted for use. This can result in removal or substitution of harmful substances in products, which would potentially reduce escape to the environment.	The Welsh National Marine Plan should reduce and prevent pollution from chemical substances and comply with the Regulations. The SA assessment framework should include assessment criteria relating to water quality.
European Commission (2006) Freight Logistics - the Key to Sustainable Mobility	The Communication aims to improve the efficacy of the European transport system through logistics, and to make freight transport more environmentally friendly, safer and more energy efficient. Action areas include identifying bottlenecks; modernisation; better use of infrastructure; use of multi-modal transport chains, among others. This is supported by the Freight Transport Logistics Action Plan (2007), the Freight-Orientated Railway Network (2007), Ports Policy (2007) and Maritime and Short Sea Shipping (2007).	The Welsh National Marine Plan should support an environmentally friendly, safe and energy efficient logistics. The SA assessment should include criteria relating to economy, environmental protection and energy.
European Commission (2007) The Floods Directive 2007/60/EC	The Floods Directive requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. Member States are required to carry out a preliminary assessment by 2011 to identify the river basins and associated coastal areas at risk of flooding. Then for each zone draw up flood risk maps by 2013 and establish flood risk management plans focused on prevention, protection and preparedness by 2015.	The Welsh National Marine Plan should take account of the flood risk management plans as they become available through the life of the plan. The SA assessment framework should include flood risk.
European Commission (2007) Integrated Maritime Policy	The Integrated Maritime Policy aims to provide a coherent approach for maritime issues in Europe. It includes cross-cutting policies in the following areas: • **Blue growth:** the Blue Growth strategy supports sustainable growth in the marine and maritime sectors, and contributes towards the Europe 2020 strategy for growth. It targets aquaculture, maritime and coastal tourism, marine biotechnology, ocean energy and seabed mining. • **Marine data and knowledge:** Marine Knowledge 2020 brings together marine data from different sources with the aim of improving understanding of the seas and to help interested parties make more effective use of available data. • **Maritime spatial planning:** a proposed directive is in place for maritime spatial planning and Integrated Coastal Zone Management. Shared seas would have minimum common requirements for maritime planning, to help reduce conflicts between maritime activities, encourage investment, increase coordination and cooperation, and protect the environment. This aims to ensure that human activities at sea are as efficient and sustainable as possible. • **Integrated maritime surveillance:** a 'Common Information Sharing Environment' is being created for maritime surveillance activities related to border control, safety and security, fisheries control, customs, environment and defence. Sharing surveillance information and data will make surveillance cheaper and more effective, and avoid duplicating data collection. • **Sea basin strategies:** the Baltic Sea, Black Sea, Mediterranean Sea, North Sea, the Atlantic and the Arctic Ocean each have a regional strategy to promote growth, while taking into account each region's specific strengths and weaknesses. They cover topics such as climate change, renewable energy, sustainable, resource use, pollution and maritime safety.	The Welsh National Marine Plan should promote the priorities and actions of the Integrated Maritime Policy. The SA assessment should include criteria relating to the topics addressed in the Integrated Maritime Policy, such as sustainable growth, use of resources, marine energy, protections of the environment etc.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	Wales falls under the Atlantic sea basin strategy. The Atlantic Action Plan priorities are to: • Promote entrepreneurship and innovation; • Protect, secure and enhance the marine and coastal environment; • Improve accessibility and connectivity; and • Create a socially inclusive and sustainable model of regional development. The agreed actions will focus on growing the tourism market, meeting the increasing demand for offshore installations, improving education and training in traditional and emerging maritime industries, as well as extending cooperation in the field of oceanic research in order to better assess climate change impacts.	
European Commission (2008) Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC and Air Quality Framework Fourth Daughter Directive 2004/107/EC	The Directive: • defines and establishes objectives for ambient air quality to avoid, prevent or reduce harmful effects on human health and the environment as a whole; • assesses the ambient air quality in Member States using common methods and criteria; • obtains information on ambient air quality in order to help combat air pollution and nuisance and to monitor long-term trends and improvements resulting from national and Community measures; • ensures that such information on ambient air quality is made available to the public; • seeks to maintain air quality where it is good and improving it in other cases; and • promotes increased cooperation between the Member States in reducing air pollution. This supersedes the Air Quality Framework Directives (96/62/EC) and Daughter Directives 1999/30/EC, 2000/69/EC, 2002/3/EC.	The Welsh National Marine Plan should contribute towards achieving air quality standards set out in the Directive. Where relevant, the SA assessment framework should consider impacts on air quality.
European Commission (2008) Waste Framework Directive 2008/98/EC	The essential objective of all provisions relating to waste management should be the protection of human health and the environment against harmful effects caused by the collection, transport, treatment, storage and tipping of waste. Some key objectives include: • The recovery of waste and the use of recovered materials as raw materials should be encouraged; • Member States should, in addition to taking responsible action to ensure the disposal and recovery of waste, take measures to restrict the production of waste; • It is important for the Community as a whole to become self sufficient in waste disposal and desirable for Member States individually to aim at such self sufficiency; • Waste management plans should be drawn up in the Member States; • Movements of waste should be reduced; • Ensure a high level of protection and effective control; • Subject to certain conditions, and provided that they comply with environmental protection requirements, some establishments which process their waste themselves or carry out waste recovery may be exempted from permit requirements; • That proportion of the costs not covered by the proceeds of treating the waste must be defrayed in accordance with the "polluter pays" principle.	The Welsh National Marine Plan should seek to ensure the protection of human health and the environment. The SA should include assessment criteria relating to the protection of human health and the environment.
European Commission (2008) Environmental Quality Standards Directive 2008/105/EC	The Directive aims to control the concentration of certain substances which pose a risk to the aquatic environment. The 33 'priority substances' addressed by the Directive are defined by the Water Framework Directive (2000/60/EC), including cadmium, lead, mercury, nickel, benzene and polyaromatic hydrocarbons. The Directive sets thresholds of concentration that must not be exceeded, with limits to average values over a year to ensure long-term water quality and maximum allowable concentrations to limit short term pollution peaks. Member States must comply with the water quality standards and record an inventory of emissions and discharges of all substances in the Directive.	The Welsh National Marine Plan should support the prevention of pollution from priority substances. The SA assessment framework should include assessment criteria relating to water quality.
European Commission (2008) Draft Directive on Equal Treatment	The draft Directive aims to protect people against discrimination linked to their disability, age, sexual orientation, religion or beliefs. This includes both direct and indirect discrimination in areas including employment; social protection and healthcare; education; and access to goods and services. Any person suffering a violation of the Directive should have access to judicial	The Welsh National Marine Plan should support equality in marine activities and local communities.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	and administrative remedies. The draft Directive also proposes that independent bodies are set up to support victims with legal proceedings and to undertake studies into discrimination.	
European Commission (2008) Marine Strategy Framework Directive 2008/56/EC	The Directive sets out a framework for an ecosystem-based approach to the management of human activities which supports the sustainable use of marine goods and services. The overarching goal of the Directive is to achieve 'Good Environmental Status' (GES) by 2020 across Europe's marine environment. The Directive establishes four European Marine Regions, based on geographical and environmental criteria. The North East Atlantic Marine Region is divided into four subregions, with UK waters lying in two of these (the Greater North Sea and the Celtic Seas). Each Member State is required to develop a marine strategy for their waters, in coordination with other countries within the same marine region or subregion. Marine strategies must be implemented to protect and conserve the marine environment, prevent its deterioration, and, where practicable, restore marine ecosystems in areas where they have been adversely affected. The marine strategies must contain: • An initial assessment of the current environmental status of that Member State's marine waters; • A determination of what Good Environmental Status means for those waters; • Targets and indicators designed to show whether a Member State is achieving GES; • A monitoring programme to measure progress towards GES; • A programme of measures designed to achieve or maintain GES. The Directive also requires Marine Protected Areas (MPAs) to be established to support the achievement of GES.	The Welsh National Marine Plan should ensure the sustainable use of marine goods and services and aid the progress towards 'Good Environmental Status' across Europe's marine environment. The SA assessment should incorporate assessment criteria relating to the quality of the marine environment.
Commission on Social Determinants of Health (2008) Closing the Gap in a Generation: Health Equity through Action on the Social Determinants Of Health	The Social Determinants of Health sets out a new approach to development, and looks at social policies and economics as the drivers of health inequalities. It aims to promote health equality through improved policies, and to 'close the gap' in health equity within the next generation. It includes three principles of action: • Improve the conditions of daily life – the circumstances in which people are born, grow, live, work, and age. • Tackle the inequitable distribution of power, money, and resources – the structural drivers of those conditions of daily life – globally, nationally, and locally. • Measure the problem, evaluate action, expand the knowledge base, develop a workforce that is trained in the social determinants of health, and raise public awareness about the social determinants of health.	The Welsh National Marine Plan should aim to enhance health equity and avoid negative health effects in disadvantaged communities. The SA assessment should include criteria relating to health and equality.
European Commission (2009) The Birds Directive 2009/147/EC	The Directive provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. It sets broad objectives for a wide range of activities, although the precise legal mechanisms for their achievement are at the discretion of each Member State (in the UK delivery is via several different statutes). The Directive applies to the UK and to its overseas territory of Gibraltar. The main provisions of the Directive include: • The maintenance of the populations of all wild bird species across their natural range (Article 2) with the encouragement of various activities to that end (Article 3). • The identification and classification of Special Protection Areas (SPAs) for rare or vulnerable species listed in Annex I of the Directive, as well as for all regularly occurring migratory species, paying particular attention to the protection of wetlands of international importance (Article 4). (Together with Special Areas of Conservation designated under the Habitats Directive, SPAs form a network of European protected areas known as Natura 2000). • The establishment of a general scheme of protection for all wild birds (Article 5). • Restrictions on the sale and keeping of wild birds (Article 6). • Specification of the conditions under which hunting and falconry can be undertaken (Article 7). (Huntable species are listed on Annex II of the Directive). • Prohibition of large-scale non-selective means of bird killing (Article 8). • Procedures under which Member States may derogate from the provisions of Articles 5-8 (Article 9) — that is, the conditions under which permission may be given for otherwise prohibited activities.	The Welsh National Marine Plan should ensure that wild bird populations are protected and enhanced The SA assessment should incorporate conservation provisions for the protection of wild flora, fauna and natural habitats.

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	• Encouragement of certain forms of relevant research (Article 10 and Annex V). • Requirements to ensure that introduction of non-native birds do not threaten other biodiversity (Article 11).	
European Commission (2009) Renewable Energy Directive 2009/8/EC	This Directive establishes a common framework for the use of energy from renewable sources in order to limit greenhouse gas emissions and to promote cleaner transport. It encourages energy efficiency, energy consumption from renewable sources and the improvement of energy supply. The Member States are to establish national action plans which set the share of energy from renewable sources consumed in transport, as well as in the production of electricity and heating, for 2020. These action plans must take into account the effects of other energy efficiency measures on final energy consumption (the higher the reduction in energy consumption, the less energy from renewable sources will be required to meet the target). These plans will also establish procedures for the reform of planning and pricing schemes and access to electricity networks, promoting energy from renewable sources. Each Member State has a target calculated according to the share of energy from renewable sources in its gross final consumption for 2020. The UK is required to source 15 per cent of energy needs from renewable sources, including biomass, hydro, wind and solar power by 2020. From 1 January 2017, biofuels and bioliquids share in emissions savings should be increased to 50 per cent.	The Welsh National Marine Plan should contribute towards increasing the proportion of energy from renewable energy sources where appropriate. The SA assessment framework should include consideration of use of energy from renewable energy sources.
European Commission (2009) Ozone Depleting Substances (ODS) Regulations 2009/1005/EC	The Regulations control the use and emissions of ODS in the EU. They seek to protect the ozone layer by phasing out Ozone Depleting Substances (ODS). Many of these substances are also potent greenhouse gases which contribute to climate change. Chlorofluorocarbons (CFCs) and halons have already been phased out, as well as many applications of hydro-chlorofluorocarbons (HCFCs). The final uses of HCFCs, such as the maintenance of existing refrigeration and air-conditioning equipment, are regulated and will be phased out by 2015. Requirements around production, trade and exemptions are also set out. This replaces Ozone Depleting Substances Regulation 2037/2000/EC.	The Welsh National Marine Plan should seek to avoid emissions of ODS. The SA assessment should include criteria relating to pollutant emissions and climate change.
European Commission (2009) EU Aquaculture Strategy	The Strategy aims to support the sustainable development of European aquaculture, through three key elements: • Help the sector become more competitive through strong support for research and development, better spatial planning in coastal areas and river basins, and giving specific help through the EU's fisheries market policy. • Ensure aquaculture remains sustainable by maintaining its environmentally-friendly production methods and high standards of animal health and welfare and consumer protection. • Improve governance and ensure there is a business-friendly environment in place at all levels (local, national and EU) so the sector can realise its full potential.	The Welsh National Marine Plan should support sustainable aquaculture. The SA assessment should include criteria relating to the promotion of a sustainable maritime economy.
European Commission (2009) Strategic Goals and Recommendations for the EU's Maritime Transport Policy until 2018	The Communication presents the main strategic objectives for the European maritime transport system up to 2018. The strategic goals and recommendations of the Commission Communication refer to two main issues: • The ability of the maritime transport sector to provide cost-efficient maritime transport services adapted to the needs of sustainable economic growth of the EU and world economies; and • The long-term competitiveness of the EU shipping sector, enhancing its capacity to generate value and employment in the EU, both directly and indirectly, through the whole cluster of maritime industries. The key areas for action include maritime safety and security; shipping in a global market; international cooperation; short-sea shipping; environmental performance; maritime research and personnel.	The Welsh National Marine Plan should be aligned with the priority areas of the maritime transport policy. The SA assessment should include criteria relating to the maritime economy and protection of the environment.
European Commission (2009) Directive on the Geological Storage of Carbon Dioxide	The Directive sets out a framework for the safe storage of carbon dioxide in geological formations. It also includes provisions on the capture and transport of carbon dioxide. The aim is to prevent risks to health or the environment through the selection of appropriate storage sites and secure transportation.	The Welsh National Marine Plan should be aware of the requirements of the Directive. The SA assessment should include criteria relating to protection of human health and the environment.
European Commission (2010) Industrial Emissions Directive	This Directive brings together the IPPC Directive (2008/1/EC) and six other Directives on titanium dioxide, VOCs and waste incineration, with the aim of reducing pollutant emissions. It covers industries with high polluting potential such as energy,	The Welsh National Marine Plan should seek to prevent pollutant

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(integrated pollution prevention and control) 2010/75/EU	production and processing of metals, minerals, chemicals, waste management and rearing of animals. It defines the obligations to be met by industrial activities with a major pollution potential. This includes establishing a permit procedure, requirements for Best Available Techniques (BAT) and setting out requirements for discharges.	emissions. The SA assessment should include criteria that ensure the protection of the environment through the prevention of pollution to air, land and water.
European Commission (2010) Europe 2020 : A strategy for smart, sustainable and inclusive growth	Europe 2020 is the EU's ten-year growth strategy. It aims to change the EU's growth model and create the conditions for growth that is smarter, more sustainable and more inclusive. It contains seven 'flagship initiatives' to provide a framework for innovation, the digital economy, employment, youth, industrial policy, poverty, and resource efficiency. There are also five key target areas for the EU to achieve by 2020: 1. Employment: 75% of the 20-64 year-olds to be employed. 2. R&D: 3% of the EU's GDP to be invested in R&D. 3. Climate change and energy sustainability: greenhouse gas emissions 20% (or even 30%, if the conditions are right) lower than 1990; 20% of energy from renewable; 20% increase in energy efficiency. 4. Education: reducing the rates of early school leaving below 10%; at least 40% of 30-34–year-olds completing third level education. 5. Fighting poverty and social exclusion: at least 20 million fewer people in or at risk of poverty and social exclusion.	The Welsh National Marine Plan should reflect the aims and priorities of the strategy. The SA assessment should include criteria relating to employment, R&D, climate change and poverty where relevant.
European Commission (2010) Energy 2020 - A Strategy for Competitive, Sustainable and Secure Energy	EU energy and climate goals have been incorporated into the Europe 2020 Strategy for smart, sustainable and inclusive growth. The energy strategy includes five priorities for Europe: 1. Achieving an energy-efficient Europe; 2. Building a truly pan-European integrated energy market; 3. Empowering consumers and achieving the highest level of safety and security; 4. Extending Europe's leadership in energy technology and innovation; 5. Strengthening the external dimension of the EU energy market. Energy 2020 is part of Resource-Efficient Europe, one of the seven key initiatives of Europe 2020.	The Welsh National Marine Plan should support the priorities of the energy strategy where feasible. The SA assessment should include criteria relating to energy where appropriate.
European Commission (2011) A Roadmap for Moving to a Competitive Low Carbon Economy in 2050	The EU already has short term targets in place to reduce its emissions to 20% below 1990 levels by 2020; to increase the share of renewable energy to 20%; and to make a 20% improvement in energy efficiency. The 2050 roadmap looks beyond 2020 at longer term objectives. The roadmap suggests that by 2050, the EU should cut its emissions to 80% below 1990 levels through domestic reductions alone. It sets out milestones which form a cost-effective pathway to this goal - reductions of 40% by 2030 and 60% by 2040. It also shows how the main sectors responsible for Europe's emissions - power generation, industry, transport, buildings and construction, as well as agriculture - can make the transition to a low-carbon economy most cost-effectively.	The Welsh National Marine Plan should support the progress towards a low carbon economy. The SA assessment framework should include assessment criteria relating to greenhouse gas emissions reductions.
European Commission (2011) EU Biodiversity Strategy to 2020	The Biodiversity Strategy aims to halt the loss of biodiversity and ecosystem services in the EU by 2020. There are six main targets, and 20 actions to help Europe reach this goal. The six targets cover: • Full implementation of EU nature legislation to protect biodiversity; • Better protection for ecosystems, and more use of green infrastructure; • More sustainable agriculture and forestry; • Better management of fish stocks; • Tighter controls on invasive alien species; • A bigger EU contribution to averting global biodiversity loss. The Biodiversity Strategy follows on from the 2006 Biodiversity Action Plan, and also forms a part of the Europe 2020 strategy, as part of 'resource-efficient Europe'.	The Welsh National Marine Plan should promote these aims by e.g. promoting biodiversity and avoiding / reducing habitat fragmentation. The SA assessment framework should include the protection of biodiversity.
European Commission (2013)	The EU strategy aims to make Europe more climate-resilient by adapting to the changing climate. It aims to provide a	The Welsh National Marine Plan

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
Strategy on Adaptation to Climate Change	coherent approach to enhance preparedness and capacity to respond to the impacts of climate change. The three key objectives of the strategy are: • Promoting action by Member States – encouraging Member States to adopt adaptation strategies and provide funding to boost capacity; • 'Climate-proofing' action at EU level – promoting adaptation in vulnerable sectors such as agriculture and fisheries; and • Better informed decision-making – addressing gaps in knowledge and improving the European information sharing platform, Climate-ADAPT.	should enhance adaptation to climate change. The SA assessment should include criteria relating to climate resilience.
European Commission (2013) Proposal for a Regulation on the Prevention and Management of the Introduction and Spread of Invasive Alien Species	The EC has proposed new legislation to prevent and manage the threat from invasive species. The proposal centres round a list of invasive alien species of Union concern, which will be drawn up with the Member States using risk assessments and scientific evidence. Selected species will be banned from the EU, meaning it will not be possible to import, buy, use, release or sell them. The proposal is for three types of intervention: • Prevention: Member States will organise checks to prevent the intentional introduction of species of concern. However many species come into the EU unintentionally, as a contaminant in goods or trapped in containers. Member States will have to take action to spot such pathways and take corrective measures. • Early warning and rapid response: when Member States detect a species of Union concern that is becoming established, they will take immediate action to eradicate it. • Management of established invasive alien species of concern: if species of Union concern are already widely spread, Member States will need to put in place measures to minimise the harm they cause.	The Welsh National Marine Plan should avoid the introduction of invasive alien species. The SA assessment should include criteria relating to biodiversity.
European Commission (2013) Seventh Environmental Action Programme to 2020 'Living well, within the limits of our planet'	The seventh Environmental Action Programme defines environmental priority objectives to be achieved by the EU up to 2020. As part of the programme, the EU aims to protect natural capital; promote resource-efficient and low-carbon growth; and safeguard health and wellbeing linked to pollutants, chemicals and climate change. The nine objectives and actions set out in the programme are: • to protect, conserve and enhance the Union's natural capital; • to turn the Union into a resource-efficient, green, and competitive low-carbon economy; • to safeguard the Union's citizens from environment-related pressures and risks to health and wellbeing; • to maximise the benefits of the Union's environment legislation by improving implementation; • to increase knowledge about the environment and widen the evidence base for policy; • to secure investment for environment and climate policy and account for the environmental costs of any societal activities; • to better integrate environmental concerns into other policy areas and ensure coherence when creating new policy; • to make the Union's cities more sustainable; and • to help the Union address international environmental and climate challenges more effectively.	The Welsh National Marine Plan should support the aims of the programme to protect natural capital, promote low carbon growth and safeguard health and wellbeing. The SA assessment framework should, where relevant, reflect the objectives of the programme.
European Commission (2013) Common Fisheries Policy	The Common Fisheries Policy is a set of rules for managing European fishing fleets and for conserving fish stocks. It gives all European fishing fleets equal access to EU waters and fishing grounds and allows fishermen to compete fairly. The policy aims for a sustainable fishing industry which does not threaten fish population sizes. The policy sets fishing capacity ceilings for member states, and stipulates that a catch limit should be set between 2015 and 2020 to maintain fish stocks in the long term. The Common Fisheries Policy was first introduced in the 1970s and has been updated several times. The policy is currently in the process of reform.	The Welsh National Marine Plan should support sustainable fishing. The SA assessment should include criteria relating to the promotion of a sustainable maritime economy.
European Commission (2013) Ship Recycling Regulations	The Ship Recycling Regulations came into force in December 2013, with articles applying at various stages from 2015. The objective of the Regulation is to reduce the negative impacts linked to the recycling of large EU-flagged ships without creating an excessive economic burden. It brings into force an early implementation of the requirements of the 2009 Hong Kong	The Welsh National Marine Plan should support the safe recycling of ships.

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	Convention for the Safe and Environmentally Sound Recycling of Ships, which has been adopted but is not yet in force. The Regulations set out a number of requirements for European ships, European ship owners, ship recycling facilities willing to recycle European ships, and the relevant competent authorities or administrations. Ships will be required to have on board an inventory of hazardous materials, specifying the location and approximate quantities of those materials, and the use of certain hazardous materials will be prohibited or restricted. The Regulations also require ships to be prepared for recycling; a ship recycling plan to be created; and to ensure that ships are recycled in approved facilities.	The SA assessment should include criteria relating to the sustainable use and disposal of resources.

