Joint Nature Conservation Committee

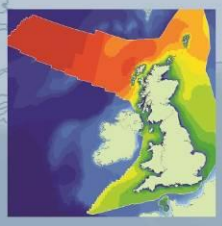
Developing the Evidence Base for Impact Assessments for Recommended dSACs and dSPAs

Report R.2462

November 2015

JNCC NOTE:
A UK network of eight sites was identified within national waters of the Management Units defined for harbour porpoise (ICES, 2014; IAMMWG, 2015a). These eight sites were submitted to Governments as draft SACs (dSACs) in June 2015. The Governments of Wales and Northern Ireland, and Defra on behalf of England and offshore regions, have decided to proceed to consultation for five sites within their jurisdictions. The Scottish Government is not proceeding to consultation at this time. This IA evidence base was commissioned for the entire suite of UK sites identified for harbour porpoise and three pSPAs in Welsh waters.

Creating sustainable solutions for the marine environment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Summary

Introduction

The purpose of the study has been to develop an evidence base of the potential environmental, economic and social benefits and costs of eight recommended draft Special Areas of Conservation (dSACs) and three draft Special Protected Areas (dSPA) in UK offshore and territorial waters. This will allow ministers to understand the implications of their decisions on implementing these sites.

The EU Habitats Directive (92/43/EC) requires Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes of the Directive to favourable conservation status (FCS). Member States are also required to contribute to a coherent European ecological network of protected sites by designating Special Areas of Conservation (SACs) for habitats listed on Annex I and for species listed on Annex II. The Joint Nature Conservation Committee (JNCC), Natural England, Scottish Natural Heritage, Natural Resources Wales and the Department of the Environment for Northern Ireland have provided advice to the UK Governments with respect to the designation of eight new Special Areas of Conservation to protect harbour porpoise (an Annex II species) in UK waters. These sites are being proposed because the UK lacks an appropriate network of harbour porpoise SACs. The UK Government and devolved administrations are aiming to submit these site proposals to the European Commission in 2016.

Separately the EU Wild Birds Directive (2009/147/EC as codified) requires Member States to classify as Special Protection Areas (SPAs) the most suitable territories for wild birds. Building on JNCC work to develop approaches to the identification of marine SPAs and taking account of published SPA selection guidelines (JNCC, 1999), Natural Resources Wales (NRW) has recommended three SPA proposals in Welsh Territorial Waters which they consider essential for the completion of a series of marine SPAs, including marine extensions to two existing SPAs and one entirely new marine SPA. One of these site extensions also encompasses an area of UK offshore waters. These proposals include sites supporting breeding terns, a range of foraging seabirds and wintering red-throated divers. Subject to Ministerial approval, the intention is for these sites to be classified by the end of 2015 or early 2016.

New SACs and SPAs, along with existing protected sites in the UK marine environment, will also contribute to achieving Good Environmental Status (GES) under the Marine Strategy Framework Directive (MSFD) and deliver the UK's contribution to the ecologically coherent network of Marine Protected Areas (MPAs) under the OSPAR convention on the protection of the marine environment in the North East Atlantic.

A formal public consultation on proposals for designation of the dSACs and dSPAs will be undertaken in 2015. Following this public consultation, Ministers will decide on whether to take forward specific sites for designation.

Decisions to classify SPAs or designate SACs and to determine their boundaries must be made using relevant scientific evidence only[1]. However, the UK Government's policy is to provide information on the potential impacts of possible marine designations to Ministers before consultation. Evidence of the environmental and socio-economic impacts of designation of conservation sites in the marine environment is therefore desired to progress classification of marine SPAs (under the EU Wild Birds Directive) and designation of SACs (under the EU Habitats Directive).

Methodology

The study has sought to estimate the effects of designation both at site level and as a network in terms of:

- Potential costs to activities:
- Potential costs to the public sector;
- Potential social impacts; and
- Potential benefits.

The study compares the costs and benefits of designating the eight dSACs and three dSPAs (the 'intervention option') against a counterfactual of what would happen in the absence of the designations (the 'do nothing' option).

Three management scenarios have been used within the intervention option **('lower' (no additional mitigation measures), 'intermediate' (most likely scenario – some additional mitigation measures may be necessary to support achievement of conservation objectives) and 'upper' (very unlikely – highly protective measures))**. These scenarios were developed by the Statutory Nature Conservation Bodies (SNCBs) which take account of different assumptions about the level of management measures that might be required to support achievement of site conservation objectives. The scenarios have been developed only to help inform the impact assessment and should not be seen as prejudging the outcome of any project level appropriate assessments at such time as these may be required.

The potential costs have been assessed for the following activities:

- dSACs:
  - Aggregates;
  - Aquaculture - finfish;
  - Commercial fisheries (mobile gears; set nets, salmon nets);
  - Offshore renewables (offshore wind, tidal stream, tidal lagoon);
  - Military activities;
  - Oil and gas; and
  - Ports & harbours.

[1] Case law (C-44/95 Lappel Bank) clarifies that decisions to classify SPAs (and by implication to designate SACs) must be made using scientific evidence only. Nevertheless, it is UK Government policy is to provide socio-economic information to Ministers before consultation on the potential socio-economic impact of classification of SPAs or designation of SACs.

- dSPAs:
  - Aggregates;
  - Commercial fisheries;
  - Offshore renewables;
  - Oil and gas;
  - Ports and harbours; and
  - Recreational boating.

It was considered sufficiently unlikely that other marine activities would experience significant cost impacts based on the management scenarios proposed by the SNCBs to exclude them from consideration,

For each activity, potential cost impacts have been quantified where possible and estimated in terms of additional expenditure that would be incurred, presented as Present Values (PV) over the lifetime of the assessment period (2015 to 2034). The assessment has been undertaken in a manner consistent with Better Regulation Executive guidance on impact assessment and the Green Book methodology (HM Treasury, 2003) for economic assessment.

For the commercial fisheries and offshore renewables sectors, the management options for some sites may give rise to economic impacts as a result of changes in output. These potential cost impacts have been estimated in terms of impacts to Gross Value Added (GVA) and employment. This provides a better representation of the true economic impact.

Where it was not possible to quantify particular impacts, this has been highlighted in the analysis. A number of the cost estimates are recognised as being highly uncertain because of uncertainties relating to the specific management requirements for individual sites and the consequential impacts on marine activities. Such uncertainties have been highlighted throughout the analysis.

A distributional analysis has been undertaken for the quantified costs to the commercial fishing and offshore renewables sectors. This has included impacts on specific locations (including regions, districts and ports) and on specific groups within the UK's population (including, for example, different age groups, genders, minority groups, and parts of UK's income distribution).

A social impact analysis has been prepared to identify the key areas of social impact that could potentially be affected by the potential economic costs (quantified and non-quantified) generated by designation and assesses the potential significance of these impacts. This approach is consistent with that put forward by the Government Economic Service / Government Social Research) Social Impacts Taskforce, which is based on the 'capitals approach' of ensuring that stocks of social capital are maintained over time. The key areas of social impact that have been assessed include:

- People's way of life;
- Culture;
- Community;
- Political systems;
- Environment;
- Health;
- Personal and property rights and equity; and
- Fears and aspirations.

Public sector costs were estimated for the following broad areas based on discussions with the SNCBs:

- Preparation of Marine Management Schemes;
- Preparation of Statutory Instruments;
- Development of voluntary measures;
- Site monitoring;
- Additional costs for geophysical surveys;
- Compliance and enforcement;
- Promotion of public understanding;
- Regulatory and advisory costs associated with licensing decisions; and
- Costs of leasing income foregone.

The potential benefits of site designation have been assessed using an ecosystem services framework. This has largely been undertaken as a qualitative assessment owing to a lack of applicable quantitative evidence.

The combined impact of designating the dSACs and dSPAs has taken account of spatial overlaps between the proposed designations and overlaps with existing designated sites. For other combined impacts, it has largely adopted an additive approach (i.e. it assumes that the combined impact is equivalent to the sum of the individual impacts within each site), although additional commentary has been provided where the combined impacts on specific sectors are potentially significant.

Detailed assessments for each proposed site are presented in Appendix G with an assessment of the combined impact presented in the main report (Section 5).

Findings

Impacts to Activities

The designation of the dSACs and dSPAs has the potential to give rise to increases in costs for a number of marine activities under all scenarios. These increases can take different forms:

- In some cases, under the 'worst case' upper scenario, there is some potential for changes in the scale of some marine activities. For example, this could occur if fisheries effort is restricted, or if marine renewable projects are unable to go ahead. In these cases, the economic impact is a loss of economic output. The value of this loss is measured in terms of lost gross value added (GVA) and lost employment for the commercial fisheries and offshore renewables sectors in relation to some of the proposed designations. These are referred to as 'impacts on GVA and employment'.
- In other cases, the costs will be extra operating costs for marine activities, such as increased costs of licence applications, or costs of mitigation measures such as pingers. However, these changes to operating costs are small relative to the turnover of the sectors involved, and would not be expected to give rise to changes in their economic output. They therefore would not give rise to impacts that were significant for local, regional or national economies, or that could be measured in terms of reduced GVA and employment. These changes in operating costs that do not affect GVA and output are referred to as 'operating costs' throughout this study.

Table S1 summarises estimated impacts to operating costs by activity. Tables S2 and S3 separately summarise estimated GVA and employment impacts respectively for commercial fisheries and offshore renewables sectors as it is not appropriate to combine these estimates with impacts to operational costs. The ranges presented across the scenarios reflect the possible range of quantified costs depending on which particular site management options are selected. It should be noted that the increases in operating costs for some marine activities under the upper scenario may be lower than for the intermediate scenario. This is because the main cost impacts under the upper scenario for these marine activities are expressed as GVA and employment impacts.

Table S1. Present value (PV) in £ '000 for quantified impacts to operating costs[2] to human activities (costs discounted over assessment period (2015-2034) at 2015 prices)

Site Name	Scenarios		
	Lower Estimate	Intermediate Estimate	Upper Estimate
dSACs			
Aggregates	106	142	142
Aquaculture - finfish	229	780	3,243
Commercial fisheries	0	861	0
Military activities	0	182	182
Offshore renewables – offshore wind	1,313	1,383	1,030
Offshore renewables- tidal stream	231	441	0
Oil & Gas	505	1,928	1,928
Ports and harbours	314	314	501
Total dSACs	**2,698**	**6,031**	**7,026**
dSPAs			
Aggregates	0	0	0
Commercial fisheries	0	0	0
Offshore renewables	0	0	0
Oil & Gas	0	0	0
Ports and harbours	96	96	96
Recreational boating	0	0	1
Total SPAs	**96**	**96**	**97**

Based on the assessments undertaken, the quantified impacts on operating costs for marine aggregates, military activities and oil and gas in relation to dSAC designations are assessed as being minor relative to annual turnover under all scenarios (Table S1). For the dSPAs, the quantified impacts on operating costs for marine aggregates, oil and gas and recreational boating are assessed as being negligible or very minor relative to annual turnover for all scenarios (Table S1). However, some of these estimates are quite uncertain and it has not been possible to quantify some impacts. Therefore, there is the potential for more significant impacts on operating costs to arise for individual projects should the assessment assumptions (documented in Appendices B and C) prove incorrect.

2 Defined in this study as costs that do not impact the output from marine activities, so do not affect GVA and employment.

Potentially more significant impacts on operating costs could be experienced by the finfish aquaculture, commercial fisheries, offshore renewables (offshore wind and tidal stream) and ports and harbours sectors under the intermediate and/or upper scenarios.

For the commercial fisheries and offshore renewables sectors there is the potential for the designations to give rise to impacts on GVA and employment (Tables S2 and S3), primarily under the upper scenario (which is considered very unlikely).

Table S2. Impacts on GVA in £m for quantified impacts to commercial fisheries (Direct and Indirect GVA only) and offshore renewables (Direct, indirect and induced GVA) (costs discounted over assessment period (2015 – 2034), 2015 prices)

Sector	Scenarios		
	Lower Estimate	Intermediate Estimate	Upper Estimate
dSACs			
Commercial fisheries (Direct and indirect GVA)	0	0	41
Offshore wind (Direct, indirect and induced GVA)	0	0	2,778
Tidal stream (Direct, indirect and induced GVA)	0	0	97
Total dSACs	**0**	**0**	**2,916**
dSPAs			
Commercial fisheries (Direct and indirect GVA)	0	0.1	0.8
Total dSPAs	**0**	**0.1**	**0.8**

Table S3. Impacts on employment (full time equivalent jobs) for commercial fisheries (Direct and indirect employment) and offshore renewables (Direct, indirect and induced employment)

Sector	Scenarios		
	Lower Estimate	Intermediate Estimate	Upper Estimate
dSACs			
Commercial fisheries (Direct and indirect employment)	0	0	71.7
Offshore wind (Direct, indirect and induced employment)			
▪ Construction (Jobs p.a. during construction period)	0	0	6,823
▪ Operation (Jobs p.a.)	0	0	1,056
Tidal stream (Direct, indirect and induced employment)			
▪ Construction (Jobs p.a. during construction period)	0	0	896
▪ Operation (Jobs p.a.)	0	0	50
dSPAs			
Commercial fisheries (Direct and indirect employment)	0	0.2	1.4

Summaries of the potential impacts on those sectors that may experience more significant impacts are presented below.

Aquaculture

For the finfish aquaculture sector, potential impacts on operating costs have been identified for Southern Sea of Hebrides and North Minch dSACs. Impacts (PV) range from £229k (lower scenario), £780k (intermediate scenario to £3.24m (upper scenario) (Table S1). There is some potential for a significant combined impact to occur on finfish aquaculture installations within these sites when taking account of the designation and management of existing and planned Scottish Nature Conservation MPAs, for which additional costs could be incurred associated with obtaining licences and associated monitoring. The combined impacts could affect the competitiveness of finfish aquaculture installations in these two dSACs. This risk can be minimised by linking the implementation of any required mitigation measures to industry investment cycles.

Fisheries

Impacts to operating costs (PV) are estimated to range from £0 (lower scenario), £861k (intermediate scenario) and £0 (upper scenario)[3] (Table S1), attributable to the potential management measure of requiring under-12m vessels fishing with nets to use acoustic deterrent devices (pingers) on their nets. These costs are mainly attributed to the Bristol Channel Approaches and Southern North Sea dSACs. There are large uncertainties in the estimate of these costs, relating to both the number of vessels that may be affected, and the length of nets used by them, and may significantly over- or under-estimate costs to the sector. Implementation of pingers on such a large scale should also be considered in relation to potentially negative impact of excluding harbour porpoise from feeding and mating areas, and the feasibility of implementation and enforcement. Non-quantified impacts on the sector relate to implementation of seasonal or annual mitigation measures on fixed engines[4] (intermediate and upper scenario).