Table 3 National Plans, Programmes and Policies

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
HM Government (1949) National Parks and Access to the Countryside Act 1949	This Act makes provision for National Parks and the establishment of a National Parks Commission. It also confers on the Nature Conservancy and local authorities powers: • For the establishment and maintenance of nature reserves and the provision for the recording, creation, maintenance and improvement of public paths and for securing access to open country; • To amend the law relating to rights of way; • To confer further powers for preserving and enhancing natural beauty; • For matters connected with the above.	The Welsh National Marine Plan and SA should ensure that the natural and cultural heritage of National Parks is conserved and enhanced and that natural resources are used sustainably.
HM Government (1973) The Protection of Wrecks Act 1973.	This Act allows the Secretary of State for Culture, Media and Sport to designate a restricted area around the site of a vessel lying on or in the seabed in UK territorial waters. The area can be designated on account of the historical, archaeological or artistic importance of the vessel, or its contents or former contents. There are currently 47 protected wreck sites in England and 62 in the UK. Under this Act it is a criminal offence to: • Tamper with, damage or remove any part of a vessel lying wrecked on or in the seabed or any object formerly contained in such a vessel. • Carry out diving or salvage operations directed to the exploration of any wreck or to removing objects from it or from the seabed, or use equipment constructed or adapted for any purpose of diving or salvage operations. • Deposit anything including anchors and fishing gear which, if it were to fall on the site, would obliterate, obstruct access to, or damage any part of the site. • Bathing, angling and navigation are permitted within a restricted area provided they do not breach the above restrictions. Anchoring on the site is only permitted for licensed activities or in cases of maritime distress.	The Welsh National Marine Plan should be compliant with the Act. The SA should include objectives relating to the protection of terrestrial and marine heritage features.
HM Government (1979) Ancient Monuments and Archaeological Areas Act 1979	The Ancient Monuments and Archaeological Areas Act aims to protect archaeological heritage and ancient moments in Great Britain. This includes Scheduled Ancient Monuments as well as other monuments designated for protection by the Secretary of State. It gives powers for the inspection, acquisition and preservation of monuments. The Act restricts works affecting scheduled monuments unless consent is granted, and makes causing damage to monuments a criminal offence.	The Welsh National Marine Plan should take protection of ancient monuments and archaeological areas into account. The SA assessment framework should incorporate the protection of ancient monuments.
HM Government (1981) Wildlife and Countryside Act	The Act makes it an offence (with exceptions) to: ▪ Intentionally kill, injure or take any wild bird or their eggs or nests;	The Welsh National Marine Plan must ensure full compliance with

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	▪ Intentionally kill, injure, or take, possess , or trade in any w ild animal listed in Schedule 5; ▪ Prohibits interference w ith places used for shelter or protection, or intentionally disturbing animals; and ▪ Pick, uproot, trade in, or possess (for the purposes of trade) and wild plant listed in Schedule 8. The Act also provides for the notification of Sites of Special Scientific Interest (SSSI) and require surveying authorities to maintain up to date definitive maps and statements, for the purpose of clarifying public rights of w ay.	the Act and prevent the restriction of Public Rights of Way. The SA should ensure a positive contribution to the w ildlife and encourage the opening of new Public Rights of Way.
HM Government (1985) Wildlife (Northern Ireland) Order 1985 (as amended)	The Order is the main piece of legislation relating to nature conservation in Northern Ireland, supplemented by the Conservation Regulations. It makes it an offence to interfere with certain species of w ild animals and plants, w ith certain exceptions, w hich require a licence. It also specifies open and closed periods for hunting of limited species. The list of birds, animals and plant species receiving special protection was significantly enlarged by the amendments from the Wildlife and Natural Environment (NI) Act 2011.	The Welsh National Marine Plan must ensure full compliance w ith the Order. The SA should take into account the effects of actions in the Marine Plan on biodiversity.
HM Government (1986) Protection of Military Remains Act 1986	This Act provides protection for the w reckage of military aircraft and certain military w recks. Designations can be either as a Controlled Site or Protected Place w here access may be permitted but any operations w hich may disturb the site are illegal unless licensed by the Ministry of Defence.	The Welsh National Marine Plan should be compliant w ith the Act. The SA should include objectives relating to the protection of terrestrial and marine heritage features.
HM Government (1990) Planning (Listed Buildings and Conservation Areas) Act 1990	The Act aims to protect listed historic buildings and conservation areas in the UK. It addresses the listing of special interest historic buildings, and the action taken if a building is not adequately protected. It also restricts the w ork that can be undertaken on listed buildings, the process for gaining consent for works, and enforcement action for non-compliance.	The Welsh National Marine Plan should have regard to listed buildings and conservation areas. The SA assessment framework should incorporate the protection of historic assets.
Northern Ireland Assembly (1995) Historical Monuments and Archaeological Objects (NI) Order 1995	The Order is in place to protect historic monuments in Northern Ireland, including those situated in the seabed in territorial w aters. The Order sets out measures for the protection of scheduled monuments, such as control of works and powers of entry, and also includes provisions for acquisition and guardianship of monuments.	The Welsh National Marine Plan should be compliant w ith the Order. The SA should include objectives relating to the protection of terrestrial and marine heritage features.
Department of the Environment (1995) Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended)	These regulations transpose the EU Habitats Directive (92/43/EEC) into Northern Ireland law, and address the conservation of natural habitats, w ild fauna and flora. The Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites.	The Welsh National Marine Plan must ensure full compliance w ith the Regulations. The SA should take into account the effects of actions in the Marine Plan on biodiversity.
HM Government (1996) The Treasure Act 1996	This Act concerns finds of treasure in England, Wales and Northern Ireland. It does not apply in Scotland or the Isle of Man. The Act requires finders of Treasure (defined within the Act) to report their find to their local coroner w ithin fourteen days. The Coroner subsequently determines w hether the find constitutes treasure through an inquest. When an item is determined to be treasure, the finder must offer the item for sale to a museum at a price set by a Treasure Valuation Committee.	The Welsh National Marine Plan should be compliant w ith the Act. The SA should include objectives relating to the protection of terrestrial and marine heritage features.
Department for Transport (1998) British Shipping: Charting a New Course	This paper sets out the Government's strategy for reviving the shipping industry. Elements of a UK shipping policy - including the need for open markets and a strong presence in shipping - are defined as the foundation for a new integrated policy approach.	The Welsh National Marine Plan should support the UK shipping economy w here feasible.

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	A comprehensive strategy to secure the future of UK shipping is mapped out in the form of 33 inter-related measures. These are grouped under four broad headings: increasing skills; encouraging employment; increasing the UK's attractiveness to shipping enterprises; and gaining safety and environmental benefit. The paper also considers next step issues of implementation and monitoring and concludes that a concerted and sustained partnership between British shipowners, the maritime-related industries, the trade unions and government is needed to secure the UK's maritime economic future.	The SA assessment should include criteria relating to marine economic activities such as shipping.
HM Government (2000) Countryside and Rights of Way Act 2000	This act extends the public's ability to enjoy the countryside and safeguards landowners and occupiers. The Act creates a new statutory right of access to open county and registered common land, modernise the right of way system, give greater protection to Sites of Special Scientific Interest (SSSIs), provide greater protection arrangements for Areas of Outstanding Natural Beauty (AONBs) and strengthen wildlife enforcement legislation.	The SA must make sure that the Act is supported and that public rights of way and access to the countryside are maintained and where possible enhanced.
National Assembly for Wales (2001) Minerals Planning Policy Wales	This document sets out the land use planning policy guidance in relation to mineral extraction and related development in Wales. The guidance should be taken into account by Mineral Planning Authorities in the development of local plans.	The Welsh National Marine Plan should be aligned with minerals planning guidance where relevant. The SA should include assessment criteria relating to sustainable resource use.
Countryside Council for Wales (2001) Register of Landscapes of Historic Interest	Cadw, the Countryside Council for Wales (CCW) and the International Council on Monuments and Sites (ICOMOS UK), has compiled a Register of Landscape of Historic Interest in Wales. The register identifies 58 landscapes of outstanding or special historic interest, which are considered to be the best examples of different types of historic landscapes in Wales. The Register provides information to decision makers and landscape managers, to help ensure that the historic character of the landscape is sustained, and that where change is contemplated, it is well-informed. It is accompanied by a good practice guide, which explains how the Register should be used in assessing the effect of major developments on the historic landscape.	The Welsh National Marine Plan should be developed with consideration of landscapes of historic interest. The SA should include assessment criteria relating to protection and enhancement of the landscapes and seascapes, including those with historic interest features.
HM Government (2002) Control of Substances Hazardous to Health Regulations (COSHH)	The COSHH regulations require risk assessment and control of hazardous substances to avoid causing harm to employees, including provision of information and training on the risks. Airborne concentrations of certain substances must remain below the Workplace Exposure Limits, where present. The regulations also require emergency planning, which could reduce the risk of chemical release to the environment in the event of loss of containment.	The Welsh National Marine Plan should be aware of chemical usage and comply with the Regulations. The SA assessment should include consideration of chemicals released to the water environment.
HM Government (2002) The National Heritage Act 2002	This Act builds on the preceding National Heritage Acts of 1980, 1983 and 1997. All four Acts define the way in which National heritage assets are managed and protected. The 2002 Act extended the powers of the Historic Buildings and Monuments Commission to include underwater archaeology within the territorial waters of the United Kingdom.	The Welsh National Marine Plan should be compliant with the Act. The SA should include objectives relating to the protection of terrestrial and marine heritage features.
English Heritage (2002) Military Aircraft Crash Sites	The document provides archaeological guidance on the significance and management of military aircraft crash sites. These sites have significance for remembrance, commemoration, their cultural value as historic artefacts and the information they contain about both the circumstances of the loss and of the aircraft itself. Crash sites can also be present in coastal areas and on the seabed.	The Welsh National Marine Plan should avoid disturbance to any marine military crash sites. The SA assessment should include criteria relating to the protection of cultural heritage.
Defra (2002) Safeguarding our	The strategy sets out the vision shared by the UK Administrations (UK Government, Scottish Government, Welsh Assembly	The Welsh National Marine Plan

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Seas: A Strategy for the Conservation and Sustainable Development of our Marine Environment	Government and Northern Ireland Executive) of having 'clean, healthy, safe, productive and biologically diverse oceans and seas'. It is underpinned by the principles of sustainable development, integrated management, the conservation of biological diversity, robust science, the precautionary principle and stakeholder involvement. This has been built upon by the 2009 high-level objectives (Our Seas – a Shared Resource) and the 2011 UK Marine Policy Statement.	should support sustainable development of the marine environment. The SA assessment should include criteria relating to sustainable development.
DCLG (2002) Marine Mineral Guidance 1: Extraction by Dredging from the English Seabed	This guidance note provides a statement of the Government's policies on the extraction of marine sand, gravel and other minerals from the English seabed. It applies both to applications for dredging licences made under the Government View (GV) procedure and for Dredging Permissions made under the statutory system. The Government wishes to see the continued use of marine dredged sand and gravel to the extent that this remains consistent with the principles of sustainable development. The Government believes this can be achieved by: • minimising the total area licensed/permitted for dredging; • the careful location of new dredging areas; • considering all new applications in relation to the findings of an Environmental Impact Assessment (EIA) where such an assessment is required; • adopting dredging practices that minimise the impact of dredging; • requiring operators to monitor, as appropriate, the environmental impacts of their activities during, and on completion of, dredging; and • controlling dredging operations through the use of conditions attached to the dredging licence or dredging permission.	The Welsh National Marine Plan should have regard for the mineral extraction strategy in England. The SA assessment should include criteria relating to the enhancement of marine economic activities, such as mineral extraction, and protection of the environment.
Northern Ireland Executive (2002) Northern Ireland Biodiversity Strategy	The Strategy sets out how the Executive plans to protect and enhance biodiversity in Northern Ireland over the period up to 2016. It includes the key threats to biodiversity; the long term goals for Northern Ireland; and mechanisms for action, such as the reconstitution of the Northern Ireland Biodiversity Group. It also presents the biodiversity responsibilities of various government departments. The Northern Ireland Biodiversity Group has since released reports in 2005 and 2009 regarding the progress of the strategy. A consultation took place in early 2014 on a revised Biodiversity Strategy for Northern Ireland to 2020.	The Welsh National Marine Plan should aim to protect and enhance biodiversity. The SA assessment should include criteria relating to the protection of species and habitats.
HM Government (2002) Environment (Northern Ireland) Order 2002	The Order provides legal protection for Northern Ireland's important habitats through its powers to designate, protect and manage Areas of Special Scientific Interest (ASSI). These powers are also used to complement or 'underpin' protection and management of European protected sites (such as Special Areas of Conservation and Special Protection Areas) and Ramsar sites.	The Welsh National Marine Plan must ensure full compliance with the Order. The SA should take into account the effects of actions in the Marine Plan on biodiversity and protected areas.
English Heritage (2003) Coastal Defence and the Historic Environment	This document provides advice on the implications of coastal and flood defence for the historic environment; sets out how the protection of historic remains can be fully integrated within the shoreline management planning process; and considers the implications for the historic environment of the increasing number of managed realignment schemes likely to arise from a more sustainable coastal defence policy.	The Welsh National Marine Plan should seek to protect the historic environment from the effects of flooding and coastal change. The SA assessment should include criteria relating to the protection of cultural heritage, flooding and coastal change.
HM Government (2003) The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003	These regulations transpose the Water Framework Directive into law in England and Wales.	The Welsh National Marine Plan should be compliant with the regulations. The SA should include objectives

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		relating to the maintenance and improvement of water body status.
Welsh Assembly Government (2004) Interim Marine Aggregates Dredging Policy Wales – South Wales	The Interim Marine Aggregates Dredging Policy Wales (IMAD-P) has been produced to guide aggregates dredging towards preferred areas in the Bristol Channel and the Severn Estuary. The document sets out 30 policies which seek to ensure sustainable, objective and transparent decision-making to meet society's needs for aggregates dredged from the Bristol Channel, Severn Estuary and River Severn. IMAD-P plans for dredged aggregate supplies to meet society's needs by making provision to: • Identify areas where dredging for marine aggregates is likely to be acceptable; • Protect the marine and coastal environment – landscape, habitats, ecology and heritage; • Control the impacts of marine dredging to acceptable levels; • Encourage efficient and appropriate use of dredged aggregates; • Safeguard resources from sterilisation; and • Protect the interests of other users of the area.	The Welsh National Marine Plan should be aligned with minerals planning guidance where relevant. The SA should include assessment criteria relating to sustainable resource use.
Welsh Government (2005) Climbing Higher – The Welsh Government's 20 year strategy for sport and physical activity in Wales	Climbing Higher is the Welsh Government's long-term strategy for sport and physical activity in Wales. The strategy seeks to maximise the contribution of sport and physical activity to well being in Wales.	The Welsh National Marine Plan should protect and enhance opportunities for recreation. The SA should include assessment criteria relating the importance of recreation.
Defra (2005) Safeguarding Sea Life	Safeguarding Sea Life is the joint UK response to the 1999-2004 Review of Marine Nature Conservation. The response sets out the shared policies of the UK Government and devolved administrations for marine biodiversity in the context of sustainable development. The document sets out broad policies and key recommendations for the conservation of marine ecosystems alongside marine industries and local communities. The response: • Confirms the commitment to working towards a vision of clean, healthy, safe, productive, and biologically diverse oceans and seas; • Recognises that government needs to manage human activities in the marine area based on a better understanding of marine ecosystems and their environmental limits; • Affirms the commitment to developing networks of marine protected areas to conserve marine biodiversity; • Sets out new strategic goals for marine nature conservation; • Outlines a new holistic approach to meeting these policies, based on the development of marine ecosystem objectives; and • Describes how the four administrations will use wider marine management regimes, including spatial planning, to help meet the objectives.	The Welsh National Marine Plan should support the protection of marine biodiversity. The SA assessment should include criteria relating to the protection and enhancement of biodiversity.
Environment Agency (2005) Cleaner Coasts, Healthier Seas: EA Marine Strategy	This is EA's Marine Strategy which aims to create cleaner coasts and healthier seas by: - Promoting sustainable development; - Integrating management between land and sea; - Providing efficient regulation of our coasts and coastal waters; - Ensuring that we all value our coastal and marine environment.	The Welsh National Marine Plan should be developed with consideration of the effects on the coast and sea. The SA assessment should include objectives and guide questions relating to the protection and enhancement of coasts and coastal waters.
Sustainable Development Commission (2005) One Future –	This is a framework document that sets out the common goals and challenges of the UK Government and devolved administrations of Scotland, Wales and Northern Ireland. The framework was produced to demonstrate the commitment of	The Welsh National Marine Plan should be aligned with the

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Different Paths. Shared Framework for Sustainable Development	the administrations to work together on shared goals and challenges. Each of the administrations have progressed their own strategies for sustainable development aligned with this framework.	principles of sustainable development. The SA should include a range of assessment objectives relating to sustainability.
Welsh Government (2006) Environment Strategy for Wales	The Strategy provides the framework to achieve an environment which is clean, healthy, biologically diverse and valued by the people of Wales. It sets out to achieve, by 2026, the distinctive Welsh environment thriving and contributing to the economic and social wellbeing and health of all of the people of Wales. Five environmental themes are identified: • Addressing climate change - covering mitigation and adaptation; • Sustainable resource use - covering materials consumption and waste; water; soils; minerals and aggregates; • Distinctive biodiversity, landscapes and seascapes – covering biodiversity; the marine environment; landscapes and seascapes and their historic component; • Local environment – covering the built environment and access to green space; environmental nuisances; walkability in urban areas and access to the countryside and coast; and flood risk management; • Environmental hazards – covering pollution; chemicals; and radioactivity.	The Welsh National Marine Plan should have regard to the environmental themes of the Environment Strategy for Wales. The SA assessment criteria should cover the environmental themes set out in the Environment Strategy for Wales.
HM Government (2006) The Stern Review: The Economics of Climate Change	The Stern Review is an independent review undertaken by Nicholas Stern into the global economic effects of climate change. The main conclusions of the report are: • There is still time to avoid the worst impacts of climate change, if we take strong action now. • Climate change could have very serious impacts on growth and development. • The costs of stabilising the climate are significant but manageable; delay would be dangerous and much more costly. • Action on climate change is required across all countries, and it need not cap the aspirations for growth of rich or poor countries. • A range of options exists to cut emissions; strong, deliberate policy action is required to motivate their take-up. • Climate change demands an international response, based on a shared understanding of long-term goals and agreement on frameworks for action.	The Welsh National Marine Plan should seek to reduce carbon emissions. The SA could include an objective/guide question in the assessment framework to reduce greenhouse gas/carbon dioxide emissions.
English Heritage (2006) Ports: the Impact of Development on the Maritime Historic Environment	This policy statement is intended to inform developers and others about the importance and relevance of the historic environment in relation to ports in England, and how it must be taken into account in development proposals. It focuses mainly on the marine aspect of new developments, but also touches on the development of existing ports and inland impacts of development. Direct damage to historic harbour structures and buildings may be caused by the construction and related processes necessary for the port to function. Particular operations such as capital dredging projects to aid navigation may result in localised changes to currents, which could result in damage to wrecks of archaeological interest, or cause buried items to be exposed. Redevelopment projects that involve advancing the line of the quayside could result in burial of, and compaction damage, to near-shore structures and wrecks. In all such cases, there are likely to be known historic environment assets and previously undiscovered features which should, where possible and appropriate, be examined and recorded or excavated prior to development.	The Welsh National Marine Plan should seek to protect the historic environment during development of ports. The SA assessment should include criteria relating to the protection of cultural heritage.
Department of the Environment (2006) An Integrated Coastal Zone Management (ICZM) Strategy for Northern Ireland 2006-2026	The Strategy seeks to identify the key factors affecting the Northern Ireland coast and put in place a series of widely supported aims, objectives and actions which will promote a coordinated and sustainable approach to the future management of the Northern Ireland coastal zone. It provides a framework for all users, planners, managers and developers in deciding how best to balance competing resource demands with environmental needs. The Strategy will improve the way the coast is managed by: • Promoting integrated management by encouraging bodies to work together and to consider management of the coastal zone as a whole. • Promoting a new approach to management that will bring users and regulators together to discuss and resolve	The Welsh National Marine Plan should support the integrated and sustainable management of coastlines. The SA assessment should include criteria in line with ICZM, such as protection of the environment, climate change, cultural heritage,

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	issues at a local level. A key aspect of the implementation of the Strategy was the establishment of a Northern Ireland Coastal and Marine Forum. The Coastal and Marine Forum is an independent, non-statutory body made up of a cross-section of interests ranging from local government, business, agriculture, fishing and environmental bodies. The Forum aims to provide meaningful stakeholder input into strategic policies affecting the coastal area, as well as raising awareness on Integrated Coastal Zone Management. It will also be responsible for monitoring progress and reporting against the targets and objectives contained in the Northern Ireland Strategy.	socio-economic factors, and community and recreation.
Welsh Assembly Government (2006) Ministerial Interim Planning Policy Statement (DMIPPS 02/2006) Planning, Health and Well-Being	This document provides additional policy on planning, health and well-being. It provides advice on how health and well-being considerations can be incorporated into decision making, including through the use of a Health Impact Assessment (HIA).	The Welsh National Marine Plan should be developed with the consideration of the potential effects on health and wellbeing. The SA should include objectives relating to the protection and enhancement of human health.
HM Government (2006) Natural Environment and Rural Communities Act 2006	The Act makes provision for bodies concerned with the natural environment and rural communities to make provision in connection with wildlife SSSI, National Parks and the Broads; to amend the law relating to rights of way to make provision as to the inland Waterways Amenity Advisory Council; to provide for flexible administrative arrangements in connection with functions relating to the environment and rural affairs and certain other functions; and connected purposes.	The Welsh National Marine Plan and SA should have regard to protected wildlife sites and rights of way.
HM Government (2006) Commons Act	The Act contains provisions to improve the management and maintenance of common land in England and Wales. It aims to: • protect common land from development; • allow more sustainable management of common land; • improve protection of common land from neglect and abuse; and • modernise registration of common land and greens to ensure that all enjoy the same protection.	The Welsh National Marine Plan should be developed in accordance with this Act. The SA should include objectives relating to the sustainable management of coastal land.
Welsh Government (2007) Making the Most of Wales' Coast: The Integrated Coastal Zone Management Strategy for Wales	This strategy is concerned with managing coastal resources in Wales in an integrated and informed way. It aims to provide a management framework to facilitate integrated working on the coast by the different interests involved in managing coastal assets. It also aims to help ensure that these assets are maintained and enhanced for the benefit of present and future generations. It also sets out the links that must be made between diverse national and local policies and strategies so that the people involved in managing and using the coast can do so in a way that takes into account the needs of others.	The Welsh National Marine Plan should be aligned with the ICZM strategy for Wales. The SA should include assessment criteria relating to sustainable management of the coastal zone in Wales.
Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland	The Air Quality Strategy sets out air quality objectives and policy options to further improve air quality in the UK to benefit public health, quality of life and help to protect our environment. The strategy sets out objectives relating to particles, nitrogen dioxide, ozone, sulphur dioxide, polycyclic aromatic hydrocarbons, benzene, 1,3- butadiene, carbon monoxide, lead, nitrogen oxides and sulphur dioxide.	The Welsh National Marine Plan should take account of air quality objectives in the strategy. The SA should include guide questions relating to the effects of options on human health and the environment.
English Heritage (2007) Regeneration in Coastal Towns	The report examines the challenges and opportunities facing local communities and the historic environment in coastal towns. The document highlights some of the key challenges facing historic coastal towns, such as high maintenance requirements; climate change; urban design conflicts; and negative perceptions. To combat the challenges, the following principles are recommended: • gain a proper understanding of the local area; • invest in the public realm; • undertake high quality development;	The Welsh National Marine Plan should avoid contributing to the challenges facing historic coastal towns, such as climate change. The SA assessment should include criteria relating to the protection of cultural heritage, local economies

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	• heritage leadership; • diversification of economic sectors; and • engage the local community.	and communities.
Defra (2007) UK Ship Recycling Strategy	The Ship Recycling Strategy aims to develop a strategic approach to the recycling of UK-flagged vessels consistent with the UK's national and international sustainable development commitments. It also aims to encourage, through the provision of guidance, the development of UK capacity for recycling of end-of-life vessels in an environmentally sound manner. It sets out minimum standards for ship recycling facilities and the requirements for waste exports associated with ship end-of-life.	The Welsh National Marine Plan should support the strategy's objectives for ship recycling. The SA assessment should include criteria relating to waste and protection of the environment.
Welsh Assembly Government (2007) Welsh Coastal Tourism Strategy	This document sets out the strategy for the development of Coastal Tourism in Wales. It aims to build on the economic potential of the coastline of Wales whilst respecting its environmental quality and recognising the importance of achieving community benefits. The strategy provides spatial guidance for the future allocation of funds to support coastal tourism in the regions of Wales through the Wales Spatial Plan. The aims of the strategy are: • to ensure that sustainable tourism is making an increasing contribution to the local economy of coastal communities; • to improve the quality of the visitor experience; • to achieve an integrated approach to the development and management of coastal tourism; • to safeguard and protect the environment and cultural heritage as a Key resource for coastal tourism; The strategy outlines implementation arrangements and the implications for the six spatial plan areas.	The Welsh National Marine Plan should be developed with consideration of the coastal tourism strategy. The SA should include assessment criteria relating to protecting and developing the tourist economy.
Scotland & Northern Ireland Forum for Environmental Research (2007) Preparing for Climate Change in Northern Ireland	The report examines the ways in which Northern Ireland must prepare to meet the opportunities and threats presented by the impacts of a changing climate. If focuses specifically on the impacts on, and the need for adaptation by, the public sector in Northern Ireland. It presents key risks and opportunities for the following areas: biodiversity, fisheries, agriculture, forestry, water resources, flood risk, buildings, business, insurance, transport, energy, tourism and health.	The Welsh National Marine Plan should support climate change mitigation and adaption. The SA assessment should include criteria relating to climate change, such as reductions in carbon emissions and increased reliance to the effects of climate change.
Department for Culture, Media & Sport (2007) Heritage Protection for the 21st Century	The joint White Paper for England and Wales sets out a vision of a unified and simpler heritage protection system, which would have more opportunities for public involvement and community engagement. The aim is for the system to be more open, accountable and transparent, and to offer those with an interest in the historic environment a clearer record of what is protected and why. It also aims to enable people who own or manage historic buildings and sites to have a better understanding of what features are important; and to streamline the consent procedures to create a more consultative and collaborative protection system. The proposals are based on three core principles: the need to develop a unified approach to the historic environment; maximising opportunities for inclusion and involvement; and supporting sustainable communities by putting the historic environment at the heart of an effective planning system.	The Welsh National Marine Plan should support the protection of the historic environment. SA assessment should include criteria relating to the protection and enhancement of cultural heritage.
HM Government (2007) Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended 2010)	These regulations are the principal means by which the Wild Birds Directive and Habitats Directives are transposed in the UK offshore marine area. The 2010 Regulations amend these by inserting references to the Planning Act 2008 and the Marine and Coastal Access Act 2009 into the list of enactments to which the duty on competent authorities set out in the 2007 regulations applies.	The Welsh National Marine Plan should be compliant with the Act. The SA should include objectives relating to the protection and enhancement of offshore biodiversity.
Defra (2007) Fisheries 2027: A long-term vision for sustainable fisheries	This document explains the changes in fisheries and fisheries management over the past thirty years and what the vision is trying to achieve, sets out the balance between economic, social and environmental priorities, clarifies the elements of sustainability, identifies the roles and responsibilities of different stakeholders in achieving sustainability and summarises the	The Welsh National Marine Plan should seek to ensure the protection and enhancement of

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	economic, social and environmental benefits and costs of delivering the vision. The document sets out a nine point vision for the sustainable management of fisheries: 1. Economic returns are optimised. 2. There are rights of access to fisheries coupled with clear responsibilities. 3. Stocks are plentiful and sustainably harvested. 4. Fishing activity contributes to coastal communities. 5. The environmental impact of producing and consuming fish products is acceptable. 6. A Common Fisheries Policy (CFP) is delivering sustainable fisheries. 7. Management is integrated and devolved to the most appropriate national, regional or local level. 8. Management is responsive and based on agreed criteria for assessing impacts on stocks and the environment more widely. 9. Fish are a readily available and valued source of protein.	fisheries. The SA could include an objective/guide question in the assessment framework relating to the protection and enhancement of fisheries.
Welsh Assembly Government (2007) One Wales – A Progressive Agenda for the Government of Wales	One Wales is an agreement between the Labour Party and Plaid Cymru, setting out the agenda for the government of Wales to improve the quality of life of people in Wales, especially those that are most vulnerable and disadvantaged. The following key themes are identified: • A Strong and Confident Nation; • A Healthy Future (Reviewing NHS reconfiguration, strengthening NHS finance and management, developing and improving Wales's health services, ensuring access to health care, Improving patients' experience, supporting social care); • A Prosperous Society (Creating jobs across Wales, stimulating enterprise and business growth, promoting tourism, enhancing skills for jobs); • Living Communities (Meeting housing need, improving access to housing, increasing the supply of affordable housing, ensuring 21st-century housing, learning for Life, a fair and just society); • A Sustainable Environment (Tackling climate change, supporting rural development, achieving sustainable energy production and consumption, improving the local environment); • A Rich and Diverse Culture (Supporting the Welsh language, promoting arts and culture, encouraging sport and physical activity, placing Wales in the world).	The Welsh National Marine Plan should be aligned with the key themes set out in One Wales. The SA should include assessment criteria relating to sustainable land and resource use.
Welsh Government (2007) Coastal Access Improvement Programme	The Coastal Access Improvement Programme was developed to improve existing coastal paths and to create new coastal access routes. The Wales Coast Path was completed in 2012 as part of this scheme to provide a path as close to the coastline as is safe and practicable. The programme is still ongoing to further improve the coastal paths in Wales.	The Welsh National Marine Plan should support and enhance coastal access. The SA should include criteria relating to community access and use of the coast.
Department for Transport (2007) Ports Policy Review Interim Report	The 2007 Ports Policy Review aimed to direct the future of ports policy for England and Wales. It set out the policy position that it is Government's responsibility to create the conditions in which investment in ports is encouraged, while ensuring sustainability. It also specified that port operators are best-placed to make decisions on port investment. This followed on from Modern Ports: A UK Policy (Department for Transport, 2000), which supported best environmental practice, improving safety and making the best use of existing infrastructure.	The Welsh National Marine Plan should support sustainable port development. The SA assessment should include criteria relating to provision of shipping and transport capacity
Defra, Scottish Government, Welsh Government (2008) The Invasive and Non-Native Species Framework Strategy for Great Britain	The vision underpinning the strategy is that when this Strategy is fully implemented, biodiversity, quality of life and economic interests in Great Britain will be better protected against the adverse impacts of invasive non-native species because there will be: • widespread awareness and understanding of the risks and adverse impacts associated with invasive non-native species, and greater vigilance against these; • a stronger sense of shared responsibility across government, key stakeholder organisations, land managers and	The Welsh National Marine Plan should not promote actions which encourage invasive species. The SA framework should include assessment criteria relating to the protection and enhancement of

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	the general public for actions and behaviours that will reduce the threats posed by invasive non-native species or the impacts they cause; and • a guiding framework for national, regional and local invasive non-native species mitigation, control or eradication initiatives helping to reduce the significant detrimental impact of invasive non-native species on sensitive and vulnerable habitats and species. The overarching aim of this Strategy is to minimise the risk posed, and reduce the negative impacts caused, by invasive non-native species in Great Britain. More specifically the aims of this Strategy are: • to improve overall clarity and co-ordination of responsibilities and functions within government and its associated bodies; • to achieve increased awareness of non-native species issues and promote appropriate changes in behaviour or attitudes throughout all relevant sectors; • to reduce and where possible, prevent the intentional and unintentional introduction of invasive non-native species; • to ensure that effective contingency response capabilities are in place and resourced to prevent the establishment of new invasions where possible; • to help ensure that sustainable action to control established invasive non-native species is adequately resourced and delivered; • to provide an effective decision-making framework and associated communications processes concerning control, mitigation and eradication of invasive non-native species; • to improve co-ordination of actions to tackle invasive non-native species in partnership with key interest groups outside government; • to make optimum use of available capacity and resources to improve detection and monitoring capabilities; and, • to identify gaps and priority issue areas for further development (for example in relation to prevention, monitoring, control and legislation).	biodiversity.
Welsh Government (2008) People, Places, Future – The Wales Spatial Plan	The *Wales Spatial Plan* provides the context and direction of travel for local development plans and the work of local service boards. The 2008 update brings the *Wales Spatial Plan* into line *with One Wales*, and gives status to the area work which has developed since 2006. The key themes of the update (and the Wales Spatial Plan before it) are set out below : Building Sustainable Communities Reducing inequalities between communities whilst retaining their character and distinctiveness. Promoting a Sustainable Economy The need for an innovative, high value-added economy for Wales utilising and developing the skills and knowledge of Welsh people; an economy which both creates wealth and promotes the spreading of that prosperity throughout Wales; an economy which adds to the quality of life as well as the standard of living and the working environment. Valuing our Environment Safeguarding and protecting natural and historic assets, and enhancing resilience to address the challenges of climate change, attracting people to Welsh communities and provide the wellbeing and quality of life to encourage them to stay and preserve the foundations for the future. Achieving Sustainable Accessibility Developing access in ways that protect the environment, encourage economic activity, widen employment opportunities, ensure quality services and integrate the social, environmental and economic benefits that travel can have. Respecting Distinctiveness A cohesive identity which sustains and celebrates what is distinctive about Wales, in an open and outward-looking way, is central to promoting Wales to the World, and Wales' future economic competitiveness and social and environmental wellbeing.	The Welsh National Marine Plan should have regard to the key themes of the Wales Spatial Plan Update. The SA assessment framework should cover the key themes set out in the Wales Spatial Plan Update.
Welsh Government (2008) Wales Transport Strategy	The objective of this strategy is to promote sustainable transport networks that safeguard the environment and strengthen Wales' economic and social life. The transport strategy identifies a series of high-level outcomes (e.g. improving access to	The Welsh National Marine Plan should be aligned with transport

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	healthcare, education etc) and sets out the steps to their delivery.	strategy. The SA should include assessment criteria supporting economic development in Wales.
Welsh Government (2008) Wales Fisheries Strategy	This is the strategy for the management and development of fisheries in Wales covering aquaculture, commercial fisheries, and recreational fisheries for 2020. The aim of the strategy is to support the development of viable and sustainable fisheries in Wales while safeguarding the environment. To achieve this, a number of goals have been set out which will determine the success of the strategy: • Environment - fisheries developed and managed in a sustainable way contributing positively to environmental policies of Wales. • Healthy fish stocks - development and management of fisheries at sustainable levels. • Positive community role - recognition of fisheries as a positive contribution to the communities of Wales. • Economic contribution - maximising the economic importance and contribution of fisheries to the development of the 'Wales' brand. • Partnership working - to further the partnership working already established between policy makers, stakeholders and delivery agents for fisheries.	The Welsh National Marine Plan should be aligned with the Wales Fisheries Strategy. The SA should include assessment criteria relating to the protection and enhancement of the marine environment.
Committee on Climate Change (2008) Building a Low-Carbon Economy - the UK's Contribution to Tackling Climate Change	The document contains the Committee on Climate Change's recommendations on the 2050 emissions reduction target and advises on the levels of the UK's first three legally binding carbon budgets for 2008-2022. The key recommendation is that the UK should aim to reduce greenhouse gas emissions by 80% below 1990 levels by 2050. This target should include all sectors of the UK economy, including international aviation and shipping. The target could be met through decarbonisation of the power sector, energy efficiency in buildings and industry, and cuts in transport emissions.	The Welsh National Marine Plan should support the UK in meeting the carbon budgets. The SA assessment should include criteria relating to greenhouse gas emissions and climate change.
HM Government (2008) The Energy Act 2008.	The Energy Act 2008 contains the legislative provisions required to implement UK energy policy following the publication of the Energy Review 2006 and the Energy White Paper 2007. The key elements of the Act: • Strengthens the regulatory framework for offshore gas supply infrastructure to enable private sector investment; • Creates a regulatory framework to enable private sector investment in Carbon Capture and Storage projects; • Strengthens the Renewables Obligation to drive greater and more rapid deployment of renewables in the UK; • Strengthens statutory decommissioning provisions for offshore renewables and oil and gas installations to minimise the risk of liabilities falling to the Government; • Improves the offshore oil and gas licensing regime in response to changes in the commercial environment and enable the Department for Business Enterprise and Regulatory Reform to carry out its regulatory functions more effectively; • Ensures the operators of new nuclear power stations accumulate funds to meet the full costs of decommissioning and their full share of waste management costs; and • Introduces amending powers such that Ofgem is able to run the offshore electricity transmission licensing regime more effectively.	The Welsh National Marine Plan should be compliant with the Act. The SA should include objectives relating to the use marine resources in energy production.
Health Protection Agency (2008) Health Effects of Climate Change in the UK 2008 - An update of the Department of Health report 2001/2002	This report updates the findings of a previous report *Health Effects of Climate Change in the UK* published in 2002. The report considers effects of heatwave and flooding on health, the potential risk of malarial incidence in the UK, tick borne diseases, food-borne diseases. The report considers the effects of climate change on supplies of drinking water and on air pollution, increases in ozone and exposure to UV light.	The Welsh National Marine Plan should contribute to the protection and enhancement the health and wellbeing of the people of Wales where appropriate. The SA should include objectives relating to the protection and enhancement of human health.

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HM Government (2008) Climate Change Act 2008	This Act aims: - to improve carbon management and help the transition towards a low carbon economy in the UK; and - to demonstrate strong UK leadership internationally, signalling that the UK is committed to taking its share of responsibility for reducing global emissions in the context of developing negotiations on a post-2012 global agreement at Copenhagen next year. The Act seeks greenhouse gas emission reductions through action in the UK and abroad of at least 80 per cent by 2050, and reductions in CO2 emissions of at least 26 per cent by 2020, against a 1990 baseline. The 2020 target will be reviewed soon after Royal Assent to reflect the move to all greenhouse gases and the increase in the 2050 target to 80 per cent. Further the Act provides for a carbon budgeting system which caps emissions over five year periods, with three budgets set at a time, to set out our trajectory to 2050. The first three carbon budgets will run from 2008-12, 2013-17 and 2018-22, and must be set by 1 June 2009.	The Welsh National Marine Plan should be developed in accordance with this Act and seek to reduce carbon emissions. The SA could include an objective/guide question in the assessment framework to reduce greenhouse gas/carbon dioxide emissions.
Defra (2008) A Strategy for Promoting an Integrated Approach to the Management of Coastal Areas in England	The strategy sets out the vision for England for coastal management. It includes the following objectives: • to integrate coastal policies and provide a clear, strategic direction to coastal managers; • to ensure a consistent, joined-up approach to regional and local planning and decision-making; • to promote the benefits of local coastal initiatives which bring together coastal stakeholders; • to promote awareness and understanding of the value of the coast and the issues facing it; • to improve the quality and co-ordination of information about the coast to improve management practices; and • to monitor progress towards improving integration at the coast.	The Welsh National Marine Plan should ensure that it does not have any detrimental effects on coastal management in England. The SA assessment should include criteria relating to coastal protection and management.
DfT (2008) Delivering a Sustainable Transport System	The document outlines the Government's five goals for transport, focusing on the challenge of delivering strong economic growth while at the same time reducing greenhouse gas emissions. It outlines the key components of the UK's national infrastructure and discusses the difficulties of planning over the long term in the context of uncertain future demand. It also sets out the first steps of future plans for investment to 2014 and beyond. The five transport goals are: • to support national economic competitiveness and growth, by delivering reliable and efficient transport networks; • to reduce transport's emissions of carbon dioxide and other greenhouse gases, with the desired outcome of tackling climate change; • to contribute to better safety, security and health and longer life-expectancy by reducing the risk of death, injury or illness arising from transport and by promoting travel modes that are beneficial to health; • to promote greater equality of opportunity for all citizens, with the desired outcome of achieving a fairer society; and • to improve quality of life for transport users and non-transport. It highlights aviation and shipping as being critical for the national economy, although these are both governed by global rules, such as reducing shipping emissions.	The Welsh National Marine Plan should support the goals set out in the document. The SA assessment should include criteria relating to marine transport and economic activities such as shipping.
Welsh Assembly Government (2008) The Wales Freight Strategy	This strategy set out high-level aims and policies for freight transport, identifying 49 actions to securing their delivery. The strategy emphasises the role of freight transport in ensuring a sustainable environment, with many of actions within the strategy containing elements that are aimed at reducing the environmental impact of freight transport through modal shift or efficiency measures, in particular the contribution of freight transport to greenhouse gas emissions. The Wales Freight Strategy is designed to: • Assist Regional Transport Consortia in the development of Regional Transport Plans; • Identify and promote factors supporting sustainable distribution systems; • Support Welsh industry and commerce with a reliable and cost efficient network for raw materials, and manufactured and consumer goods; • Anticipate and respond to fundamental changes in the supply-chain and markets; • Identify weaknesses and constraints in the existing freight network which may impact on the Welsh economy; and • Integrate and maximise use of existing freight infrastructure, using all transport modes to the benefit of the environment and economy.	The Welsh National Marine Plan should be aligned with the Wales Freight Strategy. The SA should include assessment criteria relating to developing and promoting transport in Wales.

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Her Majesty's Stationery Office (2008) Working for a healthier tomorrow Dame Carol Black's Review of the health of Britain's working age population	This report is an independent review undertaken by Dame Carol Black of the health of Britain's working aged population. The report identifies the following ten key actions: • A new approach to health and work in Britain based on the foundations laid out in this Review should be adopted. • Government, employers and representative bodies should develop a robust model for measuring and reporting on the benefits of employer investment in health and well-being. Employers should use this to report on health and well-being in the board room and company accounts. • Government should initiate a business-led health and well-being consultancy service, offering tailored advice and support and access to occupational health support at a market rate. • Government should launch a major drive to promote understanding of the positive relationship between health and work among employers, healthcare professionals and the general public. • GPs and other healthcare professionals should be supported to adapt the advice they provide, where appropriate doing all they can to help people enter, stay in or return to work. • The paper-based sick note should be replaced with an electronic fit note. • Government should pilot a new Fit for Work service • When appropriate models for the Fit for Work service are established, access to the service should be open to those on incapacity benefits and other out-of-work benefits. • An integrated approach to working-age health should be underpinned by: the inclusion of occupational health and vocational rehabilitation within mainstream healthcare; clear professional leadership; clear standards of practice and formal accreditation for all providers; a revitalised workforce; a sound academic base; systematic gathering and analysis of data; and a universal awareness and understanding of the latest evidence and most effective interventions. • The existing cross-Government structure should be strengthened to incorporate the relevant functions of those departments whose policies influence the health of Britain's working age population.	The Welsh National Marine Plan should contribute to the protection and enhancement the health and wellbeing of the people of Wales where appropriate. The SA should include objectives relating to the protection and enhancement of human health.
Welsh Water (2008) Surface Water Management Strategy	The Strategy is in place to address increased flows of surface water and the potential for pollution incidents in the Welsh Water area. It aims to promote understanding of surface water runoff to help support preventative actions. The long term objective of the Strategy is for drainage systems to mimic Greenfield drainage, in which surface water returns to streams and rivers and flows to the sea. The initiatives in the strategy include engagement, customer charging, legislation and technical solutions.	The Welsh National Marine Plan should be consistent with the Strategy's objectives to reduce water pollution incidents. The SA should include assessment criteria relating to water quality.
Welsh Assembly Government (2009) One Wales: One Planet: The Sustainable Development Scheme of the Welsh Assembly Government	One Wales One Planet seeks to build on the two previous Sustainable Development Schemes. It sets out proposals to promote sustainable development, how the Welsh Government will make sustainable development a reality for people in Wales, and the benefits that people will see from this, particularly in less well-off communities. The strategy states that the Welsh Government is committed to working in partnership with others and notes that businesses can: • Develop resource efficiency within the organisation and through supply chains, improving productivity and competitiveness; • Reduce waste; • Develop environmental and sustainability policies and targets; • Monitor performance and resource use and report publicly on them; • Engage with the workforce in both adopting sustainable practices and encouraging employees to become sustainable champions in their own communities; • Engage with and support local communities.	The Welsh National Marine Plan should be aligned with the Sustainable Development Scheme for Wales. The SA should include assessment criteria relating to improving resource efficiency, reducing waste, monitoring and public reporting, encouraging sustainable practices among the workforce and engaging with and supporting local communities. The SA should include proposals for monitoring the effects of the Welsh National Marine Plan on the environment and sustainability and

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		could utilise targets that arise from this document.
Welsh Government (2009) Farming, Food and Countryside: Building a Secure future – A New Strategy for Farming	The strategy outlines the Welsh Government's policy direction to secure a sustainable future for the farming, food and land based production industries and the Welsh countryside environment through to 2020. The objective of the strategy is to achieve a sustainable and profitable future for farming families and businesses through the production and processing of farm and forestry products whilst safeguarding the environment, animal health and welfare, adapting to climate change and mitigating its impacts and contributing to the vitality and prosperity of rural communities. The key aims of the strategy are: • Connecting to the marketplace; • Producing sustainably and profitably; • Safeguarding animal health and welfare, plant health and food safety; • Sustaining our countryside; and • Encouraging innovation. Actions are detailed against each of the aims and the strategy identifies outcomes for each of the aims.	The Welsh National Marine Plan should be aligned with the Farming Strategy. The SA should include assessment criteria relating to sustainable land and resource use.
HM Government (2009) The Climate Change Act 2008 (2020 Target, Credit Limit and Definitions) Order 2009	This Order does three things. • Amends sections of the 2008 Act that means that the Secretary of State may only set a budget for the 2018–2022 budgetary period which is equivalent to a 34% reduction in the net UK carbon account in 2020 (rather than 26%). The repeal of section 5(4) has the effect that compliance is to be calculated by reference to emissions of all targeted greenhouse gases (rather than just carbon dioxide). • Sets a limit on the net amount of carbon units that may be credited to the net UK carbon account for the 2008–2012 budgetary period of zero carbon units. • Defines what are to be regarded "international aviation" and "international shipping" for the purposes of section 30(1) of the Climate Change Act 2008.	The Welsh National Marine Plan should be developed in accordance with this Act and seek to reduce carbon emissions. The SA could include an objective/guide question in the assessment framework to reduce greenhouse gas/carbon dioxide emissions.
HM Government (2009) Strategic Review of Health Inequalities in England Post-2010 (The Marmot Review)	This is the final report from an independent review by Sir Michael Marmot to propose the most effective evidence-based strategies for reducing health inequalities in England from 2010. The report concluded that reducing health inequalities would require action on six policy objectives: 1. Give every child the best start in life. 2. Enable all children, young people and adults to maximise their capabilities and have control over their lives. 3. Create fair employment and good work for all. 4. Ensure healthy standard of living for all. 5. Create and develop healthy and sustainable places and communities. 6. Strengthen the role and impact of ill-health prevention.	The Welsh National Marine Plan should contribute to the protection and enhancement the health and wellbeing of the people of Wales where appropriate. The SA should include objectives relating to the protection and enhancement of human health.
HM Government (2009) The Marine and Coastal Access Act 2009	The Marine and Coastal Management Act 2009 Act introduces marine spatial planning to balance conservation, energy and resource needs. The Act: • Led to the establishment of the Marine Management Organisation to deliver marine functions in English territorial water and UK offshore waters. • Led to the development of a strategic Marine Planning System to agree and clarify marine objectives and priorities and to steer sea users and decision-makers towards more efficient, sustainable use and protection of our marine resources. • Streamlined the Marine Licensing System, simplifying the process for operators including the issue of a single licence for all activities. • Enable the designation of Marine Conservation Zones (MCZs) in the territorial waters adjacent to England and Wales and UK offshore waters. • Modernises inshore fisheries management in England through the creation of Inshore Fisheries and Conservation Authorities (IFCAs), whilst the Welsh Government regulates inshore fishing operations in Wales.	The Welsh National Marine Plan should be developed in accordance with this Act. The SA should include objective/guide questions relating to the provision of access to marine and coastal areas.