For commercial fisheries, potential impacts on direct and indirect GVA (discounted over assessment period, 2015 prices) of the dSACs and dSPAs combined range from £0 (lower scenario), £0.1m (intermediate scenario) to £42.0m (upper scenario) (Table S2). Impacts on direct and indirect employment (jobs) are estimated to range from 0 full-time equivalents (FTEs) (lower scenario), 0.2 FTEs (intermediate scenario) to 73 FTEs (upper scenario) (Table S3). The GVA values presented represent the estimated GVA associated with the value of landings that could be affected by the possible management measures and will be overestimates if some of the effort that could be displaced continues to fish elsewhere. The displacement of vessels from their fishing grounds under the upper scenario would have the potential to cause conflict among those vessels and with other vessels in the grounds they are displaced to. There might also be additional costs associated with moving to new fishing grounds, changing target species or fishing method, as well as additional environmental impacts to new grounds, and a number of vessels may leave the sector, with resulting employment and social

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3 Impacts under the upper scenario are expressed in terms of GVA and employment rather than in terms of operating costs

4 Nets used since the early 1800s to catch salmon on the coast outside estuary limits. Include bag nets and stake nets (fly and jumper nets).

impacts. However, there are uncertainties in the estimates of cost impacts, particularly for some of the smaller sites, which may over- or under-estimate impacts.

The estimate of impacts on commercial fisheries relates only to UK-registered vessels. Other European Member States' vessels also fish in some of the areas affected, in particular the Southern North Sea dSAC. Information on which countries' vessels may be affected for each site is provided in the site-specific reports in Appendix G.

Offshore Renewables

Impacts to operating costs (PV) for the offshore wind sub-sector are estimated to range from £1,313k (lower scenario), £1,383k (intermediate scenario) and £1,030k (upper scenario)[5] (Table S1),

Under the upper scenario, there is the potential for some offshore wind farm projects to be cancelled. This could give rise to large impacts on GVA and employment (Tables S2 and S3). However, this scenario is considered to be very unlikely to occur.

No significant impacts have been identified for the wave energy or tidal range sub-sectors. Impacts to operating costs (PV) for the tidal stream sub-sector are estimated to range from £231k (lower scenario), £441k (intermediate scenario) and £0k (upper scenario)[6] (Table S1). Under the upper scenario, there is the potential for some tidal stream projects to be cancelled. This could give rise to large impacts on GVA and employment (Tables S2 and S3). However, this scenario is considered to be very unlikely to occur.

Ports and Harbours

The quantified direct impacts on the ports and harbours sector are small (Table S1) and are not considered significant relative to annual turnover. However, it has not been possible to estimate cost impacts under the upper scenario, which in some circumstances could be substantial, should development projects not proceed. In addition, under the upper scenario there is the potential for a significant indirect effect on the sector as a consequence of impacts to the offshore renewables sector. Should offshore wind and tidal stream projects be cancelled, this would result in the loss of activity for ports both during construction and operation, although this scenario is considered very unlikely to occur. The impacts on GVA and employment for the ports sector have not been estimated separately, but are included in the overall cost impacts to the offshore renewables sector which include indirect GVA and employment associated with offshore renewables supply chains.

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5 The impacts on operating costs under the upper scenario are lower than under the intermediate scenario because some of the impacts under the upper scenario are expressed in terms of GVA and employment rather than in terms of operating costs

6 The estimated impacts on operating costs in the upper scenario are zero because, as a worst case assumption it has been assumed that the developments do not proceed and the impact is therefore assessed in terms of potential gross impacts to GVA and employment

Public Sector Costs

Table S4 presents a summary of estimated cost impacts to the public sector. Under the lower and intermediate scenarios, the main potential costs are around £1m (PV). The main costs under these scenarios relate to monitoring requirements to assess the condition of features within sites once designated (around £0.6m for dSACs and £0.3m for dSPAs under the intermediate scenario, (PV). Other public sector costs associated with preparing Statutory Instruments to implement fisheries management measures, compliance and enforcement activities, additional costs associated with geophysical surveys and regulatory and advisory costs are individually estimated to be relatively minor (PV around £0.45m (dSACs) and less than £0.02m (dSPAs) in total for intermediate scenario, PV). Under the upper scenario, potentially much larger impacts could occur as a result of leasing income that would be foregone should some offshore renewables projects not proceed. However, this scenario is considered very unlikely to occur.

Table S4. Present value (PV) in £ '000 for public sector costs (costs discounted over assessment period (2015 – 2034), 2015 prices)

Site Name	Quantified Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
dSACs			
Preparation of Marine Management Schemes	0	0	0
Preparation of Statutory Instruments	0	41	60
Development of voluntary measures	0	0	0
Site monitoring	572	572	572
Additional costs for geophysical surveys	119	119	119
Compliance and enforcement	0	0	0
Promotion of public understanding	0	0	0
Regulatory and advisory costs associated with licensing decisions and Review of Consents	293	293	263
Costs to The Crown Estate associated with potential leasing revenues foregone	0	0	504,664
dSAC Total	**984**	**1,025**	**505,678**
dSPAs			
Preparation of Marine Management Schemes	0	0	0
Preparation of Statutory Instruments	0	3	12
Development of voluntary measures	4	4	4
Site monitoring	272	272	272
Compliance and enforcement	0	0	0
Promotion of public understanding	0	0	0
Regulatory and advisory costs associated with licensing decisions and Review of Consents	10	10	10
Costs to The Crown Estate associated with potential leasing revenues foregone	0	0	0
dSPA Total	**285**	**289**	**298**

Summary of Quantified Costs

Tables S5 to S14 summarise the quantified costs (costs to activities and costs to public sector) by site. Note that these site costs do not include costs estimated at a national level for dSACs and not assigned to individual sites. (For dSPAs all costs were assigned to individual sites). There are no quantified costs for the Anglesey Terns / Morwenoliaid Ynys Mon dSPA, so no table is presented for this site. For impacts to GVA, it should be noted that this includes impacts to direct and indirect GVA for commercial fisheries and direct, indirect and induced GVA for offshore renewables.

Tables S15 and S16 summarise the quantified costs (costs to activities and costs to public sector) for all dSACs and all dSPAs respectively.

Table S5. Quantified cost impacts: Southern North Sea dSAC

Costs (£m)	Total Transition (Constant Price) 2015		Average Annual (excl. Transition) (Constant Price) 2015		Total Cost (Present Value)	
	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA
Lower Estimate*	1.60	-	-	-	1.31	-
Upper Estimate	3.43	2,254.47	-	0.87	327.48	1,936.47
Intermediate Estimate	3.84	-	-	-	3.05	-

* 'Lower' (business as no additional mitigation measures usual), 'intermediate' (most likely scenario – some additional mitigation measures may be necessary to support achievement of conservation objectives) and 'upper' (very unlikely – highly protective measures)

Table S6. Quantified cost impacts: Outer Moray Firth dSAC

Costs (£m)	Total Transition (Constant Price) 2015		Average Annual (excl. Transition) (Constant Price) 2015		Total Cost (Present Value)	
	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA
Lower Estimate	0.36	-	-	-	0.31	-
Upper Estimate	0.27	951.56	-	0.24	173.22	857.65
Intermediate Estimate	0.42	-	-	-	0.36	-

Table S7. Quantified cost impacts: North Minch dSAC

Costs (£m)	Total Transition (Constant Price) 2015		Average Annual (excl. Transition) (Constant Price) 2015		Total Cost (Present Value)	
	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA
Lower Estimate	0.13	-	-	-	0.09	-
Upper Estimate	0.85	-	-	0.13	0.62	1.95
Intermediate Estimate	0.26	-	-	-	0.19	-

Table S8. Quantified cost impacts: Southern Sea of Hebrides dSAC

Costs (£m)	Total Transition (Constant Price) 2015		Average Annual (excl. Transition) (Constant Price) 2015		Total Cost (Present Value)	
	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA
Lower Estimate	0.30	-	-	-	0.22	-
Upper Estimate	3.72	-	-	0.26	2.72	3.68
Intermediate Estimate	0.94	-	-	-	0.68	-

Table S9. Quantified cost impacts: North Channel and Outer Solway dSAC

Costs (£m)	Total Transition (Constant Price) 2015		Average Annual (excl. Transition) (Constant Price) 2015		Total Cost (Present Value)	
	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA
Lower Estimate	0.23	-	-	-	0.17	-
Upper Estimate	0.22	50.90	-	0.29	3.38	50.32
Intermediate Estimate	0.48	-	-	-	0.39	-

Table S10. Quantified cost impacts: North Anglesey Marine / Gogledd Môn Forol dSAC

Costs (£m)	Total Transition (Constant Price) 2015		Average Annual (excl. Transition) (Constant Price) 2015		Total Cost (Present Value)	
	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA
Lower Estimate	0.18	-	-	-	0.15	-
Upper Estimate	0.05	35.62	-	0.18	2.33	34.83
Intermediate Estimate	0.23	-	-	-	0.19	-

Table S11. Quantified cost impacts: West Wales Marine / Gorllewin Cymru Forol dSAC

Costs (£m)	Total Transition (Constant Price) 2015		Average Annual (excl. Transition) (Constant Price) 2015		Total Cost (Present Value)	
	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA
Lower Estimate	0.18	-	-	-	0.15	-
Upper Estimate	0.09	20.76	-	0.33	1.44	23.57
Intermediate Estimate	0.23	-	-	-	0.19	-

Table S12. Quantified cost impacts: Bristol Channel Approaches / Dynesfeydd Môr Hafren dSAC

Costs (£m)	Total Transition (Constant Price) 2015		Average Annual (excl. Transition) (Constant Price) 2015		Total Cost (Present Value)	
	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA
Lower Estimate	0.08	-	-	-	0.06	-
Upper Estimate	0.15	-	-	0.55	0.11	5.69
Intermediate Estimate	0.78	-	-	-	0.61	-

Table S13. Quantified cost impacts: Northern Cardigan Bay / Gogledd Bae Ceredigion dSPA

Costs (£m)	Total Transition (Constant Price) 2015		Average Annual (excl. Transition) (Constant Price) 2015		Total Cost (Present Value)	
	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA
Lower Estimate	0.43	-	-	-	0.31	-
Upper Estimate	0.43	-	-	0.04	0.31	0.62
Intermediate Estimate	0.43	-	-	0.01	0.31	0.13

Table S14. Quantified cost impacts: Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Benfro dSPA

Costs (£m)	Total Transition (Constant Price) 2015		Average Annual (excl. Transition) (Constant Price) 2015		Total Cost (Present Value)	
	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA
Lower Estimate	0.10	-	-	-	0.07	-
Upper Estimate	0.11	-	-	0.02	0.08	0.22
Intermediate Estimate	0.10	-	-	-	0.07	-

Table S15. Quantified cost impacts: All dSACs

Costs (£m)	Total Transition (Constant Price) 2015		Average Annual (excl. Transition) (Constant Price) 2015		Total Cost (Present Value)	
	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA
Lower Estimate	4.69	-	-	-	3.68	-
Upper Estimate	10.66	3,313.30	-	2.85	512.70	2,916.44
Intermediate Estimate	9.07	-	-	-	7.06	-

Table S16. Quantified cost impacts: All dSPAs

Costs (£m)	Total Transition (Constant Price) 2015		Average Annual (excl. Transition) (Constant Price) 2015		Total Cost (Present Value)	
	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA	Quantified (Operating Costs)	Impacts to GVA
Lower Estimate	0.53	-	-	-	0.38	-
Upper Estimate	0.54	-	-	0.06	0.39	0.84
Intermediate Estimate	0.53	-	-	0.01	0.39	0.13

Social Impacts

Social impacts analysis has considered the scale and geographical location of the predicted economic impacts to commercial fisheries and marine renewable energy generation. The potential for these impacts to have further effects on specific social groups in the communities and sectors affected has been analysed using a structured qualitative approach.

No significant social impacts are expected to occur under the lower or intermediate scenarios. Significant social impacts could occur under the upper scenario as a result of management measures affecting the commercial fisheries and offshore renewables sectors in some sites (Table S17). However, this scenario is considered very unlikely to occur.

Table S17. Description of potential social impacts under the upper scenario for dSACs and dSPAs

Site	Key Areas of Social Impact	Scale of Expected Impact Across Scenarios	Distributional Analysis
dSACs			
Southern North Sea	Employment and community cohesion from impacts on Commercial Fisheries	Minimal reduced income and employment, and risk to 'way of life' and individual identity, under upper scenario only.	Risk to: ▪ Coastal communities on East Coast. ▪ Vessels > 10m ▪ Working age men in middle income group
	Employment and community cohesion from impacts on Wind energy.	Significant reduced income and employment, under upper scenario only.	Risk to: ▪ Coastal communities on East Coast. ▪ Wind energy sector and its construction supply chain. ▪ Potentially all social groups affected.
Outer Moray Firth	Employment and community cohesion from impacts on Commercial Fisheries	Minimal reduced income and employment, and risk to 'way of life' and individual identity, under upper scenario only.	Risk to: ▪ Rural coastal communities in Scotland. ▪ Vessels > 10m ▪ Working age men in middle income group
	Employment and	Significant reduced income and	Risk to:

Site	Key Areas of Social Impact	Scale of Expected Impact Across Scenarios	Distributional Analysis
	community cohesion from impacts on Wind energy.	employment, under upper scenario only.	▪ Coastal communities in Scotland. ▪ Wind energy sector and its construction supply chain. ▪ Potentially all social groups affected.
North Minch	Employment and community cohesion from impacts on Commercial Fisheries	Minimal reduced income and employment, and risk to 'way of life' and individual identity, under upper scenario only.	Risk to: ▪ Rural coastal communities in Scotland. ▪ Vessels > 10m ▪ Working age men in middle income group
Southern Sea of Hebrides	Employment and community cohesion from impacts on Commercial Fisheries	Minimal reduced income and employment, and risk to 'way of life' and individual identity, under upper scenario only.	Risk to: ▪ Rural coastal communities in Scotland. ▪ Vessels > 10m ▪ Working age men in middle income group
North Channel and Outer Solway	Employment and community cohesion from impacts on Commercial Fisheries	Minimal reduced income and employment, and risk to 'way of life' and individual identity, under upper scenario only.	Risk to: ▪ Rural coastal communities in Scotland. ▪ Vessels > 10m ▪ Working age men in middle income group
	Employment and community cohesion from impacts on Tidal energy.	Significant reduced income and employment, under upper scenario only.	Risk to: ▪ Coastal communities in Scotland. ▪ Tidal energy sector and its construction supply chain. ▪ Potentially all social groups affected.
North Anglesey Marine / Gogledd Môn Forol	Employment and community cohesion from impacts on Commercial Fisheries	Minimal reduced income and employment, and risk to 'way of life' and individual identity, under upper scenario only.	Risk to: ▪ Rural coastal communities in Wales. ▪ Vessels > 10m ▪ Working age men in middle income group
	Employment and community cohesion from impacts on Tidal energy.	Significant reduced income and employment, under upper scenario only.	Risk to: ▪ Coastal communities in Wales. ▪ Tidal energy sector and its construction supply chain. ▪ Potentially all social groups affected.
West Wales Marine / Gorllewin Cymru Forol	Employment and community cohesion from impacts on Commercial Fisheries	Minimal reduced income and employment, and risk to 'way of life' and individual identity, under upper scenario only.	Risk to: ▪ Rural coastal communities in Wales. ▪ Vessels > 10m ▪ Working age men in middle income group
	Employment and community cohesion from impacts on Tidal energy.	Significant reduced income and employment, under upper scenario only.	Risk to: ▪ Coastal communities in Wales. ▪ Tidal energy sector and its construction supply chain. ▪ Potentially all social groups affected.
Bristol Channel	Employment and	Minimal reduced income and	Risk to:

Site	Key Areas of Social Impact	Scale of Expected Impact Across Scenarios	Distributional Analysis
Approaches / Dynesfeydd Môr Hafren	community cohesion from impacts on Commercial Fisheries	employment, and risk to 'way of life' and individual identity, under upper scenario only.	▪ Rural coastal communities in Wales and Southwest England. ▪ Vessels > 10m ▪ Working age men in middle income group
dSPAs			
Anglesey Terns / Morwenoliaid Ynys Mon	None	None	None
Northern Cardigan Bay / Gogledd Bae Ceredigion	Employment and community cohesion from impacts on Commercial Fisheries	Minimal reduced income and employment, and risk to 'way of life' and individual identity, under upper scenario only.	Risk to: ▪ Rural coastal communities in Wales. ▪ Vessels > 10m ▪ Working age men in middle income group
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Benfro	Employment and community cohesion from impacts on Commercial Fisheries	Minimal reduced income and employment, and risk to 'way of life' and individual identity, under upper scenario only.	Risk to: ▪ Rural coastal communities in Wales. ▪ Vessels > 10m ▪ Working age men in middle income group

Commercial Fishing Sector and Fish Processing Sector

For the commercial fisheries sector, the dSAC designations are unlikely to affect economic activity under the lower and intermediate scenarios, but have the potential to affect economic activity under the upper scenario. No significant impacts are identified for the dSPAs.

There is a risk of the commercial fisheries impacts at all the dSACs having social impacts in fishing communities. The impacts on those employed in the sector could be significant, but are not considered large enough to have significant subsequent impacts on particular social groups in fishing communities or the fish processing sector. In total, the risk across all the sites, in the upper scenario, is that they result in loss of 72 FTE jobs and annual average direct and indirect GVA of £2 million. These impacts could be significant at a local community scale. However, as they represent a worst case scenario, and are less than 0.2% of the UK sector, they are not considered to indicate a significant risk of social impacts at a regional or national scale.

Offshore Renewables

For the offshore renewables sector, no significant social impacts are expected to arise under the lower or intermediate scenarios. Under the upper scenario, potentially significant social impacts could arise in relation to 2 dSACs for offshore wind, and three dSACs for tidal stream energy development, should development projects be cancelled. However, this scenario is considered very unlikely to occur.

Should this scenario arise, there could be very significant secondary social impacts associated with reduced job creation (potential loss of 7,719 short-term jobs during construction and 1,106 long-term jobs associated with operation), including impacts on social cohesion in the affected communities. The renewable energy capacity forgone would have supported the wider social benefits of improved energy security and reduced greenhouse gas emissions.

The scale of the social impacts should offshore renewable energy projects be cancelled under the upper scenario are such that they would be likely to impact all social groups across society, at least at the regional level where sites are located. It is also likely that the combined social costs from the cumulative impacts of the sites would be greater that the impacts identified for the sites individually. A particular risk is that project cancellations might affect investor confidence in the sector.

Benefits

The assessment of benefits has focussed on the changes to ecosystem services that are expected to result from site designation and management. While the proposed sites undoubtedly support a considerable range and value of ecosystem services (eftec *et al*, 2015; Bournemouth University & ABPmer, 2010), the potential impacts of the site management measures on these services is limited. As a result the assessment of changes in ecosystem services at individual sites is highly uncertain. The main ecosystem service benefits that are expected to occur relate to recreational benefits and non-use benefits.

The review of evidence on the value of ecosystem services from the proposed sites reflects the factors that result in different assessments in Table 7 for each site in Appendix G. These include differences in designated features and other environmental characteristics, management measures, and current activities present at sites (e.g. tourism). The ambiguity and uncertainty associated with the quantification of ecosystem services, as reflected in the evidence reviewed, reinforces the necessity for a largely qualitative approach to the assessments of benefits at a site level.

A key part of the values of the ecosystem services are the recreational and non-use values of the sites. These are informed by only a few studies, of which Kenter *et al* (2013) provides the most relevant economic values. It suggests:

- The designations would help safeguard the recreational value of the sites, which is estimated to be worth £millions at several of the sites for which evidence is available.
- The non-use benefits of designation are also estimated to be worth £millions at several of the sites for which evidence is available.

Interpretation of the Kenter *et al* (2013) study for the proposed sites is subject to uncertainty for several reasons. The extrapolation used to estimate the values in the study has been questioned by Marine Scotland over the representativeness of the surveyed sample of divers and anglers. The study suggests much of the value of sites is 'insurance'. This relates to designation providing enhanced powers to conserve sites in the face of future pressures. However, this is a difficult characteristic to attribute to large sites being designated for highly mobile features, such as the dSACs and dSPAs under consideration.

The site ecosystem services assessments mainly identify low - moderate non-use values, with a low-moderate level of confidence (Table S18). The broad qualitative range in the analysis reflects all the uncertainties involved in the interpretation of economic evidence, such as the Kenter *et al* (2013) study, in this context. Overall, the monetary valuation of the benefits of designating proposed sites is considered to be significant, but is highly uncertain and cannot be quantified.

Table S18. Description of potential social impacts under the upper scenario for dSACs and dSPAs

Site	Moderate and High Ecosystem Services Impacts	Relevance to Sites	Scale of Benefits
All harbour porpoise sites	Non-use value	This service has moderate relevance, for harbour porpoise, along with the contribution of SACs to the MPA network.	The benefits are assessed as a small noticeable impact on this ecosystem service, based on the benefits of protecting harbour porpoise (and the marine ecosystem) from decline, and/or allowing for some recovery of the marine site, and causing a noticeable incremental increase in a site's value.
Northern Cardigan Bay / Gogledd Bae Ceredigion	Non-use value	This service has moderate relevance, for red throated diver, along with the contribution of SACs to the MPA network	The benefits are assessed as a small noticeable impact on this ecosystem service, based on the benefits of protecting red throated diver (and the marine ecosystem) from decline, and/or allowing for some recovery of the marine site, and causing a noticeable incremental increase in a site's value.
Anglesey Terns / Morwenoliaid Ynys Mon and Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Benfro	Non-use value	This service has moderate relevance, for breeding seabirds, along with the contribution of SACs to the MPA network.	The benefits are assessed as a small noticeable impact on this ecosystem service, based on the benefits of protecting seabirds (and the marine ecosystem) from decline, and/or allowing for some recovery of the marine site, and causing a noticeable incremental increase in a site's value.
	Research and education	This service has moderate relevance, due to long-term scientific studies of breeding seabirds, and their role in communicating marine protection.	The benefits are assessed as potentially a small noticeable impact on this ecosystem service, based on the benefits of protecting seabirds (and the marine ecosystem) from decline, and causing a noticeable incremental increase in a site's value.

Acknowledgements

We gratefully acknowledge the contributions from the wide range of stakeholders that have been informally consulted as part of this work. We also wish to thank Gardline for a helpful discussion on geophysical survey costs.