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	• Introduces a new licensing and authorisation system for fishing activities • Enables the creation of a continuous, well signed and managed route around the entirety of the English and Welsh coastline. • Joins-up existing sectoral policies and bylaws in place at the coastal and estuarine environment to minimise conflict and promote sustainable use through a system of Integrated Coastal Zone Management (ICZM).	
English Heritage (2009) Planning Circular 07/09: Protection of World Heritage Sites	The planning circular gives advice on the level of protection and management needed for World Heritage Sites in England, and draws attention to legislative measures designed to enhance the protection of these sites. The following key principles apply to planning policy for the sites: • protecting the World Heritage Site and its setting, including any buffer zone, from inappropriate development; • striking a balance between the needs of conservation, biodiversity, access, the interests of the local community and the sustainable economic use of the World Heritage Site in its setting; • protecting a World Heritage Site from the effect of changes which are relatively minor but which, on a cumulative basis, could have a significant effect; • enhancing the World Heritage Site where appropriate and possible through positive management; and • protecting World Heritage Sites from climate change but ensuring that mitigation is not at the expense of authenticity or integrity.	The Welsh National Marine Plan should avoid having a negative effect on the status or setting of World Heritage Sites in England. The SA assessment should include criteria relating to cultural heritage.
Defra (2009) Our Seas – a Shared Resource: High Level Marine Objectives	The high level objectives reflect the full range of the UK Government and Devolved Administrations' policies in the marine area. This progresses the vision presented in the 2002 Safeguarding our Seas strategy. The objectives are grouped under the following five overarching principles: • Achieving a sustainable marine economy; • Ensuring a strong, healthy and just society; • Living within environmental limits; • Promoting good governance; and • Using sound science responsibly. The actions to deliver the objectives are addressed in the UK Marine Policy Statement (2011).	The Welsh National Marine Plan should support the goals of the high level marine objectives. The SA assessment should include criteria relating to the economy, the environment and society.
DCLG (2009) National and Regional Guidelines for Aggregates Provision in England 2005-2020	The document sets out revised national and regional guidelines for aggregates provision in England for the period 2005 to 2020 inclusive. It also indicates how the guidelines should be taken into account in the planning process, and outlines arrangements for future monitoring and review. This includes assumed contributions from marine sand and gravel for regions across England.	The Welsh National Marine Plan should ensure it does not have a detrimental effect on aggregates provision in England. The SA assessment should include criteria relating to the effects on economic marine activities, such as aggregate extraction.
Natural England (2009) European Landscape Convention: Natural England's 2009/2010 Action Plan	The European Landscape Convention (ELC) is the first international convention to focus specifically on landscape. Created by the Council of Europe, the convention promotes landscape protection, management and planning, and European co-operation on landscape issues. It applies to all landscapes, towns and villages, as well as open countryside; the coast and inland areas; and ordinary or degraded landscapes, as well as those that are afforded protection. This Action Plan enables Natural England to monitor cumulative progress, and map achievements and results of national and regional landscape work, showing the impact of the ELC activity. Over a period of 5-10 years, the Action Plan seeks to: • Lead on improving the protection, planning and management of all England's landscapes; • Raise the quality, influence and effectiveness of policy and practical instruments; • Increase the engagement in and enjoyment of landscapes by the public; • Collaborate with partners across the UK and Europe. This builds on Natural England's 2007 publication, European Landscape Convention: A Framework for Implementation, which	The Welsh National Marine Plan should seek to protect and enhance landscape character. The SA assessment should include criteria relating to protection of landscapes and seascapes.

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	provided a structure for the action plan. English Heritage has also set out an Action Plan (2009) based on the Natural England framework, while aims to strengthen their contribution to national landscape policy and the promotion of historic aspects of landscape.	
Environment Agency (2009) Flooding in England - a national assessment of flood risk	This is the Environment Agency's national assessment of flood risk for England, which sets out the current level of risk from rivers and the sea and what the Environment Agency is doing to manage it. The report sets out how the Environment Agency tackles the risk of flooding in England and presents • The main findings of the 2008 National Assessment of Flood Risk (NaFRA). • The causes of flooding in England and the range of activities underway to manage flood risk. • An overview of our strategy and policy framework and the key organisations that we work with to protect people and property from flooding. The report does not cover Wales, but does include assessment of flood risk in cross border-catchments including the Dee, the Wye and the Severn, which discharge into Welsh Marine Waters, and the risk of coastal flooding.	The Welsh National Marine Plan should take account of flood risk. The SA should include guide questions relating to the effects of the Welsh National Marine Plan on coastal flood risk.
DECC (2009) UK Ports for the Offshore Wind Industry: Time to Act	Following the Government's proposed expansion of UK offshore wind in 2007, this study examines the port availability for the offshore wind sector. The report considers: • The requirements of the offshore wind industry for ports; • Current UK port capabilities; • The opportunity for UK ports; • Perspectives and attitudes of relevant groups of stakeholders; and • Potential port expansion or development to meet the needs of the offshore wind sector. The findings contribute to the Department for Transport's National Policy Statement for Ports, which sets out the long-term strategic requirements for port development in the UK. The report found that there are enough potential locations in the UK to meet the needs of UK offshore wind deployment by development of both existing facilities and brown-field and green-field sites. The market alone is unlikely to deliver these ports in the timeframe required for offshore delivery without UK Government intervention to facilitate the process. • Investment in ports in readiness for wind industry needs depends upon: • Confidence in the continuation of the UK Government's strategy for offshore wind development; • Readiness of port owners, operators and wind industry players to share risks to develop facilities required for efficient construction of offshore capacity in the UK; and • Continuing role of UK Government to facilitate awareness of opportunities and to ensure that development occurs.	The Welsh National Marine Plan should support port development in line with the National Policy Statement for Ports and support the offshore wind sector where appropriate. The SA assessment should include criteria relating to provision of shipping and transport capacity and renewable energy.
HSE (2009) The Health and Safety of Great Britain: Be Part of the Solution	This document presents the HSE's strategy for the health and safety system as a whole. It specifies that to be truly effective, health and safety has to be an everyday process supported by all as an integral part of workplace culture. The areas it focuses on for change are: a pressure to improve; everyone has a role; investigations and securing justice; the need for strong leadership; building competence; involving the workforce; creating healthier, safer workplaces; customising support for SMEs; avoiding catastrophe; taking a wider perspective; and driving change for the better.	The Welsh National Marine Plan should have regard to the strategy and the protection of human health and safety. The SA assessment should include criteria relating to the protection of human health and safety.
DECC (2009) Framework for the Development of Clean Coal	This consultation document sets out the governments proposals for Carbon Capture and Storage (CCS) both in the UK and internationally. The document identifies the need for new coal power stations in the UK to maintain the diversity and security of energy supplies and sets out the proposed conditions under which such power stations would be required to demonstrate CCS. The consultation document also proposes a pathway from CCS demonstration to wider UK deployment.	The Welsh National Marine Plan should seek to reduce carbon emissions. The SA could include an objective/guide question in the assessment framework to reduce greenhouse gas/carbon dioxide emissions.
Countryside Council for Wales	CCW assessed the character and special qualities of Welsh seascapes, including their comparative sensitivity to offshore	The Welsh National Marine Plan

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(2009) Seascape Assessment of Wales	development. The assessment identifies 50 regional seascape units covering the whole of Wales. Each unit comprises a section of coastal landscape between major headlands, and also includes a defined visual setting zone, running both landward and seaward from the coastline. The study systematically describes the key characteristics and special qualities of each seascape, producing a baseline of information of relevance to a wide variety of spatial planning uses (both marine and terrestrial). The project was undertaken to plan for and inform offshore renewable energy developments.	should be developed with consideration of seascapes. The SA should include assessment criteria relating to protection and enhancement of the landscapes and seascapes.
Sustainable Development Commission (2009) Low Carbon Wales	This document has two objectives, to set out the process through which the Wales Spatial Plan can serve as a vehicle for transition to a low carbon Wales; whilst it also provides background information and suggestions to enable regions in Wales to select carbon reduction priorities for action.	The Welsh National Marine Plan should reflect the aims of Low Carbon Wales. The SA assessment criteria should reflect the Government's ambitions for low carbon energy in Wales.
Environment Agency (2010) Managing the Environment in a Changing Climate	The document sets out the Environment Agency's climate change risks and its plans to address them. The Agency's priorities are to address the risks that climate change poses to their work on flooding, coastal erosion, water resources, water quality, wildlife and habitats. Based on modelling outcomes, the Agency is most concerned about the impacts arising from changes to rainfall, sea-levels and temperature. Plans include: • Partnership working to ensure sound evidence underpins the Agency's decisions and advice. • Providing advice/guidance/data to others to help them adapt to climate change; and • Ensuring climate change is considered in everything the Agency do.	The Welsh National Marine Plan should account for and be resilient to the impacts of climate change. The SA assessment should take into account the effects of climate change on the Welsh National Marine Plan.
Wales Biodiversity Partnership (2010) Wales Biodiversity Framework	The document is a first step guide to: • Identifying the key practical, policy and legislative drivers for protecting, restoring and enhancing biodiversity in Wales; • Outlining the mechanisms for promoting positive action; • Explaining the roles & remit of those responsible for undertaking biodiversity action and; • Providing links to the tools and information to help maintain and improve biodiversity in Wales.	The Welsh National Marine Plan should protect and enhance biodiversity in Wales. The SA should include assessment criteria relating to biodiversity.
Welsh Government (2010) Climate Change Strategy for Wales	The Climate Change Strategy for Wales sets out the Welsh Government's policy intentions in relation to climate change and expands on the commitments set out in One Wales. The strategy re-iterates the One Wales commitments to 3 per cent annual carbon reductions and sets out, that by 2020, the Welsh Government expect to see: • Businesses have reduced energy costs and emissions; • Employees actively engaged in reducing emissions from their workplaces; • Consumers demanding low carbon goods and services and concerned about sustainability performance of businesses; • Growth of social enterprises and community businesses providing low carbon goods and services locally; and • More businesses operating, and people employed, in businesses that provide low carbon goods and services. The Progress Report provides a qualitative assessment of the progress made in delivering the sector actions.	The Welsh National Marine Plan should incorporate climate change mitigation and adaptation measures, e.g. reducing carbon emissions. The SA should include assessment criteria relating to mitigation and adaptation to climate change. Monitoring recommendations in the SA should reflect the 3 per cent year on year emission reduction target set by the Welsh Government.
Welsh Government (2010) Low Carbon Revolution – the Welsh Government Energy Policy Statement	This policy statement sets out the Welsh Government's ambitions for low carbon energy in Wales. It comprises the following aims/targets: • a step-change in the energy efficiency performance of all housing stock in Wales; • a significant proportion of Wales' energy to be generated locally or domestically; • to promote the optimum use of offshore wind around the coast of Wales in order to deliver a further 15 kWh/d/p of capacity by 2015/16;	The Welsh National Marine Plan should be aligned with the aims of policy statement. The SA should include assessment criteria that consider climate change adaptation and mitigation.

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	• to test the appropriateness and cost effectiveness of steps to exploit the tidal range of the Severn estuary; • to capture at least 10 per cent (8 kWh/d/p) of the potential tidal stream and wave energy off the Welsh coastline by 2025; • to have 4.5 kWh/d/p of installed onshore wind generation capacity by 2015/2017; • to support small scale hydro and geothermal schemes where they are environmentally acceptable in order to generate at least 1 kWh/d/p; • to deliver by 2020 up to 6 kWh/d/p in Wales of electricity from biomass – 50 per cent indigenous/50 per cent imported – and a heat potential of 2-2.5 kWh/d/p in Wales; • that any new fossil fuel plants should be carbon capture ready with fully developed plans for carbon capture and storage; and that these plants maximise efficiency through use of waste heat and co-firing where appropriate; and • to maximise the short and long-term benefits for Wales' economy and society of the move to a low carbon energy system.	
Welsh Government (2010) Towards Zero Waste One Wales: One Planet. The Overarching Waste Strategy Document for Wales	Towards Zero Waste is the overarching waste strategy for Wales. The key outcomes that the Strategy aims to achieve are: • a sustainable environment in which the impact of waste in Wales is reduced to within environmental limits by 2050; • a Fair and Just Society, in which citizens can achieve their full human potential and contribute to the wellbeing of Wales through actions on waste prevention, reuse and recycling; • a Prosperous Society with a sustainable, resource efficient economy. The strategy sets out a long-term aim of zero waste by 2050 and a medium term aim of achieving a high recycling society by 2025. This is supported by a range of recycling and other waste management targets including in relation to commercial and industrial waste.	The Welsh National Marine Plan should be aligned within the need to promote waste reduction, reuse and recycle ahead of landfill disposal. The SA should include assessment criteria reflecting the aspirations of the Strategy.
Welsh Government (2010) Valuing the Welsh Historic Environment	This document is a review and does not contain objectives or targets as such. It can be assumed however that the protection and enhancement of the historic environment is a key objective.	The Welsh National Marine Plan should be aligned with the need to protect and, where relevant, enhance the historic environment. The SA should include assessment criteria relating to the protection and enhancement of the historic environment.
HM Government (2010) Flood and Water Management Act 2010	The Flood and Water Management Act 2010 aims to provide better, more sustainable management of flood risk for people, homes and businesses, help safeguard community groups from unaffordable rises in surface water drainage charges and protect water supplies to the consumer. The Act will also implement recommendations made by Sir Michael Pitt in his review of the 2007 floods. This will include giving water companies new powers to better control non-essential domestic uses of water during periods of water shortage. Does not contain any targets.	The Welsh National Marine Plan should be in conformity with the Act. The SA should include objectives relating to flooding.
Defra (2010) Air Pollution: Action in a Changing Climate	This document highlights the health benefits that can be achieved through closer integration of air quality and climate change policies. Air pollution often originates from the same activities that contribute to climate change (notably transport and electricity generation), so linkages between these policy areas could help ensure that they are managed most effectively. Air quality/climate change co-benefits can be realised through actions such as promoting low-carbon vehicles and renewable sources of energy that do not involve combustion. The document aims to set ambitious but realistic air quality targets, and to ensure that climate and air quality targets are better aligned in future.	The Welsh National Marine Plan should aim to enhance air quality and reduce the emission of greenhouse gases. The SA assessment should include criteria relating to air quality and greenhouse gas emissions.
HM Government (2010) Air Quality Standards Regulations	These regulations transpose into English legislation the requirements of: • Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe, ; • Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic,	The Welsh National Marine Plan must ensure full compliance with the Regulations. The SA should take into account

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	cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air; and • Council Decision 97/101/EC on the exchange of information; The Regulations replace the existing Air Quality Standards Regulations 2007. The objective of the legislation is to improve air quality by reducing the impact of air pollution on human health and ecosystems. The legislation sets air quality standards for key pollutants and obliges member states to provide air quality plans demonstrating how air quality standards will be achieved and maintained when compliance is breached, legislation on ambient air quality has contributed to the improvement of air quality throughput the European Union. Although primarily applying to England, certain elements of the Regulations apply to the whole of the UK.	the effects of the Marine Plan on Air Quality.
HM Government (2010) The Energy Act 2010.	The Energy Act aims to deliver emissions cuts of 34 per cent from 1990 levels by 2020 and of 80 per cent by 2050, while maintaining security of supply, maximising economic opportunities and protecting vulnerable consumers. The key elements of the Act: • introduces a carbon capture and storage incentive to support the construction of up to four UK demonstration projects, to be chosen in a competition; • provides for mandatory social price support to reduce energy bills for the most vulnerable. This would replace the current voluntary agreement which expires in 2011; • increases the powers of the regulator, Ofgem, to deal with exploitation of electricity distribution constraints by generators; • increases Ofgem's power to fine companies; • clarifies Ofgem's objectives on tackling climate change, ensuring secure energy supplies and the role of measures other than competition in protecting the interests of consumers; • gives the Secretary of State the power to ban cross-subsidy between gas and electricity accounts.	The Welsh National Marine Plan should be compliant with the Act. The SA should include objectives relating to the use marine resources in energy production.
HM Government (2010) The Equality Act 2010	This Bill harmonises and extends existing discrimination law covering the 'protected characteristics' of age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex, and sexual orientation. Key areas as follows: • Provides powers to extend age discrimination protection outside the workplace; • Clarifies protection against discrimination by association, for example in relation to a mother who cares for her disabled child; • Extends protection from discrimination on the grounds of gender reassignment to school pupils; • Extends discrimination protection in the terms of membership and benefits for private clubs and associations; • Creates a unified public sector duty, intended to promote equality in public policy and decision-making, existing provisions being extended to the protected characteristics of sexual orientation, age and religion or belief, and proposes a new public sector duty related to socio-economic inequalities; • Provides for legislation requiring that employers review gender pay differences within their organisations and publish the results; • Provides for changes to the way that individual claims are enforced, and gives employment tribunals wider powers to make recommendations for the collective benefit of employees; • Allows a Minister to amend UK equality legislation to comply with European law without the need for primary legislation; and • Extends the period for which all-women shortlists may be used for parliamentary and other elections until 2030 and allows parties to reserve places on shortlists of candidates for people on the grounds of race or disability.	The Welsh National Marine Plan should be compliant with the Act. The SA should include objectives to assess the effects of the Plan on social equality issues.
Sustainable Development Commission (2010) Sustainable Development: The Key to Tackling Health Inequalities	The report addresses health inequalities resulting from other forms of inequity and unfairness within our society. The report aims for society to take account of the wider causes of illness, in order to promote good health across all socio-economic groups, and at the same time create a better environment for current and future generations. The links between health and sustainable development were found to be particularly strong in transport, food, green space and the built environment. The key findings were:	The Welsh National Marine Plan should support sustainable development and avoid contributing to the causes of health inequality.

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	• Climate change resulting from carbon and greenhouse gas emissions poses potentially catastrophic risks to human health and threatens to widen health inequalities between rich and poor populations in the UK; • Despite contributing the least to greenhouse gas emissions, low-income groups will suffer greater exposure to extreme weather risks, flooding and homelessness, whilst lacking insurance and other material resources to cope with the effects of climate change; • Promoting measures such as active travel, green spaces and healthy eating will yield co-benefits for both health and carbon emissions; and • Opportunities for healthy, low-carbon living should be distributed in ways that favour people with low incomes and so help to reduce their vulnerability to ill-health.	The SA assessment should include criteria relating to sustainable development and human health.
UK Marine Monitoring and Assessment Strategy (2010) Charting Progress 2: The State of UK Seas	Charting Progress 2 is a comprehensive report on the state of the UK seas. It describes progress made since the publication of Charting Progress in 2005, and provides key findings from UK marine research and monitoring for use by policy makers and others. It covers ocean processes, biodiversity and habitats, climate change and water quality. The key findings of the report are that: • All of the regions support, or are affected by, human activities but more remote regions such as the Atlantic North-West Approaches have little activity compared to regions such as the North Sea and Irish Sea, which are closer to centres of human population. • Each of the regions makes an important contribution to the economy and jobs and, in most cases, the environmental footprint of industry is small as a result of good regulation. • Despite a reduction in fishing effort or change in the nature of the fishing activities in several regions, fishing continues to be a widespread pressure on both target and non-target fish stocks and on significant areas of seabed sediment habitats. • Rising sea temperature and rising sea levels affect all regions. The threat of increasing coastal erosion and flooding is greatest in the south and east of England, where the land is sinking and where changes to the marine ecosystem associated with rising temperature are most apparent. • The threat due to pollution by hazardous substances and nutrients is greatest around the coasts of England and Wales although inputs are declining in most areas. • There are significant changes in the populations of seabirds and seals across the different regions but the causes are often unclear, and could be due to both human and environmental changes.	The Welsh National Marine Plan should have regard for the findings of the report, and seek to alleviate the key issues where possible. The SA assessment should include criteria relating to the key findings of the report, such as protection of biodiversity and habitats, improvements to water quality, coastal change, and socio-economic needs.
NERC (2010) Marine Environmental Mapping Programme (MAREMAP)	MAREMAP aims to improve seafloor and shallow geological mapping to achieve national objectives such as habitat mapping, Quaternary science, coastal and shelf sediment dynamics and the assessment of human impacts and geohazards in the marine environment. Better seabed maps are needed to ensure healthy and biologically diverse seas, sustainable use, efficient use of research resources, and for greater safety at sea. Using an array of high-tech equipment and survey techniques, MAREMAP is able to identify and survey areas of strategic, economic or biological importance. The data pool can be used to inform decisions about marine activities such as commercial fishing, renewable energy and raw material exploitation. By locating and mapping biologically vulnerable habitats, it can also outline the areas that need to be protected from such activities.	The Welsh National Marine Plan should draw on MAREMAP resources where applicable to help inform decisions on marine activities. The SA assessment should include criteria relating to the protection and enhancement of marine environment and economy.
BIS (2010) Local Growth: Realising Every Place's Potential (Local Growth White Paper)	This White Paper sets out the government's role in supporting locally driven growth, encouraging business investment and promoting economic development. For local communities this means ensuring that everyone has access to opportunities that growth brings and everyone is able to fulfil their potential. The majority of the proposals apply to England only. The key aims are to: • shift power to local communities and business, enabling places to tailor their approach to local circumstances; • promote efficient and dynamic markets, in particular in the supply of land, and provide real and significant incentives for places that go for growth; and • support investment in places and people to tackle the barriers to growth.	The Welsh National Marine Plan should support growth in local economies. The SA assessment should include criteria relating to enhancement of local economies.