Abbreviations

ABPmer	ABP Marine Environmental Research Ltd
ADD	Acoustic Deterrent Devices
AIS	Automatic Identification System
BBC	Bib Bubble Curtain
BMAPA	British Marine Aggregate Producers Association
boe	Barrels of Oil Equivalent
BOWL	Beatrice Offshore Windfarm Limited
BPA	British Ports Association
BRIA	Business and Regulatory Impact Assessment
CEDA	Central Dredging Association
Cefas	Centre for the Environment, Fisheries and Aquaculture Science
CFP	Common Fisheries Policy
DARDNI	Department of Agriculture and Rural Development (Northern Ireland)
DECC	Department of Energy and Climate Change
Defra	Department for the Environment, Food and Rural Affairs
DETINI	Department of Enterprise Trade and Investment (Northern Ireland)
DfT	Department for Transport
DoE(NI)	Department of the Environment (Northern Ireland)
DRDNI	Department for Regional Development
dSAC	Draft Special Area of Conservation
dSPA	Draft Special Protection Area
DTI	Department of Trade and Industry
EIA	Environmental Impact Assessment
ES	Ecosystem Service
EPS	European Protected Species
EU	European Union
FAO	Food and Agriculture Organisation
FCS	Favourable Conservation Status
FEAST	Feature Activity Sensitivity tool
FPSO	Floating Production Storage and Offloading
GeMS	Geodatabase of Marine features in Scotland
GES	Good Environmental Status
GIS	Geographic Information System
GSR	Government Social Research
GVA	Gross Value Added
HRA	Habitats Regulations Assessment
IA	Impact Assessment
ICES	International Council for the Exploration of the Seas
IFCA	Inshore Fisheries and Conservation Authority
iMADP	Interim Marine Aggregate Dredging Policy
inc.	Including
ISO	International Standards Organisation
JNCC	Joint Nature Conservation Committee

MarLIN	Marine Life Information Network
MCA	Maritime and Coastguard Agency
MCZ	Marine Conservation Zone
MESAT	Marine Environment and Sustainability Assessment Tool
MESH	Mapping European Seabed Habitats
MMO	Marine Mammal Observer
MMO	Marine Management Organisation
MOD	Ministry of Defence
MORL	Moray Offshore Renewables Limited
MPA	Marine Protected Areas
MSFD	Marine Strategy Framework Directive
NC MPA	Nature Conservation MPA
NE	Natural England
NEA	National Ecosystem Assessment
NFFO	National Federation of Fishermen's Organisations
NGO	Non-Governmental Organisation
NIFPO	Northern Ireland Fish Producers Organisation
NMPi	National Marine Plan interactive
NPV	Net Present Value
NRW	Natural Resources Wales
NUTFA	New Under Ten Fishermen's Association
O&G	Oil and Gas
OSPAR	Oslo and Paris Commission
p.a.	per annum
PAG	Project Advisory Group
PFOW	Pentland Firth and Orkney Waters
pMPA	Possible Marine Protected Area
PSAG	Project Steering and Advisory Group
PSG	Project Steering Group
PV	Present value over the assessment period (2015 to 2034) at 2015 prices
RYA	Royal Yachting Association
SAC	Special Area of Conservation
SFF	Scottish Fishermen's Federation
SG	Scottish Government
SNCB	Statutory Nature Conservation Body
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SSPO	Scottish Salmon Producers Organisation
UK	United Kingdom
UKCS	UK Continental Shelf
UKFEN	UK Fisheries Economics Network
UKMPG	UK Major Ports Group
UKNEA	UK National Ecosystem Assessment
UNEP-WCMC	United Nations Environment Programme – World Conservation Monitoring Centre
VMS	Vessel Monitoring System

VNN	Valuing Nature Network
WFA	Welsh Fishermen's Association
WG	Welsh Government

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

Glossary

Annual turnover – The amount of business a company conducts during a year, measured in revenue or sales.

Average Annual Costs – The average of recurring yearly costs that will be incurred as a result of the policy intervention.

Constant Prices – Prices that relate to specific points in time (years) that are expressed relative to a standard base year, which removes the effect of inflation.

Contract for Difference - A Contract for Difference is a private law contract between a low carbon electricity generator and the Low Carbon Contracts Company, which is a government-owned company. A generator party to a Contract for Difference is paid the difference between the 'strike price' – a price for electricity reflecting the cost of investing in a particular low carbon technology – and the 'reference price'– a measure of the average market price for electricity in the Great Britain market. Offshore renewables developers can apply for Contracts for Difference within specific funding rounds. There have been two funding rounds to date. In April 2014, five offshore wind farms were awarded Contracts for Difference (Beatrice, Burbo Bank extension, dudgeon, Hornsea 1 and Walney extension). In February 2015 a further two offshore wind farms were awarded Contracts for Difference (Neart na Gaoithe and East Anglia One).Further funding rounds are anticipated on an approximately annual basis. The level and availability of funding for Contracts for Difference is also set annually.

Counterfactual – The scenario in the absence of the policy intervention. An impact assessment assesses the specific effect of the policy intervention while recognising that the baseline would change in the absence of the policy intervention.

Direct and indirect employment – Direct employment is employment associated directly with an activity. Indirect employment is employment associated with the supply chains that support a main activity.

Discounting – The conversion of future costs/benefits to present values using a discount rate.

Discounted over assessment period – Where costs or benefits occur over a period of time, society generally places greater value on costs and benefits that are closer to the current time period compared to those which are further away in time. This can be recognised by discounting costs or benefits that are further away in time. The HM Treasury Green Book specifies discount rates that can be used in impact assessments.

Dynamic baseline – A dynamic baseline recognises that changes will occur to the baseline over the assessment period, even in the absence of the policy intervention. The dynamic baseline provides the counterfactual against which the impact of the policy can be assessed.

Estimated Employment Impact – The estimated change in employment over a given time period due to the policy intervention.

GDP deflators – A measure of general inflation in the domestic economy. HM Treasury publishes information on historic inflation and provides projections of possible future inflation. The deflators can be applied to actual prices where it is necessary to present information in constant prices.

Good Environmental Status (GES) – "The environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive."[7]

Gross Value Added (GVA) – The value generated by any unit engaged in production and the contributions of individual sectors or industries to Gross Domestic Product. GVA can be measured as 3 components:

- Direct GVA - Output less intermediate consumption.
- Indirect GVA – The effect of expenditure in supply chains.
- Induced GVA – The effect of spending by those directly and indirectly employed by the sector.

Present Value – The discounted value of a set of future costs or benefits.

Net Present Value (NPV) - The value of an asset determined by estimating the stream of net benefits (benefits minus costs) expected to be earned in the future and then discounting the future income back to the present accounting period.

Non-quantified impact – Impacts that are assed qualitatively, rather than given a quantitative value.

One-off values – A value that occurs once in a given time-period (i.e. a non-recurring value).

Present Value - The sum of discounted values over a given time period.

Primary and secondary social impacts – Primary social impacts are the first order social impact that may occur due to the consequence. Secondary social impacts are the second order impact that may occur due to the first order social impact.

Recurring costs and benefits: these are the costs and benefits that will recur while the policy measure remains in force.

Sunk Costs – A non-recoverable cost that has already been incurred.

Total Economic Value – The sum of direct and indirect use values, option value, and non-use values (e.g. bequest and existence value).

Total Cost – The sum of Transition Costs and Average Annual Costs, usually expressed as Present Value relative to a base year and over a defined time period.

7 http://ec.europa.eu/environment/marine/good-environmental-status/index_en.htm

Transition Costs – Transient or one-off costs or benefits that occur, which normally relate to the implementation of the measure.

Value Transfer (benefits transfer) – A process of using secondary valuation evidence sourced from previously undertaken studies to apply to a new decision-making context.

Developing the Evidence Base for Impact Assessments for Recommended dSACs and dSPAs

Contents

Appendices

A. Stakeholders Contacted During Study
B. Context for Marine Activities and Proposed Assessment Methods for dSACs
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(N.B. Appendices B, C, D and G are provided separately).

Tables

Figures

1. Introduction

1.1 Background

The purpose of the study has been to develop an evidence base of the potential environmental, economic and social benefits and costs of eight recommended draft Special Areas of Conservation (dSACs) and three draft Special Protected Areas (dSPA) in UK offshore and territorial waters. The evidence base will inform Impact Assessments for each site and a Sustainability Appraisal for the network of harbour porpoise SAC proposals and addition of the proposed dSPAs to the existing SPA network.