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	The White Paper includes proposals for the creation of local enterprise partnerships (LEPs), which are partnerships between local authorities and businesses to establish the priorities for investment in roads, buildings and facilities in the area. As of January 2014, 39 LEPs are in place across England.	
Natural England (2010) Coastal Access: Natural England's Scheme	The Scheme sets out the methodology that Natural England will use when carrying out its Coastal Access Duty under the Marine and Coastal Access Act 2009, which will develop a new coastal path around England. The new right of access will be brought into effect at different times around the coast. The Scheme sets out the key principles of route alignment, which seek to balance the public interests, such as safety, convenience and continuity, with the interests of owners and occupiers in terms of income, privacy and operational needs. Natural England's audit of coastal paths (2009) also sets out existing access to the coast, and highlights areas where access is not currently available.	The Welsh National Marine Plan should avoid infringing on coastal access in England. The SA assessment should include criteria relating to community access and use of the coast.
HM Government (2010) Marine Strategy Framework Directive - putting in place the legal framework for implementation The Marine Strategy Regulations 2010	These regulations transpose the Marine Strategy Framework Directive into UK law.	The Welsh National Marine Plan should be compliant with the regulations. The SA should include objectives relating to the maintenance and improvement of the environmental status of marine waters.
DECC (2010) Marine Energy Action Plan	The Marine Energy Action Plan sets out an agreed vision for the marine energy sector to 2030. It outlines the actions required by both private and public sectors to facilitate the development and deployment of marine energy technology and intends to fulfil the vision set out in the UK Renewable Energy Strategy and Low Carbon Industrial Strategy. Covering wave, tidal range and tidal stream energy, the Action Plan has a UK-wide focus while respecting the diversity of policy making roles under the Devolution Settlement. Key recommendations of the Marine Energy Plan were made under five high level themes: • the need to prove the technology, particularly to stimulate long-term investor confidence; • providing the appropriate regulatory frameworks; • ensuring appropriate funding is in place for the sector (public and private); • co-operation and engagement across the sector and supply chain; and • the importance of interdependency of all these themes.	The Welsh National Marine Plan should support the development of marine energy. The SA assessment should include criteria relating to economic development and climate change.
Welsh Assembly Government (2010) National Transport Plan	The National Transport Plan sits alongside the Regional Transport Plans in delivering the Wales Transport Strategy. The National Plan details the Welsh Government's plan to reduce carbon emissions from transport and ensuring that transport within Wales can support sustainable economic development and social inclusion. The plan identifies: • 55 National Interventions; • 17 North-South Corridor Interventions; • 18 East-West Interventions in South West Wales; • 3 East-West Interventions North Wales; • 4 East-West Interventions Mid Wales. The interventions focus on road and rail infrastructure improvements for public and private transport.	The Welsh National Marine Plan should be aligned with the Wales Transport Strategy. The SA should include assessment criteria relating to developing and promoting transport in Wales.
Department for Regional Development (2010) Regional Development Strategy (RDS) 2035: Building a Better Future	The RDS provides an overarching strategic planning framework for the future development of Northern Ireland. It provides a spatial strategy which takes account of the economic ambitions and needs of the Region, and puts in place spatial planning, transport and housing priorities. Its visions and aims are as follows: • Support strong, sustainable growth for the benefit of all parts of the Region. • Strengthen Belfast as the regional economic driver and Londonderry as the capital of the North West. • Support our towns, villages and rural communities to maximise their potential.	The Welsh National Marine Plan should not have a detrimental effect on the development of Northern Ireland. The SA assessment should include criteria that support the RDS's aims, such as adaptation to climate

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	• Promote development which improves the health and well-being of communities. • Improve connectivity to enhance the movement of people, goods, energy and information between places. • Protect and enhance the environment for its own sake. • Take actions to reduce our carbon footprint and facilitate adaptation to climate change.	change and enhanced movement of goods.
Northern Ireland Executive (2010) Everyone's Involved: Sustainable Development Strategy	The Strategy is a high-level framework which should support and inform the decisions and actions taken by individuals, groups and organisations in progressing the sustainability agenda in Northern Ireland. It is supported by the Sustainable Development Implementation Plan, which sets out the practical actions for fulfilling the commitments in the Strategy. The Strategy contains six priority areas for action: • Building a dynamic innovative economy that delivers the prosperity required to tackle disadvantage and lift communities out of poverty; • Strengthening society such that it is more tolerant, inclusive and stable and permits positive progress in quality of life for everyone; • Driving sustainable, long-term investment in key infrastructure to support economic and social development; • Striking an appropriate balance between the responsible use and protection of natural resources in support of a better quality of life and a better quality environment; • Ensuring reliable, affordable and sustainable energy provision and reducing our carbon footprint; and • Ensuring the existence of a policy environment which supports the overall advancement of sustainable development in and beyond government.	The Welsh National Marine Plan should support sustainable development. The SA assessment should include criteria relating to sustainable development, such as protection of the environment and enhancement of local communities and economies.
HM Government (2010) Conservation of Habitats & Species Regulations 2010 (as amended 2011)	These regulations consolidate all the various amendments made to the Conservation (Natural Habitats_ Regulations 1994 in respect of England and Wales. The 1994 Regulations transposed Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) into national law. The Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites. Under the Regulations, competent authorities i.e. any Minister, government department, public body, or person holding public office, have a general duty, in the exercise of any of their functions, to have regard to the EC Habitats Directive.	The Welsh National Marine Plan must ensure full compliance with the Regulations. The SA should take into account the effects of actions in the Marine Plan on biodiversity
Welsh Government (2010) Economic Renewal: A New Direction	The document sets out the role the Welsh Government can play in providing the best conditions and framework to enable the private sector to grow. There will be a shift away from direct and generic support for companies, to a focus on creating the right environment for businesses to succeed. The five priorities for achieving the vision of economic renewal are: • Investing in high quality and sustainable infrastructure; • Making Wales a more attractive place to do business; • Broadening and deepening the skills base; • Encouraging innovation; and • Targeting the business support the Welsh Government offers.	The Welsh National Marine Plan should support the Welsh economy in a manner consistent with the strategy document. The SA should include objectives relating to enhancement of the Welsh economy.
Defra (2010) Adapting to Coastal Change: Developing a Policy Framework	This document was developed by Defra as a staging post in the development of a policy framework on adapting to coastal change. It: • Provides background on coastal change and an overview of the wider policy context on flood and coastal erosion risk management; • Confirms the introduction of a coastal erosion assistance grant as a fixed grant of £6,000 available to local authorities to help homeowners with the costs of demolishing a home at risk of loss to coastal erosion and some basic moving costs; • Sets out ideas and guidance for local authorities and other bodies on adapting to coastal change. In doing so, it draws on examples of existing practice, including those suggested through the consultation; and • Highlights where new and innovative approaches are being put to the test by the coastal change pathfinders (15 local authorities exploring a range of approaches to both building capacity and finding practical solutions).	The Welsh National Marine Plan should be developed to address issues of coastal change. The SA should include objective/guide questions relating to the provision of access to marine and coastal areas and protection of coastal areas from flooding and erosion.

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Defra (2010) Noise Policy Statement for England	This policy statement sets out the long term vision of government noise policy. It aims to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion. The policy applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise. Three policies are identified: • *Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development;* • *Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development; and* • *Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*	The Welsh National Marine Plan should not lead to increases in noise and disturbance to those living and working in Wales. The SA should include objectives relating to the protection and enhancement of human health.
HM Government (2010) Environmental Permitting (England and Wales) Regulations	The regulations provide a system for environmental permits and exemptions for industrial activities, mobile plant, waste operations, mining waste operations, water discharge activities, groundwater activities and radioactive substances activities. It also sets out the powers, functions and duties of the regulators.	The Welsh National Marine Plan should ensure compliance with the regulations. The SA framework should take protection of the environment and pollution prevention into account.
Welsh Government (2011) Understanding the risks, empowering communities, building resilience: The national flood and coastal erosion risk management strategy for Wales	Provides the national framework for flood and erosion risk management setting out the four overarching objectives required to achieve this for Wales: • reducing the consequences for individuals, communities, businesses and the environment from flooding and coastal erosion ; • raising awareness of and engaging people in the response to flood and coastal erosion risk; • providing an effective and sustained response to flood and coastal erosion events; • prioritising investment in the most at risk communities.	The Welsh National Marine Plan should seek to ensure that additional risk of flooding or coastal erosion does not arise. The SA framework should consider flooding and coastal erosion.
Welsh Government (2011) Rural Development Plan for Wales (2007-2013 and 2014-2020)	The Rural Development Plan sets out those measures to be implemented that are in line with the strategic priorities set out in the Wales Annex of the UK National Strategic Plan. These measures include those: • aimed at promoting knowledge and improving human potential; • aimed at restructuring and developing physical potential and promoting innovation; • targeting the sustainable use of agricultural land; • targeting the sustainable use of forestry land; • to diversify the rural economy; and • to improve the quality of life in rural areas.	The Welsh National Marine Plan should be aligned with the Rural Development Plan for Wales. The SA assessment should include assessment criteria relating to the protection and enhancement of rural areas.
HMG, NI Executive, Scottish Government, Welsh Government (2011) UK Marine Policy Statement	The Marine Policy Statement (MPS) sets out the framework for preparing Marine Plans and taking decisions affecting the marine environment, supporting the delivery of the following high level marine objectives: • Achieving a sustainable marine economy; • Ensuring a strong, healthy and just society; • Living within environmental limits; • Promoting good governance; • Using sound science responsibly. It provides detailed considerations on topics such as ecology, air quality, climate change, seascape, coastal change, water quality and noise. It also sets out the policy objectives for the key activities that take place in the marine environment, including energy production, ports and shipping, marine aggregates, dredging, telecommunications, fisheries, aquaculture and tourism. It does not contain any targets.	The Welsh National Marine Plan should take into account the objectives of the Marine Policy Statement. The SA assessment should include criteria relating to the topics addressed in the Marine Policy Statement.

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Welsh Government (2011) Policy Statement: Preparing for a Changing Climate	This Policy Statement sets out how the Welsh Government will implement relevant provisions of the Climate Change Act 2008. It provides technical advice on how to assess climate risks and how to develop adaptation plans and in this context Welsh Water is identified as a key reporting authority.	The Welsh National Marine Plan should incorporate climate change mitigation and adaptation measures where appropriate. The SA should include assessment criteria relating to mitigation and adaptation to climate change.
Welsh Government (2011) Welsh Government Strategic Policy Position on Water	The Welsh Government published its first Strategic Policy Position Statement on Water in 2009 with the purpose of providing Ofwat, the water companies, regulators and other interested parties a clear steer on the Welsh Government's priorities for water in the context of the water price review. This revised Statement updates the position reflecting key developments over the last two years and highlights areas that will be a priority in the future in the context of the following themes: • Customers at the heart of delivery; • Working together and planning for the future; • Drinking water quality; • Charging and metering; • Protecting the environment; • Meeting obligations; • Effective management of water resources in Wales; • Twenty first century drainage systems; • Market reform and competition; • Secure supplies and building up resilience; and • Global water responsibility. The Welsh Government is currently producing a Water Strategy for Wales, a draft version of which has been published for consultation in April 2014 (the final version is expected to be published later in 2014).	The Welsh National Marine Plan should be closely aligned to Welsh Government's Policy Position Statement on Water. The SA assessment framework should include assessment criteria reflecting the aspirations of the policy positions.
Welsh Government (2011) Marine Renewable Energy Strategic Framework	The framework project aimed to support policy development through an investigation into marine renewable energy resources in Welsh waters and the potential renewable capacity available. It also reviewed several scenarios to assess the sustainability of various marine renewable resources.	The Welsh National Marine Plan should support marine renewable energy. The SA assessment should include criteria relating to improvements to local economies and mitigation of climate change.
Department of Transport (2011) National Policy Statement for Ports	This National Policy Statement (NPS) provides the framework for decisions on proposals for new port development. It is also a relevant consideration for the Marine Management Organisation, which decides other port development proposals, and for local planning authorities where they have a role to play. It also applies to associated development including road and rail links, for which consent is sought alongside that for the principal development. The policy statement sets out the Government's view on the need for new port infrastructure and explains to planning decision-makers the approach they should take to proposals. It also identifies the main issues need to be addressed to ensure that future development is fully sustainable.	The Welsh National Marine Plan must ensure full compliance with this policy statement. The SA could include objectives relating to the provision of transport and shipping capacity.
Defra (2011) Air Quality Plans for the Achievement of EU Air Quality Limit Values for Nitrogen Dioxide (NO_2) in the UK: List of UK and National Measures	The Plans set out over 90 key UK and National measures that will help to achieve the nitrogen dioxide (NO_2) limit values in the EU Ambient Air Quality Directive (2008/50/EC). The measures relate to freight, rail, vehicle standards, shipping and industrial pollution, among others. The marine action relates to the undertaking of survey and inspection work to ensure NO_2 emissions meet the regulatory requirements. The measures for Wales alone relate to sustainable travel and research.	The Welsh National Marine Plan should support the reduction of pollutant emissions from marine activities. The SA assessment should include criteria relating to air quality.
DECC (2011) National Policy	The energy National Policy Statements (NPSs) set out national policy against which proposals for major energy projects will	The Welsh National Marine Plan

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Statements for Energy Infrastructure	be assessed and decided on by the Infrastructure Planning Commission. The following six NPSs have been designated: - Overarching NPS for Energy (EN1); - Fossil Fuel Electricity Generating Infrastructure NPS (EN2); - Renewable Energy Infrastructure NPS (EN3) ; - Gas Supply Infrastructure & Gas and Oil Pipelines NPS (EN4); - Electricity Networks Infrastructure NPS (EN5); - Nuclear Power Generation NPS (EN6). The Overarching NPS for Energy sets out that the purpose of the NPSs is to develop a clear, long-term policy framework which facilitates investment in the necessary new infrastructure (by the private sector) and in energy efficiency. The NPS highlights that the construction, operation and decommissioning of this infrastructure can lead to increased demand for water, involve discharges to water and cause adverse ecological effects resulting from physical modifications to the water environment. The NPSs expect applicants to undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment. One site in Wales is identified as potentially suitable site for the deployment of a new nuclear power station (Wylfa on Anglesey). Hinkley Point (Somerset), Oldbury (Gloucestershire), Heysham (Lancashire) and Sellafield (Cumbria) are also identified. These sites are not located in Wales, but are adjacent to the Severn Estuary and the Irish Sea. The NPSs reiterate and are underpinned by the target to cut greenhouse gas emissions by at least 80 per cent by 2050, compared to 1990 levels.	may need to consider the potential impact of major energy proposals. This may include the potential development of nuclear power stations at Wylfa and further afield at Oldbury, Hinkley Point, Heysham and Sellafield. The SA should consider the cumulative effects of the Welsh National Marine Plan and any major energy proposals.
Environment Agency (2011) The National Flood and Coastal Erosion Risk Management Strategy for England	This strategy describes what needs to be done by all organisations involved in flood and coastal erosion risk management. It will support local decision-making and engagement in FCERM, making sure that risks are managed in a co-ordinated way across catchments and along each stretch of coast. This includes the development of local flood risk management strategies by lead local flood authorities, as well as a strategic overview of all sources of flooding and coastal erosion. The strategy encourages more effective risk management by enabling people, communities, business, infrastructure operators and the public sector to work together to: • ensure a clear understanding of the risks of flooding and coastal erosion, nationally and locally, so that investment in risk management can be prioritised more effectively; • set out clear and consistent plans for risk management so that communities and businesses can make informed decisions about the management of the remaining risk; • manage flood and coastal erosion risks in an appropriate way, taking account of the needs of communities and the environment; • ensure that emergency plans and responses to flood incidents are effective and that communities are able to respond effectively to flood forecasts, warnings and advice; • help communities to recover more quickly and effectively after incidents.	The Welsh National Marine Plan should avoid contributing to flood and coastal erosion risk in England. The SA assessment should include criteria relating to flooding and coastal erosion.
English Heritage (2011) Coastal Estate Risk Assessment	This risk assessment was undertaken to assess the likely impacts of accelerated coastal erosion and increasingly frequent and severe flood events on the English Heritage portfolio of historic properties. In order to make an assessment of the level of risk, projections of future coastal erosion and information about areas potentially at risk of flooding, supplied principally by the Environment Agency, were compared with data on the English Heritage coastal estate. Of the fifty four EH coastal estate historic properties included in this assessment, forty-eight (89% of the total) were recognised to be at risk of flooding, while thirty-eight (70% of the total) were deemed to be potentially at risk of coastal erosion. This work will inform future management of the coastal estate properties, helping to ensure that any predicted damage and/or loss from flooding and coastal erosion can be mitigated, and action taken, where feasible, to minimise potential risks. The risk assessment will also allow a prioritisation of relevant maintenance and protection measures, where possible and affordable.	The Welsh National Marine Plan should avoid contributing to flooding and coastal erosion that may affect sites in England. The SA assessment should include criteria relating to flooding and coastal erosion.
English Heritage (2011) Maritime and Marine Historic Environment	The research framework aims to identify the state of our knowledge on the maritime and marine historic environment in England; identify strengths to build upon; and set out key research questions and areas for future research projects to pursue.	The Welsh National Marine Plan should aim to enhance knowledge

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Research Framework	The volume contains discussion of overarching questions central to research into the maritime and marine historic environment, concerning chronologies, marine geoarchaeology and investigative methodologies, archives and conservation. In addition is has nine period-specific chapters: Palaeolithic, Mesolithic, Neolithic and Early Bronze Age, Later Bronze Age and Pre-Roman Iron Age, Roman, Early Medieval, High to Post Medieval, Early Modern, and Modern (c. 1850-2000). Each of which address five key themes, which are consistent throughout the volume: coastal change, maritime settlement and marine exploitation, seafaring, maritime networks, maritime identities and perceptions of maritime space.	of the historic marine environment, where appropriate. The SA assessment should include criteria relating to cultural marine heritage.
English Heritage (2011) Seeing History in the View	The document presents a method for understanding and assessing heritage significance within views. The method can be applied to any view that is significant in terms of its heritage values. It provides guidance for an initial baseline analysis of the heritage significance in any selected view, followed by assessment of the impact on that significance of particular development proposals. The existence of heritage views, often containing well-known landmarks and landscapes, enriches daily life, attracts visitors and helps communities prosper. The view can also contribute to the setting of heritage assets.	The Welsh National Marine Plan should protect heritage views and the setting of heritage assets. The SA assessment should include criteria relating to the protection of landscapes and seascapes.
English Heritage (2011) The Setting of Historic Assets	This document sets out English Heritage guidance on managing change within the settings of heritage assets, including archaeological remains and historic buildings, sites, areas, and landscapes. It is intended to assist those involved with managing development that may affect the setting of heritage assets. The document is in the process of revision following the publication of the 2012 National Planning Policy Framework.	The Welsh National Marine Plan should ensure that marine activities do not affect the setting of heritage assets. The SA assessment should include criteria relating to landscapes, seascapes and the protection of cultural heritage.
UK National Ecosystem Assessment (2011) UK National Ecosystem Assessment: Understanding Nature's Value to Society	The report is an independent assessment of the state and value of the UK's natural environment and ecosystem services, identifying the drivers of change observed in the natural environment and the services it has provided over the last 60 years, and what may drive change in the future. It includes an investigation into the monetary and non-monetary value to the economy, society and individuals from various ecosystem services, including how some of these may change in future. The report has six key messages and findings: • The natural world, its biodiversity and its constituent ecosystems are critically important to our well-being and economic prosperity, but are consistently undervalued in conventional economic analyses and decision making. • Ecosystems and ecosystem services, and the ways people benefit from them, have changed markedly in the past 60 years, driven by changes in society. • The UK's ecosystems are currently delivering some services well, but others are still in long-term decline. Marine fisheries are highlighted as being in a reduced or degraded state, among others. • The UK population will continue to grow, and its demands and expectations continue to evolve. This is likely to increase pressures on ecosystem services in a future where climate change will have an accelerating impact both here and in the world at large. • Actions taken and decisions made now will have consequences far into the future for ecosystems, ecosystem services and human well-being. It is important that these are understood, so that we can make the best possible choices, not just for society now but also for future generations. • A move to sustainable development will require an appropriate mixture of regulations, technology, financial investment and education, as well as changes in individual and societal behaviour and adoption of a more integrated, rather than conventional sectoral, approach to ecosystem management. A follow-up study in 2013 has assessed the value of cultural ecosystem services from marine conservation areas to users such as sea anglers, divers and snorkelers.	The Welsh National Marine Plan should take the key findings of the assessment into account, and support the protection of the natural environment and ecosystem services. The SA assessment should include criteria relating to protection and enhancement of the natural environment, ecosystem services, and socio-economic needs.
Defra (2011) The Natural Choice: Securing the Value of Nature (Natural Environment White Paper)	The aim of the White Paper is to set out a framework for England for protecting and enhancing the goods, services and amenity value that nature provides. It addresses protection and improvement of the natural environment, growing a green economy, reconnecting people and nature, international and EU leadership and monitoring and reporting.	The Welsh National Marine Plan should take the White Paper actions into account and seek to

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	The White Paper set out 92 specific commitments for action, 58 of which were completed by November 2013 and many others were underway.	enhance the value of nature. The SA assessment should include criteria relating to protection and enhancement of ecosystem services.
Natural England and JNCC (2011) Marine Conservation Zone (MCZ) Project	The Marine Conservation Zone Project was set up in 2008 and led by the Joint Nature Conservation Committee (JNCC) and Natural England to identify and recommend Marine Conservation Zones (MCZs) to Government. Marine Conservation Zones (MCZs) are a type of Marine Protected Area. They protect areas that are important to conserving the diversity of nationally rare or threatened habitats and/or species and those places containing habitats and/or species that are representative of the biodiversity in our seas. The MCZ Project consisted of four regional MCZ projects covering the south-west (Finding Sanctuary), Irish Sea (Irish Sea Conservation Zones), North Sea (Net Gain) and south-east (Balanced Seas). These regional MCZ projects worked with a range of sea users and interest groups to identify MCZs within their regions. Defra has since designated 27 new MCZs in English inshore and offshore waters in November 2013, and announced plans to designate further MCZs across the next three years. In Wales, upon commencement of Part V of the Marine and Coastal Access Act 2009, which was agreed January 2014, the Marine Conservation Zone (MCZ) legislation will replace the Marine Nature Reserve (MNR) legislation and so MNRs will become MCZs.	The Welsh National Marine Plan should have regard of the presence of MCZs and the need for marine protection. The SA assessment should include criteria relating to protection of habitats and biodiversity.
HM Treasury (2011) UK Plan for Growth	The Plan for Growth presents a programme of structural reforms to remove barriers to growth for businesses and equip the UK to compete in the global economy. These reforms span a range of policies including improving UK infrastructure, cutting red tape, root and branch reform of the planning system and boosting trade and inward investment, to achieve the government's four ambitions for growth: • creating the most competitive tax system in the G20; • encouraging investment and exports as a route to a more balanced economy; • making the UK the best place in Europe to start, finance and grow a business; and • creating a more educated workforce that is the most flexible in Europe.	The Welsh National Marine Plan should have regard for the plan's ambitions for the economy and workforce. The SA assessment should include criteria relating to socio-economic needs.
DECC (2011) Carbon Plan: Delivering our Low Carbon Future	The Carbon Plan sets out how the UK will achieve decarbonisation within the framework of energy policy: to make the transition to a low carbon economy while maintaining energy security, and minimising costs to consumers, particularly those in poorer households. It sets out policies for meeting the first four carbon budgets, and includes proposals for energy efficiency, heating, transport and industry. Specific actions relate to secure and low carbon energy, reducing energy in homes and communities, reducing business and industrial emissions, and low carbon transport.	The Welsh National Marine Plan should support the UK in meeting the carbon budgets. The SA assessment should include criteria relating to greenhouse gas emissions and climate change.
DECC (2011) UK Renewable Energy Roadmap	The Renewable Energy Roadmap outlines the UK's framework for delivering 15% of energy demand from renewable sources by 2020 (as mandated by the EU Renewable Energy Directive). Although starting from a low-level of renewable generation, eight technologies were identified that have the potential to generate 90% of the renewable target by 2020. These are: onshore wind, offshore wind, marine energy, biomass electricity, biomass heat, ground source and air source heat pumps and renewable transport. The Roadmap includes an indication from the Welsh Government that it has the potential to double the amount of renewable energy consumption by 2025, and to deliver 4GW of power from marine energy. The 2013 update highlights that offshore wind and marine energy have the potential to make significant contributions to meeting the UK's future energy needs.	The Welsh National Marine Plan should support offshore and marine renewable energy. The SA assessment should include criteria relating to improvements to local economies and mitigation of climate change.
Defra (2011) Mainstreaming Sustainable Development	This document sets out the Government's vision for mainstreaming sustainable development. It sets out measures across a variety of areas, including the following topics: • Embedding sustainable development in Government departments; • Supporting a Green Economy;	The Welsh National Marine Plan should contribute towards sustainable development. The SA assessment should include

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	• Tackling climate change; • Protecting and enhancing the natural environment; • Improving wellbeing; and • Building a 'Big Society'. These refreshed commitments build on the principles that underpinned the UK's 2005 Sustainable Development Strategy, by recognising the needs of the economy, society and the natural environment, alongside the use of good governance and sound science.	criteria relating to sustainable development, such as the economy, the environment and society.
Welsh Government (2012) Planning Policy Wales	Planning Policy Wales sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes and procedural advice given in National Assembly for Wales / Welsh Office circulars. It sets out key policy objectives for Local Development Plans (LDPs) in Wales which reflect the sustainable development agenda.	The Welsh National Marine Plan will need to be aligned with Planning Policy Wales. The SA should include assessment criteria relating to sustainable development.
Welsh Government (2012) Sustaining a Living Wales: A Green Paper on a New Approach to Natural Resource Management in Wales	This Green Paper sets out, and seeks views on, proposals for the management and regulation of the environment in Wales. The consultation will principally inform the proposed Environment and Planning Bills. The central proposal is to move to an ecosystem approach to environmental regulation and management which is expected to: • improve the resilience and diversity of the environment and its supporting biodiversity; • provide simpler and more cost-effective regulation; • offer greater certainty for decision-makers. In this context, the Green Paper is underpinned by the aim to "ensure that Wales has increasingly resilient and diverse ecosystems that deliver environmental, economic and social benefits now and in the future."	The Welsh National Marine Plan should consider resource use and management in Wales. The SA should include assessment criteria relating to sustainable resource use.
Welsh Government (2012) Welsh Government: Proposals for a Sustainable Development Bill	The Sustainable Development Bill aims to strengthen the Welsh Government's approach to sustainable development and change their existing commitments to a legal duty. This consultation paper includes proposals to: • Legislate to make sustainable development the central organising principle of the Welsh Government and public bodies in Wales; and • Create an independent sustainable development body for Wales. The consultation will inform the Sustainable Development Bill White Paper prior to introduction of the Bill itself which is anticipated to take place in Autumn 2013.	The Welsh National Marine Plan should be aligned with the principles of sustainable development. The SA should help to deliver sustainable development through the balanced assessment of the Welsh National Marine Plan.
Welsh Government (2012) Preparing Wales for Climate Change. Energy Wales A Low Carbon Transition	The document aims to enhance the economic, social and environmental wellbeing of the people and communities of Wales – to achieve a better quality of life for this and future generations by creating a sustainable, low carbon economy for Wales. This will be done by taking full advantage of the transition to a low carbon economy to secure a wealthier, more resilient and sustainable future for Wales.	The Welsh National Marine Plan should support a transition to a low carbon economy The SA should include assessment criteria that consider climate change adaptation and mitigation.
DCLG (2012) National Planning Policy Framework	The National Planning Policy Framework sets out the Government's planning policies for England and how these are expected to be applied. At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development, which should be seen as a golden thread running through both plan-making and decision-taking. For decision-taking this means: - approving development proposals that accord with the development plan without delay; and - where the development plan is absent, silent or relevant policies are out of date, granting permission unless: ▪ any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole; or ▪ specific policies in this Framework indicate development should be restricted.	There is no direct relationship to the Welsh National Marine Plan, although it should be noted that Local Authorities in England must comply with this. The SA assessment framework should ensure that consideration is given to the principles of sustainable development.