The EU Habitats Directive (92/43/EC) requires Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes of the Directive to favourable conservation status (FCS). Member States are also required to contribute to a coherent European ecological network of protected sites by designating Special Areas of Conservation (SACs) for habitats listed on Annex I and for species listed on Annex II. The Joint Nature Conservation Committee (JNCC) and the other Statutory Nature Conservation Bodies (SNCBs) have provided advice to the UK Governments with respect to the designation of eight new Special Areas of Conservation to protect harbour porpoise (an Annex II species) in UK waters (Figure 1, Table 1). These sites are being proposed because the UK lacks an appropriate network of harbour porpoise SACs. The UK Government and devolved administrations are aiming to submit these site proposals to the European Commission in 2016. .

Table 1. Draft SACs

MPA Proposal	Name Abbreviation (See Figure 1)	Proposed Protected Feature	Draft Conservation Objectives
North Minch	NOM	Harbour porpoise	Maintain Favourable Conservation Status (FCS)
Southern Sea of Hebrides	SSH	Harbour porpoise	Maintain FCS
North Channel and Outer Solway	NCS	Harbour porpoise	Maintain FCS
North Anglesey Marine / Gogledd Môn Forol	NAM	Harbour porpoise	Maintain FCS
West Wales Marine / Gorllewin Cymru Forol	WWM	Harbour porpoise	Maintain FCS
Bristol Channel Approaches / Dynesfeydd Môr Hafren	BCA	Harbour porpoise	Maintain FCS
Southern North Sea	SNS	Harbour porpoise	Maintain FCS
Outer Moray Firth	OMF	Harbour porpoise	Maintain FCS

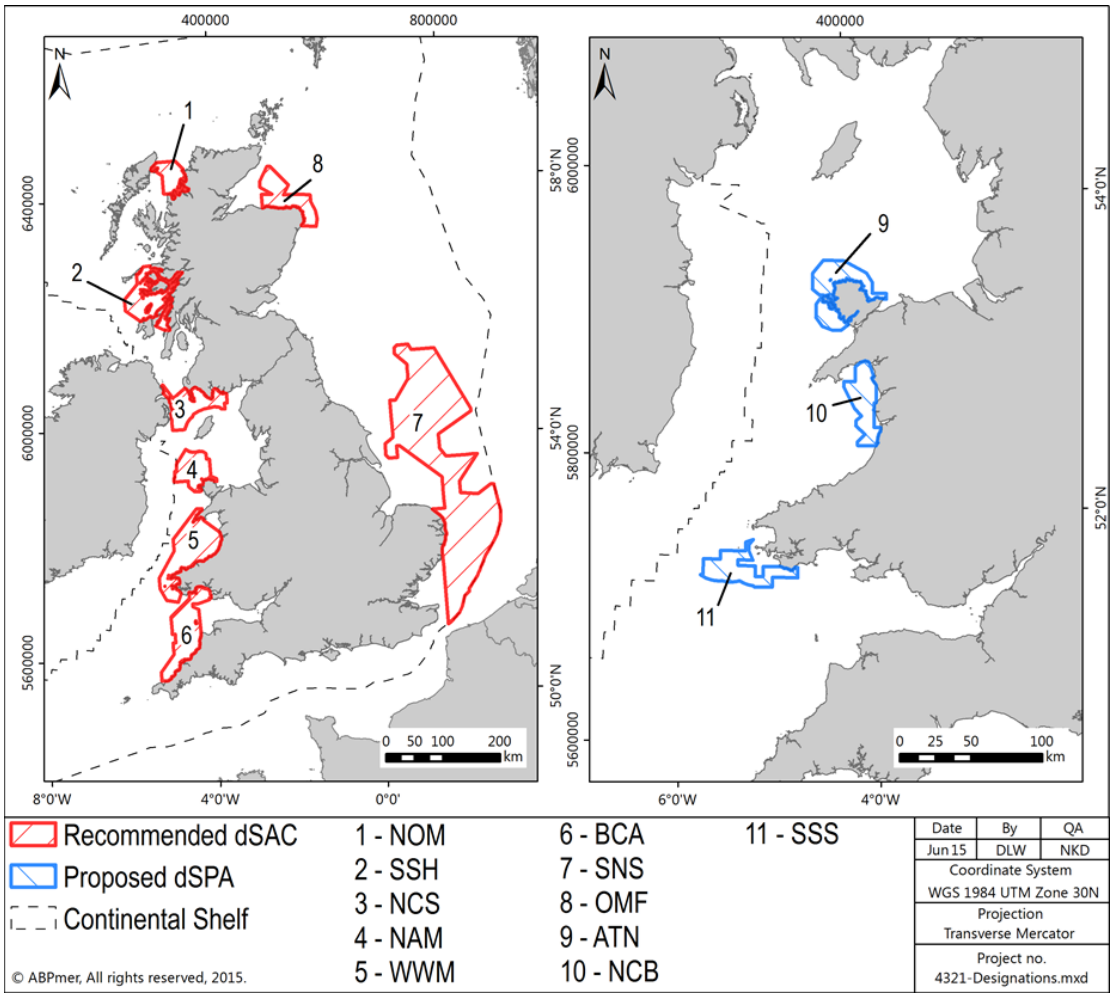

Figure 1. Recommended dSAC options for harbour porpoise and proposed dSPAs in UK Offshore and Territorial Waters

Separately the EU Wild Birds Directive (2009/147/EC as codified) requires Member States to classify as Special Protection Areas (SPAs) the most suitable territories for wild birds. Building on JNCC work to develop approaches to the identification of marine SPAs and taking account of published SPA selection guidelines (JNCC, 1999), Natural Resources Wales (NRW) has identified three SPA proposals in Welsh Territorial Waters which they consider essential for the completion of a series of marine SPAs, including marine extensions to two existing SPAs and one entirely new marine SPA. (Figure 1, Table 2). These proposals include sites supporting breeding terns, a range of foraging seabirds and wintering red throated divers. Subject to Ministerial approval, the intention is for these sites to be classified in 2016.

New SACs and SPAs, along with existing protected sites in the UK marine environment, will also contribute to achieving Good Environmental Status (GES) under the Marine Strategy Framework Directive (MSFD) and deliver the UK's contribution to the ecologically coherent network of Marine Protected Areas (MPAs) under the OSPAR convention on the protection of the marine environment in the North East Atlantic.

Table 2. Draft SPAs

dSPA Proposal	Name Abbreviation (See Figure 1)	Qualifying Bird Species in Existing SPA	Qualifying Bird Species in Proposed SPA/extension
Anglesey Terns / Morwenoliaid Ynys Mon (extension to the existing Ynys Feurig, Cemlyn Bay and The Skerries SPA)	ATN	Common tern; Arctic tern; Sandwich tern; Roseate tern.	Common tern, Arctic tern and Sandwich tern
Northern Cardigan Bay / Gogledd Bae Ceredigion	NCB		Red throated diver
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Benfro (extension to the existing Skokholm and Skomer SPA)	SSS	Manx shearwater; Atlantic puffin; European storm petrel; Lesser black backed gull Chough and Short-eared Owl	Manx shearwater and Atlantic puffin

The designation of dSACs and classification of dSPAs may give rise to a range of environmental, economic and social costs and benefits, potentially including:

- Impacts to the marine environment associated with the designation and management of sites:
  - Ecological benefits to marine features protected within designated sites (and associated habitats);
  - Changes in the level of ecosystem services, greater certainty of long-term protection ;
  - Costs of degradation of marine features where activity is displaced to areas outside of designated sites;
- Economic impacts to marine activities and the UK economy:
  - Costs of complying with management measures to support achievement of site-specific conservation objectives;
  - Impacts on Gross Value Added (GVA) and employment;
  - Benefits associated with an increased level of ecosystem service provision;
- Economic costs to the public sector associated with monitoring, management and enforcement activities for designated sites;
- Social impacts to individuals, communities and society:
  - Primary and secondary social impacts associated with any changes in income and employment (e.g. on people's way of life, culture, community, health, fears and aspirations); and
  - Benefits to individuals, communities and society through increased access to and use of the marine environment.