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	This does not apply to local authorities in Wales but applies to local authorities in England that border or lay in close proximity to Welsh Waters.	
Defra (2012) Marine Strategy Part 1: UK Initial Assessment and Good Environmental Status	This is the first part of the development of a UK Marine Strategy, which supports the EU Marine Strategy Framework Directive's requirements for member states to achieve 'Good Environmental Status' (GES) for their seas by 2020. Achieving 'good' environmental status means protecting the marine environment; preventing its deterioration and restoring it where practical; and using marine resources sustainably. This initial assessment provides an analysis of the essential features, characteristics and environmental status of UK marine waters, together with an analysis of economic and social use of UK marine waters and predominant pressures and their impacts. It also presents GES characteristics and targets, which relate to biodiversity, contaminants, litter, energy and eutrophication, among others. The second part of the strategy, on how progress towards achieving GES is monitored, is being consulted on in early 2014.	The Welsh National Marine Plan should support progress to Good Environmental Status for the marine environment. The SA assessment should include criteria relating to GES priorities such as sustainable resource use, pollution prevention and protection of biodiversity.
Defra (2012) National Policy Statement for Waste Water	This National Policy Statement (NPS) sets out Government policy for the provision of major waste water infrastructure. It will be used by the Infrastructure Planning Commission (IPC) to guide its decision making on development consent applications for waste water developments that fall within the definition of Nationally Significant Infrastructure Project (NSIP) as defined in the Planning Act 2008. As well as considering the general need for new waste water infrastructure, this NPS covers two NSIPs which have been assessed as required to meet this need although these are not within Wales or neighbouring areas and are therefore unlikely to influence, or be influenced by, the Welsh National Marine Plan.	The Welsh National Marine Plan should consider any unforeseen NSIP proposals that come forward prior to adoption which may affect marine resources or the marine environment in Wales. The SA should consider the cumulative effects of the Welsh National Marine Plan and any unforeseen NSIP proposals that come forward which may affect marine resources or the marine environment in Wales.
Committee on Climate Change (2012) Scope of carbon budgets: Statutory advice on inclusion of international aviation and shipping	The advice document from the Committee on Climate Change presents the recommendation that international aviation and shipping should be included in the UK carbon budgets and in the 2050 target to reduce greenhouse gas emissions by 80% below 1990 levels. Inclusion of these sectors would create a more transparent and comprehensive approach. It sets out potential methodologies for estimating international shipping emissions, such as bunker fuel purchases, global trade shares, and ship movements. The document also presents options for when to include international aviation and shipping in the budgets and targets. These sectors have not yet been included in the budgets, and the Government deferred any decisions on this matter in late 2012.	The Welsh National Marine Plan should have regard for the fact that international shipping could be brought into carbon budgets and targets. The SA assessment should include criteria relating to greenhouse gas emissions and climate change.
Defra (2012) UK Climate Change Risk Assessment: Government Report	The 2012 risk assessment highlights the risks posed by climate change over the next 80 years. It includes actions already in place to manage the risks identified, and outlines UK Government plans for the future. This includes the main priorities for adaptation in the UK under five key themes: Natural Environment; Buildings & Infrastructure; Health & Wellbeing; Business & Services; and Agriculture & Forestry.	The Welsh National Marine Plan should contribute to reducing the risks posed by climate change. The SA assessment should include criteria relating to climate change mitigation and adaptation.
JNCC and Defra (2012) UK Post-2010 Biodiversity Framework	The framework sets out UK priorities for work on the Convention on Biological Diversity, and follows on from the 1994 UK Biodiversity Action Plan. It sets out a vision that, 'by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people'. The goals and activities to meet this aim are grouped under the categories of International / European context; facilitating and contributing to common country approaches and solutions; evidence provision; and reporting.	The Welsh National Marine Plan should support the protection and enhancement of biodiversity. The SA assessment should include criteria relating to the protection of species and habitats.

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Welsh Government (2013) Partnership for Growth: The Welsh Government Strategy for Tourism 2013 – 2020	The strategy identifies the priorities to deliver a prosperous and competitive tourism industry in Wales. It sets out how Welsh tourism will be promoted and communicated more effectively and how investment will be directed to improve quality and choice for the consumer.	The Welsh National Marine Plan should take account of the benefits that tourism can bring to Wales. The SA should include assessment criteria relating the importance of tourism and/or recreation.
Welsh Government (2013) National Flood and Coastal Erosion Strategy for Wales	This document sets out the Welsh Government's policies on flood and coastal erosion risk management. The strategy sets four overarching objectives for managing flood and coastal erosion risk in Wales: • reducing the consequences for individuals, communities, businesses and the environment from flooding and coastal erosion; • raising awareness of and engaging people on flood and coastal erosion risk; • providing an effective and sustained response to flood and coastal erosion events; and • prioritising investment in the most at risk communities	The Welsh National Marine Plan should reflect the actions identified within the Strategy for water companies. The SA should include an objective/ guide question(s) relating to flood and coastal erosion risk management.
Welsh Government (2013) Wales Marine and Fisheries Strategic Action Plan	The objective of the Action Plan is to provide a framework for clean, healthy, safe, productive and biologically diverse seas. It aims to safeguard environmental resources; use them as a driver for economic growth; and help to ensure that the Welsh fishing industry receives the level of support it needs in order to grow and become more competitive. The actions within the plan cover four key areas: • A planned approach to guide the management of Welsh seas • Encourage sustainable, local and shared management of all marine activities in Wales • Ensure better evidence and understanding of our marine life • Increase profitability in the marine and fisheries industry The plan addresses marine planning and licensing, marine protected areas and sustainable fisheries.	The Welsh National Marine Plan should be aligned with the actions in the Wales Marine and Fisheries Strategic Action Plan. The SA should include assessment criteria relating to the protection and enhancement of the marine environment and fisheries.
English Heritage (2013) Strategic Environmental Assessment, Sustainability Appraisal and the Historic Environment	The document sets out English Heritage's guidance on undertaking SEAs and SAs, with a focus on how to approach the assessment of impacts on the historic environment. This includes example indicators and assessment criteria, in addition to an overview of the SA process.	The Welsh National Marine Plan should support the protection and enhancement of cultural heritage. The SA assessment should include criteria relating to the protection and enhancement of cultural heritage.
Northern Ireland Assembly (2013) Marine Act (Northern Ireland) 2013	The Marine Act introduces a management framework for Northern Ireland's marine waters based on a new system of marine planning. It enables the Department of the Environment to prepare a marine plan for all for part of the inshore region. A marine plan will bring together information and policies on the multiple uses of the marine area, together with spatial and temporal data for the water column and the sea bed, using maps where appropriate. As a strategic tool it will allow decisions to be made about the best use of the marine area, in order to maximise compatibility of activities and achieve sustainable development. The Act also enables the Department to designate areas as marine conservation zones. MCZs may be designated for various purposes including the conservation of marine species and habitats, taking fully into account any economic, cultural or social consequences of doing so. The Act also allows the Department to make byelaws to protect MCZs.	The Welsh National Marine Plan should be aligned with the Act where cross-boundary effects may occur. The SA assessment should include criteria relating to sustainable development and the protection of the marine environment.
Department of the Environment (2013) Air Pollution in Northern Ireland 2012	The report presents information on local air quality monitoring, including the key results of monitoring from throughout the region during 2012. It sets out how air pollution in Northern Ireland has changed over time, and covers spatial patterns in pollution. It also includes actions to improve local air quality. Key sources of pollution included industrial and domestic fuel burning and transport.	The Welsh National Marine Plan should support the reduction of air pollution. The SA assessment should include criteria on the reduction of pollutant emissions from marine activities.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
Defra (2013) The National Adaptation Programme: Making the Country Resilient to a Changing Climate	The National Adaptation Programme sets out what government, businesses and society are doing to become more climate-ready. It contains a mix of policies and actions to help adapt successfully to future weather conditions, by dealing with the risks and making the most of the opportunities. It also aligns risks identified in the Climate Change Risk Assessment to actions being undertaken (or to be undertaken) and the timescales according to each theme. It looks most closely at the most urgent risks. The NAP is divided into chapters looking at the: • Built environment, • Infrastructure, • Healthy and resilient communities, • Agriculture and forestry, • Natural environment, • Business and local government.	The Welsh National Marine Plan should support adaptation to climate change and increased resilience. The SA assessment should include criteria relating to climate change
Welsh Government (2013) The Historic Environment Strategy for Wales	This strategy summarises the areas which the Welsh Government will prioritise for action during the course of the next three and a half years. The strategy will protect Wale's heritage, whilst encouraging public access, enjoyment and participation. The Strategy sets out the role of the historic environment in delivering tangible social, economic and environmental benefits for Welsh communities. It has been produced ahead of the Heritage Bill, due to be introduced in 2014. The Strategy aims to further develop the economic role of heritage in Wales and maximise educational, training and leisure opportunities.	The Welsh National Marine Plan should protect and enhance the historic environment of Wales. The SA should include assessment criteria relating to protection and enhancement of the historic environment.
Department for Culture, Media & Sport (2013) Scheduled Monuments & Nationally Important but Non-Scheduled Monuments	The statement sets out Government policy on the identification, protection, conservation and investigation of nationally important ancient monuments for the benefit of current and future generations, including Scheduled Monuments. Together with the domestic legal framework that underpins them, this policy helps to fulfil the obligations under the terms of the 1992 European Convention on the Protection of the Archaeological Heritage and the 1972 Convention Concerning the Protection of the World Cultural and Natural Heritage. It addresses the requirements for identifying & protecting nationally important monuments and conserving & investigating Scheduled Monuments. The document also sets out the principles of selecting Scheduled Monuments and the scope of scheduling.	The Welsh National Marine Plan should ensure the protection of ancient monuments. The SA assessment should include criteria relating to the protection of cultural heritage.
Department of the Environment (2013) Northern Ireland Marine Litter Strategy	The Northern Ireland Marine Litter Strategy is a co-ordinated response which aims to address the problem of marine litter at a local level by reducing the levels of litter entering the sea and removing litter which is already there. The Strategy contains measures designed to change attitudes and behaviour towards littering. This will be done through education, adequate provision of bins, fining offenders and collecting data on the extent of the problem.	The Welsh National Marine Plan should support the protection of the marine environment through the reduction in waste and contaminants entering the sea. The SA assessment should include criteria relating to protection and enhancement of the marine environment and water quality.
Department of the Environment (2013) Northern Ireland Planning Policy Statement 2: Natural Heritage	This PPS sets out Northern Ireland's planning policies for the conservation, protection and enhancement of our natural heritage. For the purpose of this Planning Policy Statement, natural heritage is defined as 'the diversity of our habitats, species, landscapes and earth science features'. The policies set out relate to international, national and local protected sites; species protected by law; important habitats; and Areas of Outstanding Natural Beauty.	The Welsh National Marine Plan should aim to protect habitats and protected areas. The SA assessment should include criteria on the protection of natural heritage features, such as habitats, landscapes and species.
Department of the Environment (2014) The Northern Ireland Climate	The Adaptation Programme sets out what the Government in Northern Ireland is doing to become more resilient to the risks and opportunities identified in the Climate Change Risk Assessment (CCRA) for Northern Ireland (2012). It provides ongoing	The Welsh National Marine Plan should support the mitigation of

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Change Adaptation Programme	and planned government action in four primary areas, flooding, water, natural environment and agriculture and forestry. The Adaptation Programme is divided into two parts. The first part provides the background to climate change, climate change adaptation in a global context and describes climate change adaptation activities already undertaken by departments. The second section sets out the strategic direction and objectives in preparing for the impacts of climate change. It also establishes a range of adaptation activities and actions (policies and proposals) for the next five years. The five objectives identified to support the path towards adaptation are: • Fulfil the statutory duties as set out under the UK Climate Change Act 2008. • Work in partnership across Government and with relevant stakeholders to strengthen and develop policies, strategies and actions which will cope with the threats and exploit the opportunities identified by the CCRA for Northern Ireland. • Raise awareness of the likely effects of climate change and the need for adaptation action. • Promote and support the enhancement of scientific evidence and sector specific data collection that will address climate change adaptation need. • Engage with other administrations at national and international level, in order to ensure the sharing of climate change adaptation best practice.	climate change and adaption to the effects of a changing climate. The SA assessment should include criteria relating to climate change mitigation and adaption.
JNCC (ongoing) Geological Conservation Review (GCR)	The Geological Conservation Review (GCR) is major initiative that began in 1977 to identify and describe the most important geological sites in Britain. These sites display sediments, rocks, fossils, and features of the landscape that make a special contribution to our understanding and appreciation of Earth science and the geological history of Britain. After over two decades of site evaluation and documentation, there is now an inventory of over 3000 GCR sites. The GCR sites form the basis of statutory geological and geomorphological site conservation in Britain. A series of 45 volumes has been published to provide a public record of the features of interest and importance at localities already notified or being considered for notification as 'Sites of Special Scientific Interest' (SSSIs).	The Welsh National Marine Plan should support the protection of geologically important sites. The SA assessment should include criteria relating to the protection of SSSIs and of geologically important sites.
Maritime & Coastguard Agency (ongoing) Civil Hydrography Programme	The Civil Hydrography Programme is in place to systematically survey the waters around the UK. Under the programme, commercial contracts are let regularly to ensure accurate hydrographic information is gathered for updating the nation's nautical charts and publications. Survey areas are prioritised using a contemporary risk analysis methodology, and exclude areas within Port Authority limits. Currently, three survey workstreams drive data acquisition under the programme: • Shallow water: predominantly 0 to 40m. • Shallow to medium water: 0 to 200m. • Routine resurvey: navigationally critical areas with mobile seabed.	The Welsh National Marine Plan should take account of the programme's data and findings where relevant, and recognise the need for marine surveys. The SA assessment should include criteria relating to the ongoing ability to undertake marine activities, such as mapping.
Natural England (ongoing) National Character Area Profiles	National Character Areas (NCAs) divide England into 159 distinct natural areas, with boundaries that follow natural lines in the landscape rather than administrative boundaries. Each is defined by a unique combination of landscape, biodiversity, geodiversity and cultural and economic activity. The NCA profiles are guidance documents which include a description of the key ecosystem services provided in each character area and how these benefit people, wildlife and the economy. They identify potential opportunities for positive environmental change and provide the best available information and evidence as a context for local decision making and action. Natural England is currently revising its National Character Area profiles to make environmental evidence and information easily available to a wider audience.	The Welsh National Marine Plan should have regard for the content of the NCA profiles to ensure that character areas in England are not negatively affected by the plan. The SA assessment should include criteria relating to the NCA content, such as landscape, biodiversity and socio-economic needs.
English Heritage (ongoing) Historic Seascape Characterisation programme	Historic Seascape Characterisation (HSC) assesses the present and historic character of a seascape with the aim to characterise dominant maritime activity. Sources include modern marine data (fishing, navigation and hazards, exploitation of natural resources), historic charts, and maps and associated documentary sources. For inshore and offshore waters HSC assesses the character for the sea surface, water column, the surface of the sea-bed, and the sea-bed. In 2008 English Heritage developed a methodology to guide work using Geographic Information Systems (GIS) software.	The Welsh National Marine Plan should avoid any detrimental effects on the historic character of England's seascapes. The SA assessment should include

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	HSC is currently taking place around England's coastlines to identify historic character.	criteria relating to protection and enhancement of seascapes.
Natural Resources Wales (ongoing) LANDMAP Programme	LANDMAP assesses the diversity of landscapes within Wales. It identifies and explains the most important characteristics and qualities of landscapes within Wales - whether they are ordinary, but locally important landscapes, or nationally recognised spectacular landscapes. It is a GIS (Geographical Information System) based system where landscape characteristics, qualities and influences on the landscape are recorded and evaluated into a nationally consistent data set.	The Welsh National Marine Plan should be developed with consideration of Welsh landscapes. The SA should include assessment criteria relating to protection and enhancement of the landscapes and seascapes.
Welsh Government (Various) Technical Advice Notes (Nature Conservation and Planning, Design, Tourism, Development and Flood Risk, Transport, Waste, Renewable Energy, Coastal Planning)	The Technical Advice Notes provide detailed planning advice for the different subjects listed to the left. They should be taken into account by local planning authorities when they are preparing development plans. They should be read along with the Planning Policy Wales document which sets out land use planning policies.	The Welsh National Marine Plan should take account of the subject areas covered by the technical advice notes and make provision for them where appropriate. The SA should include assessment criteria relating to the subject areas covered by the technical advice notes where these are considered relevant.
Inshore Fisheries and Conservation Authorities Bylaws (various)	The Inshore Fisheries and Conservation Authorities (IFCA) replaced Sea Fishery Committees in 2011 with a remit to "lead, champion and manage a sustainable marine environment and inshore fisheries, by successfully securing the right balance between social, environmental and economic benefits to ensure healthy seas, sustainable fisheries and a viable industry". IFCAs are currently in the process of reviewing legacy byelaws from the previous Committees, which is due to be completed by 2015. These byelaws may regulate fishing methods and fishing gear, restrict fishing seasons, set minimum sizes for fish and shellfish, manage and protect shellfish beds or control fishing for environmental purposes.	The Welsh National Marine Plan should support compliance with any legacy byelaws and avoid causing harm to fish and shellfish habitats. The SA assessment should include criteria relating to protecting biodiversity and habitats as well as marine economic activities such as fishing.
Welsh Government (Various) Minerals Planning Guidance Notes	Minerals Planning Policy Wales sets out the land use planning policy guidance in relation to mineral extraction and related development in Wales. Mineral Planning Guidance notes were published between 1988 and 1995 by the then Welsh Office (WO). Ten individual Mineral Planning Guidance notes remain in force in Wales	The Welsh National Marine Plan should be aligned with minerals planning guidance where relevant. The SA should include assessment criteria relating to sustainable land and resource use.
Defra (2011) Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services	The biodiversity strategy for England provides a comprehensive approach for implementing international and EU commitments. It sets out the strategic direction for biodiversity policy for the next decade on land (including rivers and lakes) and at sea. The four strategy priority areas for action are: • a more integrated large-scale approach to conservation on land and at sea; • putting people at the heart of biodiversity policy; • reducing environmental pressures; and • improving our knowledge.	The Welsh National Marine Plan should support the protection and enhancement of biodiversity. The SA assessment should include criteria relating to the protection and enhancement of biodiversity.

Table 4 Relevant Plans and Programmes from the Other Nations, Devolved Administrations and Self Governing Crown Dependencies

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
Isle of Man Government (1971) Sea Fisheries Act 1971	The Act consolidates the laws relating to the sea-fisheries of the Isle of Man. It also allows for certain restrictions on fishing methods and practices to be made.	The Welsh National Marine Plan should be aware of the Act. The SA assessment should include criteria relating to protection and enhancement of economic activities such as fishing.
Isle of Man Government (1979) Wreck and Salvage (Ships and Aircraft) Act 1979	The Act aims to make better provisions in the law relating to wreck and salvage of ships and aircraft. It restricts access to and activities around wrecks and sites of wrecks in order to facilitate their return to their owners.	The Welsh National Marine Plan should be aware of the Act. The SA assessment should include criteria relating to protection of historic artefacts.
Isle of Man Government (1986) Minerals Act 1986	The Act relates to the discovery and working of minerals, and covers the leases and permits required for mineral extractions. The Mineral Workings (Offshore Installations) (Isle of Man) Act 1974 provides for the safety, health and welfare of persons working in the underwater exploitation of mineral resources in the waters in or surrounding the Isle of Man, and for the safety of such installations and the prevention of accidents on or near them.	The Welsh National Marine Plan should be aware of the Act. The SA assessment should include criteria relating to marine economic activities such as mineral extraction, and the health and wellbeing of affected persons.
Isle of Man Government (1986) Oil Pollution Act 1986	The Act relates to the prevention of oil pollution, incidents with the potential to cause oil pollution, enforcement and application of UK and international conventions relating to pollution from ships. The Act also prohibits the discharge of oil into the marine environment.	The Welsh National Marine Plan should be aware of the Act. The SA assessment should include criteria relating to water quality.
Isle of Man Government (1990) The Wildlife Act 1990	The Act includes legislation for the protection of birds; conservation of wild creatures and wild plants; prohibits certain methods of killing or taking wild animals; restricts the introduction of certain animals and plants; and makes new provisions relating to nature conservation. Conservation areas set out in the Act include Areas of Special Scientific Interest, National Nature Reserves and Marine Nature Reserves.	The Welsh National Marine Plan should be aware of the Act. The SA assessment should include criteria relating to protection of wildlife and conservation area.
Government of Ireland (1991 to 2006) Sea Pollution Acts 1991 to 2006	The Acts provide for the protection of the marine environment from oil and other substances. They also bring into force several pieces of international legislation relating to oil pollution of the sea. They include provisions for fines and the detention of ships; the requirement for harbours to have emergency plans; and the duties to report pollution incidents.	The Welsh National Marine Plan and SA should be aware of the Act and ensure protection of the marine environment from oil pollution.
Government of Ireland (1996 to 2006) Harbours Acts 1996 to 2006	The Acts provide for commercial operations at harbours. They aim to create a competitive and commercial regime within the Irish ports sector. The scope of activities which may be undertaken by port companies has been extended by the legislation to permit port companies to engage in commercial activities outside the limits of their harbours, subject to obtaining Ministerial consent.	The Welsh National Marine Plan and SA should be aware of the Act and support maritime economic activities and harbours.
[Isle of Man Government (1999) Town and Country Planning Act 1999 Now revoked???	The Act makes provisions with respect to town and country planning, including protection of buildings and areas of special architectural or historic interest and the control of advertisements. The Act directs and controls development whilst preserving and protecting existing areas and buildings of an historical or architectural interest. The Town and Country Planning Act 1999 (Extension to the Territorial Seas) (No 2) Regulations came into operation in 2013. The Schedule within the Regulations sets out which components of the Town and Country Planning Act 1999 have been extended to the Territorial Seas.	The Welsh National Marine Plan should be aware of the Act. The SA assessment should include criteria relating to the protection of historic buildings.}
The Stationary Office (2002)	The National Spatial Strategy is the planning framework for Ireland and it aims to achieve a balance of social, economic and	The Welsh National Marine Plan

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
National Spatial Strategy for Ireland 2002 – 2020: People, Places, Potential	physical development. Its focus is on the relationship between people and the places where they live and work, and it seeks to support progress and growth through more effective planning. The strategy has five core messages: • A wider range of work opportunities; • A better quality of life; • Better places to live in; • Effective Urban and Rural Planning; and • Getting things done. The strategy identifies four cities to act as national gateways, nine strategically located urban hubs, and also identifies the need to support smaller towns and rural areas.	and SA should ensure that it is not in conflict with balanced development in Ireland.
Government of Ireland (2003) Fisheries (Amendment) Act 2003	The Act aims to ensure the long-term conservation and sustainable fishing of straddling fish stocks and highly migratory fish stocks on the high seas as well as within waters subject to national sovereignty. It gives effect to the provisions of the United Nations Convention on the Law of the Sea (1982) relating to the conservation and management of fish stocks. The Act also sets out the regulation of and fees associated with sea-fishing licences. It lists highly migratory fish species for protection, and allows for the designation of 'conservation areas' in the high seas (outside the exclusive fishery limits of the State) which are subject to conservation and management measures.	The Welsh National Marine Plan and SA should ensure that fish stocks and conservation areas are managed sustainably.
Government of Ireland (2003) Protection of the Environment Act 2003	The Act transposes the Integrated Pollution Prevention and Control Directive (96/61/EC) into Irish law, and strengthens the environmental protection regulatory framework. The Act amends the licensing requirements for activities with the potential for environmental pollution, and brings several new activities into the licensing framework such as intensive agriculture activities, food production, and the production of paper, pulp or board. • New licence conditions were brought in with regard to energy efficiency, waste prevention measures, accident prevention and control together with a requirement for measures to be in place to return the site to a satisfactory state following cessation of the activity.	The Welsh National Marine Plan and SA should be aware of the Act.
Isle of Man Government (2005) Coastline Management Act 2005	The Act addresses the management of designated coastline zones and regulates development in these zones. It aims to provide for the sustainable management of designated parts of the coastline that are subject coastal change, and aims to ensure that coastline management decisions about planning policies are taken on an informed basis.	The Welsh National Marine Plan should be aware of the Act.
Government of Ireland (2006) Planning and Development (Strategic Infrastructure) Act 2006	This Act amends the Planning and Development Act 2000, which is the basis of Irish planning legislation. The Strategic Infrastructure Act establishes a streamlined consent procedure for certain types of major infrastructure projects. Major infrastructure includes project in the following categories: • projects of strategic economic or social importance to the State or the region in which it would be situate; • projects that would contribute substantially to the fulfilment of any of the objectives of the National Spatial Strategy or any regional planning guidelines in respect of the area or areas in which the development would be situate; and • projects that would have a significant effect on the area of more than one planning authority.	The Welsh National Marine Plan and SA should ensure that any large-scale developments are not in conflict with Irish planning legislation.
Department of Local Government and the Environment (2008) Isle of Man Landscape Character Assessment	The assessment aims to provide an improved understanding of the island's landscapes, including the diversity, character, sensitivity to change and the management needs of each area. This should support the achievement of 'sustainable landscapes' which are visually rich, biodiverse, and meet society's social, economic and environmental needs. 59 landscape character areas were identified and described in the study. Recommendations in relation to landscape policy were also included in the report. This assessment was followed by Planning Policy Statement The Role of Landscape Character in Development (2009), which has the strategic policy to 'promote the active conservation, enhancement, and restoration of the Island's landscape character'.	The Welsh National Marine Plan should be aware of the Act. The SA assessment should include criteria relating to the enhancement of landscapes and seascapes.
Government of Ireland (2009) Foreshore and Dumping at Sea Amendment Act	The foreshore is defined as seabed and shore below the line of high water of ordinary or medium tides and extends outwards to the limit of twelve nautical miles (approximately 22.24 kilometres). The Foreshore Acts 1933 - 2011 require that a lease or licence must be obtained from the Minister for Agriculture, Food and the Marine for works undertaken on the foreshore which are deemed to be: any function in relation to a fishery harbour centre,	The Welsh National Marine Plan should not result in dumping at sea. The SA should include objectives concerning the sustainable use of the marine

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	any function in respect of— (i) an activity which is wholly or primarily for the use, development or support of aquaculture, or (ii) an activity which is wholly or primarily for the use, development or support of sea-fishing including the processing and sale of sea-fish and manufacture of products derived from sea-fish. The Dumping at Sea Acts 1996 to 2009 prohibit the dumping at sea from vessels, aircraft or offshore installation of a substance or material unless permitted by the Environmental Protection Agency. The Foreshore Acts 1933 to 2011 include the following: Foreshore Act 1933 Foreshore (Amendment) Act, 1992. Section 5 of the Fisheries and Foreshore (Amendment) Act, 1998 Fisheries (Amendment) Act, 2003 (Part 5) Maritime Safety Act, 2005 No. 11 (Part 6) Foyle and Carlingford Fisheries Act, 2007 Foreshore and Dumping at Sea (Amendment) Act, 2009 - Foreshore (Amendment) Act 2011	environment.
Isle of Man Government (2010) Harbours Act 2010	The Act relates to the management, control, operation, maintenance, development and improvement of harbours. It covers harbour charges; the registration and operation of vessels; prohibits persons living on board certain vessels within harbour limits; and makes provisions for compulsory insurance and the presence of alcohol and drugs on vessels. • Under the Act, the Department of Infrastructure has powers to impose restrictions on the discharge of ballast waters to harbour areas. It also prohibits deposition of certain substances within the limits of a harbour, on the seashore or into tidal waters without authorisation from the Department of Infrastructure.	The Welsh National Marine Plan should be aware of the Act. The SA assessment should include criteria relating to protection of biodiversity and water quality.
Sustainable Energy Authority of Ireland (2010) Strategic Plan 2010-2015	The Sustainable Energy Act 2002 created a national authority for Ireland, the Sustainable Energy Authority of Ireland, to promote energy efficiency and renewable energy. The strategy provides a vision for Ireland's sustainable energy future, and details the goals and actions to achieve this. Specific energy goals include fast-tracking ocean energy deployment. The key objectives in the strategic plan are: • Energy efficiency first: implementing strong energy efficiency actions that radically reduce energy intensity and usage; • Low carbon energy sources: accelerating the development and adoption of technologies to exploit renewable energy sources: and • Innovation and integration: supporting evidence-based responses that engage all actors, supporting innovation and enterprise for our low-carbon future.	The Welsh National Marine Plan and SA should support the generation of renewable energy and reductions in greenhouse gas emissions.
Department of Public Expenditure and Reform (2011) Infrastructure and Capital Investment 2012-16, Government of Ireland	The report contains a review of infrastructure and capital investment policy in Ireland. It assesses the existing capacity of Ireland's infrastructure and identifies remaining gaps which must be addressed to aid economic recovery, social cohesion and environmental sustainability. The report sets out the four main components of the investment strategy: • Economic infrastructure – encompassing transport networks, energy provision and telecommunications capacity. • Investment in the productive sector and human capital – such as direct supports for enterprise development; science, technology and innovation advancement; supports for tourism, agriculture, fisheries and forestry; and capital investment in education infrastructure. • Environmental infrastructure – including waste and water systems and investment for environmental sustainability. • Critical social investment – such as the health service and social housing programmes. This succeeds the National Development Plan 2007-2013.	The Welsh National Marine Plan and SA should have regard of the investment plan and not be in conflict with its aims.
Isle of Man Department of Environment, Food and Agriculture (2013) Managing our Natural Wealth to 2020: the Isle of Man's	The Strategy lays out aims, objectives and strategic actions required to ensure that Manx biodiversity is conserved to the benefit of the economy and for future generations. Implementing this strategy and associated action plans will also fulfil the commitments under the Convention on Biological Diversity. The strategic aims are that by 2020 the Isle of Man aims to:	The Welsh National Marine Plan should support the strategic aims and minimise the loss of biodiversity.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
First Biodiversity Strategy (consultation draft)	• manage biodiversity change to minimise loss; • maintain and where necessary restore or enhance native biodiversity; and • actively involve society in understanding, appreciating and safeguarding biodiversity. Seven strategic objectives and 39 strategic actions in the document underpin these aims. Once the draft strategy is agreed a Delivery Plan will be developed by March 2014 to implement the Strategy, and this will identify the specific tasks needed before 2020.	The SA assessment framework should include the protection of biodiversity.
Isle of Man Government (Various) Isle of Man Development Plan	The Development Plan consists of two parts; (a) a Strategic Plan; and (b) one or more Area Plans. The Isle of Man Strategic Plan came into operation in 2007 and covers the period up to 2016. It formulates the Department of Local Government and the Environment's general policies in respect of development and other use of land in the Island, together with a reasoned justification of those policies. It also provides guidance for development in and around Conservation Areas and working with Registered Buildings. Area Plans cover local and site specific issues, which address proposals for the development or other use of land. Under the Isle of Man Development Plan, a number of areas have been designated as Areas of High Landscape Value or Coastal and Scenic Significance. This designation covers much of the Isle of Man coastline. The designation requires that coastal areas are not affected by development except where there is an over-riding national requirement.	The Welsh National Marine Plan should be have regard to the contents of the plan and avoid having a detrimental effect on landscapes and seascapes. The SA assessment should include criteria relating to protection of landscapes and seascapes.
Department of Infrastructure (In progress) Isle of Man Strategic Marine Plan	The Marine Strategic Plan is proposed as part of the overarching Isle of Man Marine Plan: Securing a Sustainable Future. The aim of the Strategic Plan is to consider all current activities, designations and potential future uses within the territorial seas and identify appropriate Planning Policies for the marine environment over the next 20 years. The plan is currently in development and has not yet been published.	The Welsh National Marine Plan should have regard of the aims of the strategic plan once it is released. The SA assessment should include criteria relating to sustainable use of the marine environment.

Table 5 Regional and Local Plans, Programmes and Policies

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
Environment Agency Wales (2002) Metal Mines Strategy for Wales	The strategy was developed to explore common ground, identify potential site constraints and enable a clear assessment of all the issues at each of the Agency's top 50 metal mine sites recognised as having the greatest environmental impact. This will enable the development of future site management options. The specific objectives of this piece of work were to: • Bring together the site specific views of various stakeholders in one document; • Identify sites with differing stakeholder views or concerns; and • Revisit the Agency's priority list such that better informed decisions can be made regarding the prioritisation of sites.	The Welsh National Marine Plan should address water pollution from all sources including metal mines, where relevant. The SA should include assessment criteria relating to the protection of water quality.
Environment Agency (2009) River Basin Management Plans	River Basin Management Plans (RBMPs) set out how the water environment will be managed and provide a framework for more detailed decisions to be made. The RBMPs were produced in 2009 and are produced on a 6-yearly basis, with updated versions to be published in 2015. RBMPs set out a more integrated approach to river basin management based on the following principles: • Integrate and streamline plans and processes;	The Welsh National Marine Plan should be aware of the broad objectives of these plans. The SA should include assessment criteria relating to the sustainable

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	• Set out a clear, transparent and accessible process of analysis and decision-making; • Focus at the river basin district level; • Work in partnership with other regulators; • Encourage active involvement of a broad cross-section of stakeholders; • Make use of the alternative objectives to deliver sustainable development; • Use Better Regulation principles and consider the cost-effectiveness of the full range of possible measures; • Seek to be even handed across different sectors of society and sectors of industry; • Seek to be even handed and transparent in the management of uncertainty; • Develop methodologies and refine analyses as more information becomes available. RBMPs that cover Wales include the Severn, Western Wales and Dee. The North West England RBMP is also relevant to Wales due to the export of water from Wales.	management of resources.
Defra (2010) Eel Management Plans for the United Kingdom	The Eel Management Plans aim to describe the current status of eel populations, assess compliance with the target set out in the EU regulation on establishing measures for the recovery of the stock of European eel (EC 1100/2007) and detail management measures to contribute to the recovery of the eel stock. A Management Plan has been produced for each of the UK's 15 river basin districts. Potential measures in the plans include population monitoring, reduction in fishery pressures, improving eel access and habitat and predator control.	The Welsh National Marine Plan should be aware of the Management Plans. The SA should include assessment criteria relating to the conservation of species and habitats.
Milford Haven Port Authority (2011) The Milford Haven Waterway Recreation Management Plan 2011	The aim of the plan is to manage the potentially conflicting interests of recreation, conservation, commerce and community in the Milford Haven Waterway in order to establish a safe and effectively managed environment. The aims of the plan include: • Whilst the Waterway continues to gain international acclaim as a centre for UK energy production, the Haven's recreational qualities will remain a key priority. • The Plan outlines policies for areas that are popular for recreational use, paying attention to environmental responsibility and commercial navigation through the promotion and enforcement of a zoning scheme for particular activities. • The Plan is aimed at informing, educating and engaging communities around the Haven, together with all users and associated interest groups. • The Plan aims to further enhance public understanding and appreciation of both the Haven Waterway as a valuable leisure resource, and the responsibility of Milford Haven Port Authority in fostering a safe and efficient environment. These aims support the plan's vision of continued support and enhancement for the leisure use of the Haven, underpinned by clear environmental responsibilities and the promotion of a sustainable approach.	The Welsh National Marine Plan should help support the balance between recreation, conservation, commerce and community in waterways. The SA should include assessment criteria relating to these factors, such as the local economy, recreation facilities and protection of the environment.
Environment Agency (2013) River Dee SSSI Restoration	The River Dee/ Afon Dyfrdwy (which flows through both Wales and England) has a high conservation value, being designated as two separate Sites of Special Scientific Interest (SSSIs). The report aims to develop a restoration vision for the whole river catchment identifying where the main physical pressures are, and to outline restoration measures to help achieve favourable condition of the SSSIs and SAC. Five restoration measures have been developed as part of a management plan, based on field evidence and data from previous studies: • Riparian zone management; • Bank protection removal; • Unmanaged and managed embankment retreat; • Channel realignment; • Removal or modification of weirs.	The Welsh National Marine Plan should take into account the measures in the River Dee restoration plan. The SA assessment framework should consider the effects on protected species and habitats.
Environment Agency Wales (2013) Tidal Dee Flood Risk Management Strategy	The flood risk management strategy is a 100 year plan that sets out how to adapt, improve and prepare an area for dealing with flooding in the short term, medium term and long term. The strategy covers the areas at risk from tidal flooding from the Dee Estuary between Talacre, Chester and Neston. The overarching strategy is that all properties in this area should be protected to their current standard or better, through a combination of improvements to some of the existing flood defences, realigning the defences in some areas and being	The Welsh National Marine Plan should take the flood risk management strategy into account. The SA assessment framework should consider the effects on

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	prepared for and adapting to future flood risk.	coastlines and flooding.
Environment Agency (various) Salmon Action Plans	The National Salmon Strategy was launched in 1996, which aimed to preserve fish stocks while protecting sustainable exploitation. The four objectives for the management of salmon fisheries in England and Wales are: 1. Optimise the number of salmon returning to home water fisheries. 2. Maintain and improve fitness and diversity of salmon stocks. 3. Optimise the total economic value of surplus stocks. 4. Ensure beneficiaries meet necessary costs. The strategy is delivered locally through Action Plans for the main salmon rivers. The Action Plans review the status of the river and draw up actions to address the main issues. Actions include setting conservation limits for rivers, reducing agricultural pollution, setting spawning targets and restoring habitats.	The Welsh National Marine Plan should be aware of the Action Plans. The SA should include assessment criteria relating to the conservation of species and habitats.
Environment Agency (various) Shoreline Management Plans	The second generation Shoreline Management Plans (SMP2) provide a large scale assessment of the risks associated with erosion and flooding at the coast. The SMPs aim to: - set out the risks from flooding and erosion to people and the developed, historic and natural environment within the SMP area; - identify opportunities to maintain and improve the environment by managing the risks from floods and coastal erosion; - identify the preferred policies for managing risks from floods and erosion over the next century; - identify the consequences of putting the preferred policies into practice; - set out procedures for monitoring how effective these policies are; - inform others so that future land use, planning and development of the shoreline takes account of the risks and the preferred policies; - discourage inappropriate development in areas where the flood and erosion risks are high; and - meet international and national nature conservation legislation and aim to achieve the biodiversity objectives.	The Welsh National Marine Plan should take into account the policies and actions of the SMP. The SA assessment framework should consider the effects on coastal change and flooding.
English Local Authorities (various) Local Plans	Local Plans set planning policies in a local authority area for how the area will develop over time. The National Planning Policy Framework states that every local planning authority in England should have a clear, up to date Local Plan, which conforms to the framework, meets local development needs, and reflects local people's views of how they wish their community to develop. The Planning Policy Framework specifies that Local Plans should: • be based on the objectively assessed needs of the local area; • set out opportunities for development and clear policies on what will or won't be permitted and where; • plan positively for the development and infrastructure required in the area to meet the objectives, principles and policies of the National Planning Policy Framework; • reflect a collective vision for the sustainable development of the area; • cover an appropriate time scale (preferably 15 years) and be kept up to date; • be based on co-operation with neighbouring authorities, public, voluntary and private sector organisations; • allocate sites to encourage development and the flexible use of land, identifying new land where necessary; • contain a clear strategy for enhancing the natural, built and historic environment and supporting Nature Improvement Areas where they have been identified.	The Welsh National Marine Plan should take local plans into account. The SA assessment framework should consider the effects on land use planning.
Local Authorities (various) AONB Management Plans	The following Areas of Outstanding Natural Beauty (AONB) are located in Wales: - Anglesey; - Clwydian Range; - Gower; - Llŷn; - Wye Valley. The management plans for AONBs contain actions to ensure the protection and enhancement of the landscape. The Management Plans formulate the polices of local authorities for the management of AONB, and help to manage change in a positive way and influence developments within the area. The Management Plans aim to:	The Welsh National Marine Plan should be consistent with the Management Plan objectives. The SA assessment framework should consider the effects on landscapes, including designated landscapes.

Plans, Policies and Programmes	Purpose of the Document, including Objectives and Targets relevant to the Welsh National Marine Plan and SA	Relationships and Influences on the Welsh National Marine Plan and the SA
	• highlight the special qualities and the enduring significance of the AONB, and the importance of its different features; • present an integrated vision for the future of the AONB as a whole, in the light of national, regional and local priorities; • set out agreed policies incorporating specific objectives which will help secure that vision; • identify what needs to be done, by whom, and when, in order to achieve these outcomes; • state how the condition of the AONB and the effectiveness of its management will be monitored.	
National Park Authorities (various) National Park Management Plans	The following National Parks are present in Wales: - Snowdonia; - Brecon Beacons; - Pembrokeshire Coast. The Management Plans are policy documents for the National Park areas which coordinate and integrate other plans, strategies and actions, creating a framework for Park management. The Plans set a vision for the future and contain actions to ensure the protection, enhancement and enjoyment of the landscape and natural environment of these areas.	The Welsh National Marine Plan should be consistent with the Management Plan objectives, particularly for coastal National Parks. The SA assessment framework should consider the effects on landscapes and the natural environment, including designated areas.
Natural Resources Wales (formerly Countryside Council for Wales) (various) SAC Management Plans	There are 92 Special Areas of Conservation in Wales (SAC). The SAC Management Plans include information on the special features of the SAC, details of historic and current management, and an assessment of conservation status. The Plans also contain conversation objectives as required by the Habitats Directive (92/43/EEC) which aim to maintain or restore 'favourable conservation status' of SAC habitats or species. The objectives correspond to the ecological requirements of the habitats and species for which the SACs are designated.	The Welsh National Marine Plan should be consistent with the Management Plan objectives. The SA assessment framework should consider the effects on protected habitats and species.
Welsh Local Planning Authorities (various) Local Development Plans	Each Local Planning Authority in Wales must prepare a Local Development Plan (LDP) which sets out their proposals and policies for future development and use of land in its area across the next 15 years. LDPs provide a framework for rational and consistent decisions to deliver change which benefits communities and business, providing certainty and maximising investment. In Wales, there are 25 local planning authorities. LDPs may be prepared jointly between authorities or individually. Unitary Development Plans were used for development planning prior to LDPs, some of which remain in effect until an LDP is in place.	The Welsh National Marine Plan should take local development plans into account. The SA assessment framework should consider the effects on land use planning.

Appendix B

Overview of the Economic Valuation Methodologies used in the SSE

Sections 1.1 to 1.4 of this technical appendix describe the methodology used to generate the value of each economic sector considered in the SSE. The limitations of the data, and the key assumptions made are discussed in Section 1.5.

1.1 Economic Data within the Marine Environment

The economic considerations discussed in Section 16 of the SSE are based on three different types of economic data for each sector:

1) The Gross Value Added (GVA);
2) The direct and indirect employment; and
3) The number of businesses.

There are a number of difficulties involved in seeking to determine the economic impact related to activities which take place in the marine environment. Not least of these difficulties, especially in respect of this research, is trying to understand the extent of current activities within the plan area.

Data are currently collected in a way that allows statisticians in the Office for National Statistics (ONS) to identify, with reasonable accuracy, the relevant indicators for land-based activities. However, there is no such approach that enables the attribution of specific activities that take place in the marine environment to be accounted for in a consistent way. The Marine Management Organisation (MMO) has recently undertaken a project to investigate how ONS data can be adapted to improve the socio-economic evidence supporting English marine plans; the outcomes and benefits of which may be of relevance to the development of the Welsh National Marine Plan (MMO n.d.). In the meantime, the most appropriate sources of data are typically those that take a sectoral approach, and from which approximate estimates of activity in specific plan areas can be developed.

The section below outlines the approach, based on ONS guidance, for collecting data on Welsh economic activity. As will be seen within the individual sectoral elements of the report, in most cases we are reliant on pre-existing studies, as the raw data is not available from ONS.

1.2 Measuring Activity

1.2.1 Gross Value Added (GVA)

At a micro-level GVA is the contribution of each individual producer, industry or sector to the economy. At an aggregate macro-level it provides a summary measure of the complex interactions of the economy. GVA for the UK is estimated and published by ONS and estimates feed into the calculation of GDP. GVA is used extensively to compare national and sub-national economies on a consistent basis. Nevertheless, the measurement of economic impacts using GVA gives rise to a number of technical and conceptual issues.

The Office for National Statistics (2010) presents a simple way to explain GVA (using the production approach) describing it in the context of a traditional manufacturing process:
"During a manufacturing process goods, energy, and services are changed or consumed. The associated costs are termed 'Intermediate Consumption'. At the end of the process the business has a product (s) (or 'Output') for sale or for its own use.

For example, if Output comprises a wooden chair, then Intermediate Consumption includes the cost of wood, glue, screws, and other materials used in its manufacture, plus the cost of rental, utilities, transport, legal and business services, insurance, marketing and other consumables.

Selling the product (Output) generates revenue from which costs associated with the production of the product (Intermediate Consumption) can be met. The balance of Output less intermediate Consumption is the firm's GVA."

In principle, aggregate GVA can be calculated using the approach based on income, production or expenditure. UK GVA by industry is calculated by ONS using the Income and Production approaches. Only the Income approach is used for regional and sub-regional estimates of total GVA and GVA by industry. GVA is estimated by ONS at regional (NUTS1) and sub-regional level (both NUTS2 and NUTS3 – former county level). While data on GVA at this resolution is relatively detailed, it is acknowledged by ONS that the data available from the GVA estimates is insufficient to enable the assessment of the impacts of interventions at the sub-NUTS3 level, which is the level at which many impacts are evident. This would certainly be the case in respect of economic activity associated with the marine environment, as the location of impacts would vary within NUTS3 sub-regions. Accordingly it is not possible to reflect the proportion of GVA in a NUTS3 sub-region that relates to the marine environment.

1.2.2 Important Considerations

There are a number of issues that can affect the accuracy of a GVA calculation, notably in respect of the impacts on GVA associated with an intervention. A key issue is the question of additionality because economies do not operate in a vacuum. Any assessment of the impact of an intervention needs to be on a net basis which isolates the impact of the intervention and takes account of what would have happened in the absence of the intervention. This good practice is reflected in the aim of the SSE: determining the baseline against which any change will be measured. A range of factors have been identified as affecting the level of additionality. These include displacement, leakage, and multiplier effects.

- **Displacement** is where jobs are filled by people previously employed elsewhere in the region.
- **Leakage** is where jobs are created outside the region.
- **Multipliers** are the further economic activity associated with the additional income to those employed as a result of an investment or intervention.

The range of impacts that might result from an investment or intervention can be categorised as direct, indirect and induced impacts. Understanding and measuring each of these impacts is essential to assessing the entire impact of an intervention, but may not always be possible given data availability. These impacts are summarised by the Office for National Statistics (2010) as follows:

- **Direct impacts** occur when additional demand for a unit generates a corresponding unit of output, e.g. production of a chair.
- **Indirect impacts** arise as demand for materials and fuels used to create that additional unit of output generates, in turn, outputs in other industries, e.g. wood, steel, paint, fabric, electricity, gas, water and other materials, fuels and services used in furniture production. There will be associated increases in labour, profits and capital.
- **Induced impacts** are felt as increases in compensation of employees lead to increased spending on goods and services in the economy.

Direct measures are the simplest of the impacts to measure and understand. Indirect and induced impacts have the potential to be significant, but are more difficult to understand and measure.

1.3 Direct and Indirect Employment

As for GVA, there are a number of difficulties in accurately identifying levels of employment associated with the marine environment in a specific region. Where possible we identify direct employment in terms of Full Time Equivalents (FTEs), and also indirect employment, which is a less straightforward figure to determine, and accordingly subject to greater uncertainty due to potential overlaps between different sectors supply chains and supporting activities.

It is important to recognise that FTEs are dynamic and variable in the sense that they are not a homogenous indicator: jobs can vary in terms of hours worked, length of contract and salary. The number of FTEs is therefore not the optimal proxy for economic activity, but the availability of data is superior to other measures.

The number of FTEs is an inherently static measure and does not account for the changes to workforce structure that may occur over time. A case in point is the renewable energy sector: as an emerging industry in the plan areas most of the employment is in project construction and development. This will change once this phase is complete and the operational phase begins, resulting in a change in employment type and a reduction in total FTEs. Conversely, FTEs in the more established aggregate extraction and navigation dredging sectors are likely to stay constant, at least in the short term. Such limitations are difficult to mitigate, but require recognition.

1.4 Number of Businesses

In almost all cases we identify the number of businesses in a sector that are undertaking activities within the plan areas. In most cases we have not sought to quantify the types of businesses, nor their size due to lack of publicly available information.

Like FTEs, the businesses are dynamic and variable. Thus only measuring the number of businesses does not lead to a detailed understanding of the economic contribution of the businesses within a given sector. The size of businesses (both in terms of FTEs employed and turnover) are important considerations and are presented in the analysis where information is identified.

1.5 Data Sources, Assumptions and Limitations

A key confounding factor in seeking to present information on the concentration of activity within Wales, is the absence of detailed data from which to establish a 'bottom up' calculation. The only sector for which we have fully been able to undertake a bottom up calculation is renewable energy. In other cases the estimates have been almost entirely developed through 'top down' calculations, using an assumption of the proportion of UK activity in the sector that is accounted for within Wales. However, this does not permit a detailed assessment of where specific activities are concentrated within the plan areas. The approaches used in this report to estimate the economic contributions by sector are shown in Table 1.

Table 1: Approaches used to estimate economic contributions by sector.

Sector	Bottom Up (BU) Approach	Top Down (TD) Approach
Aggregates	✓ Partly BU	✓ Partly TD
Aquaculture		✓
CCS	No Significant Activity Identified	
Coastal Protection	Not Quantified	
Coastal Tourism	✓ Partly BU	✓ Partly TD
Dredging		✓
Fisheries		✓
Marine Recreation		✓
Military Defence	Not Quantified	
Oil & Gas	No Significant Activity Identified	
Ports		✓
Renewable Energy	✓	
Shipping		✓
Telecoms and Communications	Not Quantified	

As noted previously, there are a number of difficulties involved in seeking to determine the economic impact related to activities which take place in the marine environment. Data are currently collected in a way that allows ONS statisticians to identify, with reasonable accuracy, the relevant indicators for land based activities. However, there is no such approach that enables the attribution of specific activities that take place in the marine environment to be accounted for in a consistent way. As mentioned in Section 1.1, the recent project by the MMO into improving socio-economic evidence to support marine plans (MMO n.d.) may be of use to the WNMP.

Moreover, in time, improved data collection may allow for a better understanding, and indeed visual spatial representation, of the economic contribution of specific areas of the marine environment. The focus of Section 7 in the SSE has been to try to understand the economic impact of the marine environment in Wales, and more specifically on the 'terrestrial hinterland' of the coast relating to Wales. The employment and income associated with the offshore activities will 'make landfall' at some point.

Hence the 'interface' of the marine activities with the land is critical, but difficult to fully understand in the absence of more detailed data.

However, this focus may possibly under represent the actual value of the marine resource. For example, if marine aggregates are extracted but then landed in France this should not be ignored, as it further demonstrates the demand for, and hence value of, the marine resource. Importantly in respect of marine planning, it would be a clearer representation of the utilisation, and potential utilisation, of the specific aspect of the marine environment.

1.5.1 Minimum Data Requirements

As noted above, there are a number of data gaps that lead to uncertainty in the sector baselines. Where baselines are developed through a top down calculation, (see Table 1) it is clearly desirable that further research be undertaken in order that a bottom up calculation may be determined. This would typically involve an element of primary research in order to gather data.

There are a number of ways in which estimates can be made based on differing levels of data availability, with associated variation in the levels of confidence that can be placed on the estimates. These can be summarised as follows:

1. Top down apportionment - based on an estimate of the proportion of national activity (for which data is available) that occurs in the plan areas.
2. Top-down/bottom up hybrid – where the number of activities within a sector in a plan area is known, but the level of contribution to economic activity is not known. In this case, it is necessary to revert to national data, making an assessment of the proportion of the national activity accounted for within the plan.
3. Bottom-up approach – where a detailed understanding is obtained of both the number of activities and of their contribution to economic activity.

Ideally, the 'Gold Standard' method would be for the bottom-up approach to be completed for each sector in the marine plan areas, whereby each activity is accounted for and categorised within the economic sectors. This would include capturing the overall number of businesses, the number of employees directly employed and a calculation of the GVA of the businesses. This information is likely to lead to easier identification of hot spots and multiplier effects, including the identification of indirect and induced employment. Once captured, this bottom-up data can then be aggregated and cross-referenced against a top-down approach to ensure consistency. However, in the absence of detailed local data we are some way from achieving this gold standard, and placing trust data collected at a national (UK) level.

1.5.2 Method and Assumptions for the Economic Activity in each Sector

Marine Aggregates

- The number of businesses operating in Wales in 2008/09 are assumed to still be operating in 2013/14
- Direct employment is based on the proportion of marine aggregate landings in Wales, applied to the total number of office and sea staff working in the UK marine aggregate industry
- Indirect employment is based on a ratio of direct to indirect employment as used in Lafarge (2011). This ratio relates to land based aggregates, but has been used in this instance due to the lack of more suitable data.
- GVA is based on marine aggregate landings in Wales as a proportion of marine landings in England and Wales, applied to the total GVA of the sector in England and Wales.

Aquaculture

- It is assumed that the marine aquaculture businesses in Wales consist solely of shellfish farms. The number of shellfish farms (businesses) in Wales is identified in a UK wide report (Cefas 2013).
- The direct employment in this sector is also based on the assumption that marine aquaculture in Wales consists solely of shellfish farming. The direct employment in shellfish farming is also identified in the UK wide report mentioned above.
- Indirect employment is based on a ratio of direct to indirect employment as used in an aquaculture report by the Food and Agriculture Organisation of the United Nations (FAO) (2014).
- GVA data is not available for the aquaculture sector, but turnover of the Welsh shellfish industry is. The GVA has been calculated based on a GVA to turnover ratio of 1.75.
- The assessment omits Anglesey Aquaculture who are currently the only producer of sea bass in the UK. Further information can be found at The Centre for Sustainable Aquatic Research at Swansea University may be able to aid in identifying additional companies working within the aquaculture industry.

Coastal Tourism

- Data regarding the number of businesses is not available on a Welsh basis. However, an estimate of 11. 85 FTEs per enterprise was calculated, and applied to the number of FTEs to establish the number of businesses.
- Direct employment in Welsh seaside towns is taken from a seaside tourism report (Centre for Regional Economic and Social Research 2010).

- Indirect employment is based on a ratio of direct to indirect employment as used in the seaside tourism report referred to above.
- GVA in Welsh seaside towns is taken from the seaside tourism report mentioned above.

Navigation Dredging

- No data is available for the number of businesses, direct and indirect employment for the navigation dredging sector in Wales.
- GVA is based on the port activity in Wales as a proportion of the UK, applied to the total UK GVA of the dredging sector.

Fisheries

- The number of businesses is based on the tonnage of fish landings in Wales as a proportion of the UK tonnage, applied to the number of marine fishing businesses in the UK.
- Direct employment in fisheries in Wales is reported on an annual basis (MMO 2013).
- Indirect employment is based on the number of fishermen in Wales as a proportion of the fishermen in the UK, applied to the number of jobs associated with activities related to fisheries in the ONS Annual Business Survey (for example, processing and preserving of fish, crustaceans and molluscs).
- GVA is based on the value of fish landings in Wales as a proportion of the UK total, applied to the total UK GVA of the marine fishing sector.

Marine Recreation

- Data regarding the number of businesses is not available on a Welsh basis. The number of businesses in the 'UK Leisure, Superyacht and Small Commercial Marine Industry' has been apportioned to Wales using the number employed in the sector in Wales as a proportion of the UK total.
- Direct employment in the 'UK Leisure, Superyacht and Small Commercial Marine Industry' is published on an annual basis by the British Marine Federation (2014).
- Indirect employment is based on the number of jobs in this sector in Wales as a proportion of UK total, applied to the number of jobs associated with activities related to marine recreation in the ONS Annual Business Survey (such as construction of other civil engineering projects e.g. reefs).
- GVA in the 'UK Leisure, Superyacht and Small Commercial Marine Industry' is published on an annual basis by the British Marine Federation (BMF).

Military Defence

- No data is available for the number of businesses, direct and indirect employment and GVA for the Military Defence sector in Wales.

Ports

- Data regarding the number of businesses in the ports sector operating in Wales is not available.
- Direct and indirect employment in the ports sector in Wales is published on an annual basis by Oxford Economics (2013a). The calculation for GVA in the ports sector is split into two parts: the freight share of GVA and the passenger share of GVA:
    - Freight share of GVA: percentage of UK shipping revenue from freight is applied to the ports sector contribution to UK GDP. This is then apportioned by the throughput in Wales as a proportion of the UK total.
    - Passenger share of GVA: percentage of UK shipping revenue from carrying passengers is applied to the ports sector contribution to UK GDP. This is then apportioned by the throughput in Wales as a proportion of the UK total.

Renewable Energy

- The economic activity is based on offshore wind power.
- Data regarding the number of businesses in the renewable energy sector operating in Wales is not available.
- The calculation for direct employment is split into two parts: operational jobs and construction jobs, based on the number of direct jobs associated with each MW of offshore wind power, depending on whether it is being constructed or is in operation (UK Commission for Employment and Skills 2011):
    - Operational jobs: number of direct jobs per MW operational offshore wind power applied to the MW installed capacity in Wales.
    - Construction jobs: number of direct jobs per MW offshore wind power under construction applied to the MW capacity under construction in Wales.
- Indirect employment is based on a ratio of direct to indirect employment in offshore wind power (UK Commission for Employment and Skills 2011).
- The calculation for GVA is split into two parts: operational and construction, based on the GVA associated with each MW of offshore wind power, depending on whether it is being constructed or is in operation:
    - Operational GVA: the GVA per operational MW (European Offshore Wind Deployment Centre 2011) is applied to the MW installed capacity in Wales.

- Construction GVA: the GVA per MW under construction (European Offshore Wind Deployment Centre 2011) is applied to the MW capacity under construction in Wales.

Shipping

- The number of businesses is based on two key Standard Industry Classification (SIC) codes for the shipping sector: 50.1 (sea and coastal passenger water transport) and 50.2 (sea and coastal freight water transport) (Office for National Statistics 2013):
  - The number of businesses under SIC 50.1 operating in Wales as a proportion of the UK total is applied to the number of micro, small, medium and large 50.1 businesses in the UK.
  - The number of businesses under SIC 50.2 operating in Wales as a proportion of the UK total is applied to the number of micro, small, medium and large 50.2 businesses in the UK.
- Direct and indirect employment in the shipping sector in Wales is published on an annual basis by Oxford Economics (2013b) . The calculation for GVA in the shipping sector is split into two parts: the freight share of GVA and the passenger share of GVA:
  - Freight share of GVA: percentage of UK shipping revenue from freight is applied to the shipping sector contribution to UK GDP. This is then apportioned by the number of vessels arriving in Wales as a proportion of the UK total.
  - Passenger share of GVA: percentage of UK shipping revenue from carrying passengers is applied to the shipping sector contribution to UK GDP. This is then apportioned by the number of vessels arriving in Wales as a proportion of the UK total.

Telecommunications

- Data regarding the number of businesses in the telecommunications sector operating in Wales is not available.
- Direct employment is based on international calls as a percentage of all calls, applied to the number of telecommunications FTEs. This is then apportioned to Wales by applying the proportion of subsea cables that make landfall in Wales as a proportion of the UK total.
- Data regarding the indirect employment in the telecommunications sector operating in Wales is not available.
- The GVA is based on the relevant activities listed under the Annual Business Survey, apportioned to Wales by applying the proportion of subsea cables that make landfall in Wales as a proportion of the UK total.

1.6 Valuing Ecosystem Services

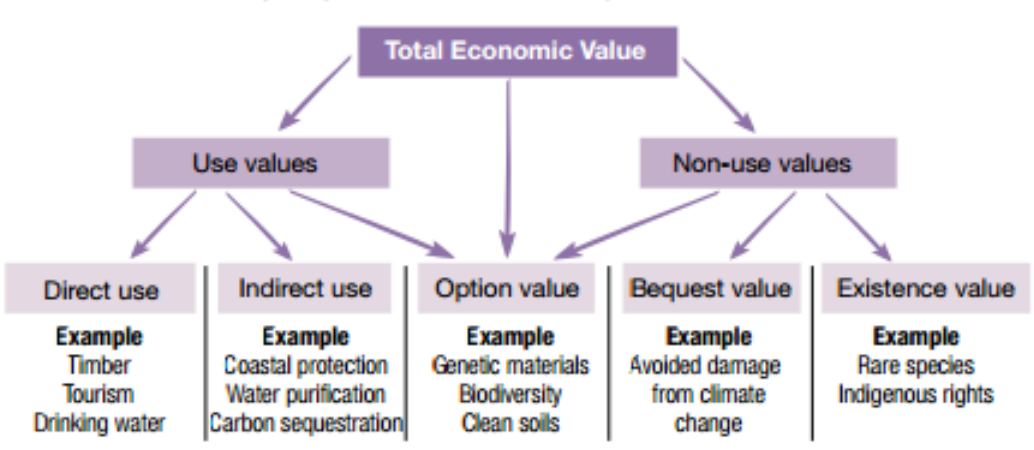
1.6.1 Total Economic Value

The concept of Total Economic Value (TEV) has proven useful as a conceptual framework for keeping track of the wide range of complex and interrelated physical and value flows involved in valuing the natural environment. It reflects the use humans make of the natural environment (through markets or informally) and also the value they may attribute to it unrelated to their current or future use. In other words, TEV consists of *use value* and *non-use value*.

The term 'benefit' as used in the description of TEV is used to mean maintaining or increasing human welfare. A cost, on the other hand, would relate to a change in the natural environment (e.g. pollution) that leads to a decrease in human welfare.

Some *use values* can be expressed in monetary terms using data from actual markets – these would represent the financial value of the goods and services. Use values derived from environmental goods and services that are not traded in markets, i.e. are non-market, and non-use values in general, are not reflected in market transactions unless there has been a government intervention in the form of taxation or another policy that forces the market price to incorporate these values. Figure 1, shown below, summarises the TEV.

Figure 1: The Total Economic Value Framework



Source: van Beukering, P., Brander, L., Tompkins, E. and McKenzie, E. (2007) Valuing the Environment in Small Islands - An Environmental Economics Toolkit, 2007

In the following paragraphs an outline of the key aspects of the TEV are provided:

Use value involves some interaction with the resource, either directly or indirectly (Eftec 2006):

Direct use value: Individuals make use of a resource in either a consumptive way (e.g. the fishing industry and agriculture) or a non-consumptive way (e.g. rambling).

Indirect use value: Individuals benefit from ecosystem services supported by a resource rather than actually using it (e.g. watershed protection for flood mitigation, cycling processes for agriculture or carbon sequestration).

Non-use value is associated with benefits derived simply from the knowledge that the natural environment is maintained. By definition, non-use value is not associated with any use of the resource or tangible benefit derived from it, although users of a resource might also attribute non-use value to it. Non-use value can be split into two basic components (Eftec 2006):

Bequest value: Associated with the knowledge that the natural environment will be passed on to future generations.

Existence value: Derived simply from the satisfaction of knowing that ecosystems continue to exist, regardless of use made of them by oneself or others now or in the future (also associated with 'intrinsic value').

Finally, one category not immediately associated with the initial distinction between use value and non-use value is:

Option value: An individual derives benefit from keeping open the option to make use of some aspect of the natural environment in the future, even though he or she does not currently plan to make such use. It can be regarded as a form of insurance to provide for possible future use.

1.7 Valuing Non-Market Goods and Services

There are two main approaches for placing an economic value on non-market goods and services based on people's behaviour.

Revealed Preference (RP) methods look at surrogate markets to infer preferences for non-market goods and services from observable changes in people's behaviour. In this way the value the public places on environmental, social and other non-market goods and services is "revealed" by their activity in an associated market. For example, the value people place on a "good environment" might be revealed though the prices of housing. RP techniques include the travel cost method and hedonic price method. The main advantage of RP techniques is that they are based on analysing actual behaviour. RP methods have limitations. The first is the inability to estimate non-use values, as they are based on market footprints of some form of use-related behaviour. The second is their inability to estimate values for levels of quality that have not been experienced and revealed by the market (Atkinson and Mourato 2008).

Stated Preference (SP) method is a term for survey-based methods which use constructed or hypothetical markets to elicit preferences for specified changes, often to policy. Using an appropriately designed questionnaire, a hypothetical (or contingent) market is described where the good(s) in question (which might be an improvements in water quality, reduction in a risk to human health, or protection of an ecosystem) can be traded. This contingent market defines the good itself, the institutional context in which it would be provided, and the way it would be financed. Respondents are then asked to express their maximum willingness to pay (WTP) or minimum willingness to accept (WTA) compensation for a hypothetical change in the level of provision of the good. The method can be used to estimate the benefits/costs associated with a change in the level of provision of a good or service (Atksinson and Mourato 2008). The most widely applied SP technique is the contingent valuation method. A special panel appointed by the U.S. National Oceanic and Atmospheric Administration (NOAA) in 1993 following the Exxon Valdez oil spill concluded that CV studies could produce estimates reliable enough to be used in a (U.S.) judicial process of natural resource damage assessment. Developments in contingent valuation include choice modelling which refers to a number of techniques where choices, ranks or matches between alternatives are involved. In environmental economics choice experiments have asked participants to choose their most preferred from a set of alternative options which are associated with particular attributes (such as cleaner air or water) and a cost. WTP can be indirectly inferred from the choices made.

1.8 Valuation Methodologies

Within the Total Economic Value framework, there are a number of methodologies which can be employed to value. In the following sections we have sought to outline some of the most common, these include:

- Willingness to Pay;
- Willingness to Accept;
- Choice Modelling;
- Benefits/Value transfer;
- Avoided Damage Costs; and
- Hedonic Pricing.

1.8.1 Contingent Valuation

Value estimates for environmental goods can be obtained by either estimating preference parameters as "revealed" through behaviour related to some aspect of the amenity or using "stated" information concerning preferences for the good.

In the environmental economics literature the stated preference approach has come to be known as "contingent valuation" as the "valuation" estimated obtained from preference information given the respondent is said to be "contingent" on the details of the "constructed market" for the environmental good put forth in the survey.

There is a large body of contingent valuation literature and surveys. Contingent valuation has been suggested to produce estimates reliable enough to be used in a (U.S.) judicial process of natural resource damage assessment (Arrow et al. 1993).

1.8.1.1 Willingness to Pay

Willingness to Pay is the **maximum** monetary value a participant would be willing to pay in exchange for a good or service, or prevent something undesired. For the environment this translates as the maximum monetary value a participant would be willing to pay for an improvement to the environment or avoid degradation of it, for example to clean up or avoid pollution.

This method is also used to gauge an individual's preference for one good or service over another and allows environmental goods to be compared to marketed goods.

There are two method sets that fall under the willingness to pay technique, revealed preference and stated preference (Accent and RAND Europe 2010).

Revealed preference methods refer to economic data from the market to provide real-world evidence for an individual's choices. Where market data is unavailable, stated preference methods can be employed to examine hypothetical situations.

1.8.1.2 Willingness to Accept

Willingness to accept is the **minimum** monetary value an individual is willing to accept to forego an environmental resource or allow loss (van Beukering et al. 2007). This method also allows environmental goods to be compared to marketed goods as well as integrating social and environmental aspects in the decision-making.

1.8.2 Choice modelling

Choice modelling is a survey style approach that can be used to estimate the economic value of almost any ecosystem good or service. This method uses the principle that a good can be described in terms of its attributes and characteristics. Choice modelling asks participants to choose from a set of attributes, values are then inferred from the set of choices a respondent makes between different combinations of attributes.

The choice model forces respondents to repeatedly choose between complex, multi-attribute scenarios which express non-market changes at a given cost (van Beukering et al. 2007). The respondent will be required to either choose a preferred combination or rank alternative scenarios (Defra 2007). The results provide respondents WTP or WTA for various scenarios.

1.8.3 Benefits/Value Transfer

The benefit transfer method is used to estimate economic values for ecosystem services by transferring available information from studies already completed in another location and/or context. The method uses estimates of economic values (use and non-use) and the willingness to pay (WTP), which have been generated in a study site and are transferred to the policy site. A mean value is borrowed, unadjusted for the policy site.

A more complex use of benefits transfer is taking WTP functions and applying the coefficients describing the relationship between WTP and the factors influencing it, to the data from the policy site (Ozdemiroglu et al. 2006).

The benefits transfer method avoids the cost and time involved in conducting primary valuation studies (Accent and RAND Europe 2010) and is often used when there is too little time, or it is not cost effective

to conduct a primary valuation study (Ecosystem Valuation – *Benefit Transfer Method, http://www,ecosystemvaluation.org/benefit_transfer.htm, Date Accessed: 21 Mar 2013)*.

Of relevance to the benefits transfer methodology is the Environmental Valuation Reference Inventory (EVRI). EVRI is a searchable storehouse of empirical studies on the economic value of environmental benefits and human health effects. It has been developed as a tool to help policy analysts use the benefits transfer approach. In the benefits transfer approach, the results of the previous studies held within the EVRI can be used (transferred) to estimate the economic value of changes stemming from current programs or policies.

For the time being, entries in the EVRI are concentrated in the area of water valuation studies. This is a consequence of an initial focus on water valuation in the Americas during the development of the database. The scope of the EVRI is being broadened to include valuation studies for many types of natural capital (Ecosystem Valuation – Benefit Transfer Method, accessed 21 March 2013 http://www.ecosystemvaluation.org/benefit_transfer.htm,).

1.8.4 Avoided Damage Costs

The avoided damage costs method looks to calculate the value of protection provided by an ecosystem for economically valuable assets. This method uses the value of the cost of actions/infrastructure to avoid damages that would otherwise occur should the ecosystem protection not exist. The value of the property and assets protected can also be used under the avoided damage costs method to value the ecosystem (Ecosystem Valuation – Benefit Transfer Method, date accessed 21 March 2013 http://www.ecosystemvaluation.org/benefit_transfer.htm,).

1.8.5 Hedonic Pricing

The hedonic pricing method can be used to estimate direct and indirect use value (van Beukerng et al. 2007) and is based on the idea that an individual's decision to buy goods or services is based on the characteristics the good or service is comprised of, including its environment. Hedonic pricing assumes environmental services of the surrounding location are reflected in the value of a property. This includes environmental characteristics such as a pleasant view. Both amenity and disamenity (such as proximity to a landfill site) are included in this technique.

Hedonic property valuing uses statistical regression as well as data from the housing market to evaluate the increments in property values associated with the various attributes. Structural, neighbourhood and environmental attributes may all effect property value (Sander and Polasky 2009).

Hedonic pricing is also used in the context of the labour market on the basis the wage rate will reflect a workers willingness to accept compensation for taking health risks inherent in certain jobs. The application to labour markets can be difficult particularly in less developed countries where workers may not know the true risks of certain occupations or where alternate employment is not available.

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