The decisions to classify SPAs or designate SACs must be made using relevant scientific evidence only[8]. The UK Government's policy, however, is to provide information in the form of

[8] Case law (C-44/95 Lappel Bank) clarifies that decisions to classify SPAs (and by implication to designate SACs) must be made using scientific evidence only. Nevertheless, it is UK Government policy is to provide socio-economic information to Ministers before consultation on the potential socio-economic impact of classification of SPAs or designation of SACs.

a Regulatory Impact Assessment on the potential impacts of possible designations to Ministers before consultation. Evidence of the environmental and socio-economic impacts of designation of conservation sites in the marine environment is therefore required to progress classification of marine SPAs (under the EU Wild Birds Directive) and designation of SACs (under the EU Habitats Directive).

JNCC and the other SNCBs are currently preparing information on draft conservation objectives and advice on activities/operations (including management options) for each proposed dSAC and marine dSPA. Draft advice has informed the development a series of management scenarios that have been used within the assessment.

1.2 Aims and Objectives

The aim of the study has been to generate evidence on the potential environmental and economic costs and benefits and social impacts[9] of:

- Designating the individual marine SAC proposals;
- Classifying the individual marine SPA proposals; and
- Designating/classifying the new SAC and SPA proposals in net terms taking account of geographic overlaps and similar impacts with existing sites to avoid double counting.

The specific objectives of the study were:

- For each individual SAC and SPA proposal:
  - a) Building on the sensitivity analyses, conservation objectives and the management scenarios provided by the SNCBs, identify the activities taking place in proposed sites that could be affected by designation of each proposed site as an SAC or SPA, and how they may be affected;
  - b) Utilising the management scenarios provided, identify and estimate the costs to potentially affected activities arising from designation proposals, specifically from potential management requirements arising from conservation objectives proposed for each SAC or SPA individual site. It should be noted that fishing activity can vary considerably from year to year and, therefore, a range of scenarios will need to be considered;
  - c) Identify, describe and quantify the potential benefits to marine activities and the environment, associated with designation of each individual site as an SAC or SPA. This will need to consider whether furthering the conservation objectives for harbour porpoise and the relevant seabirds could undermine other environmental objectives.
  - d) Identify any communities and social groups that may be adversely or positively affected by designation proposals, and quantify the scale and costs of such impacts where possible;

9 In the context of this project, 'social impacts' are defined as distributional impacts – the impact of the sets of plan options on different groups. This includes impacts on specific locations (including individual settlements, where feasible within the scope of the project and data availability) and on specific groups within the UK's population (including but not limited to different age groups, genders, minority groups, and parts of UK's income distribution).

e) Estimate the benefits and costs to Governments and other public bodies associated with designation of sites as SACs or SPAs, including (but not limited to) additional management, monitoring and enforcement requirements;
f) Identify, describe and quantify the potential costs and benefits to society as a whole associated with designation of each individual site as an SAC or SPA.

- For the assessment of the two separate components of the network proposals (the marine SAC proposals and marine SPA proposals) as a whole as well as a combined analysis:
  a) Based on the individual SAC and SPA impact assessments, estimate the potential aggregate costs of designation of (a) the suite of marine SAC proposals, (b) the suite of marine SPA proposals and (c) the combined package of SAC and SPA proposals to potentially affected marine activities, communities, social groups, small businesses and Governments;
  b) Assess the extent to which aggregated negative impacts and costs may be increased or offset as a result of cumulative factors (e.g. displacement of fisheries activities; economies of scale in monitoring and enforcement, account taken of overlaps between site proposals and measures);
  c) Based on the individual SAC and SPA impact assessments, identify, describe and quantify the potential aggregated benefits from designation of the suite of SAC and SPA proposals to marine activities, communities, social groups, small businesses and society with separate analyses consistent with paragraph (a) above;
  d) Assess the extent to which aggregated positive impacts are increased or offset as a result of cumulative factors, and the extent to which additional benefits are generated through designation of the suite of SAC and SPA proposals;
  e) Update the impact assessments for both individual and network level assessments of both SACs and SPAs in light of consultation responses, preferred management and/or new evidence.

In addition, the study has considered the relative cumulative impact as a result of the new suite of proposed SAC and SPAs. The total cumulative impact as a result of previously designated MPAs, offshore renewables development and other nature conservation sites has also been considered. However, the project has not reassessed the regulatory impact of sites that have already been designated.

1.3 Project Oversight

The contract has been managed by JNCC with input provided from a wider Project Steering Group (PSG), comprising members of JNCC, NRW, Scottish Natural Heritage (SNH), Natural England, and the Department of the Environment (Northern Ireland) (DoE). The purpose of this group has been to advise the project team, facilitate access to required data and evidence, and to comment and sign off on project outputs.

In addition, limited consultation was undertaken with those sectors potentially affected by the designation proposals. A list of organisations contacted as part of this study is presented in Appendix A.

1.4 Structure of Report

This Final Report provides details of the methods used to undertake the assessment, together with a summary of the main findings of the assessment. The report is structured as follows:

Section 1: Introduction – this section;

Section 2: Methodology

Section 3: Site Assessments - dSACs

Section 4: Site Assessments - dSPAs

Section 5: Combined Assessments

Section 6: Discussion and Conclusions

Section 7: References

Appendices:

A. Stakeholders Contacted During Study
B. Context for Marine Activities and Proposed Assessment Methods for dSACs
C. Context for Marine Activities and Proposed Assessment Methods for dSPAs
D. Scenarios for Recommended dSAC and dSPA Proposals
E. Public Sector Costs
F. Draft Reporting Template for Sites
G. Site Assessment Documents for dSACs and dSPAs
H. Social and Distributional Analysis
I. Marine Wildlife Tourism in the UK

(N.B. Owing to file size, Appendices B, C, D and G are provided separately).

2. Methodology

2.1 Introduction

The project methodology builds on previous marine socio-economic assessments carried out for the designation of Marine Conservation Zones (MCZs) (Defra, 2012), Nature Conservation MPAs (Marine Scotland, 2013a; 2015a) and dSPAs (Marine Scotland, 2015a). It is consistent with Better Regulation Executive guidance on impact assessment[10] and the Green Book methodology (HM Treasury, 2003) for economic assessment.

The methodology covers:

- Establishing a baseline against which impacts can be assessed;
- Assessment of costs and benefits; and
- Reporting of assessment outcomes.

2.2 Collation and Preparation of Baseline Information

In order to undertake the assessment, a range of baseline information has been collated. Given that the assessment relates to impacts over time, a dynamic baseline has been constructed which indicates how baseline conditions might change over the time period of the assessment. Assuming designation by the end of 2015 and an assessment covering a 20 year period following designation, the baseline information has extended from 2015 to 2034.

The broad types of information collated for the baseline include:

- The distribution of relevant biodiversity features within and adjacent to the proposed dSAC and dSPA sites and how this might change over the assessment period (in the absence of the intervention);
- The distribution and intensity (volume/value) of human activities within and adjacent to the proposed dSAC and dSPA sites and how this might change over the assessment period (in the absence of the intervention) focused on those activities that will potentially be affected by management measures; and
- Information on ecosystem service values associated with the marine environment and how these may change over the assessment period (in the absence of the intervention).

In addition a range of other information has been collected to inform the socio-economic assessment, for example, in relation to the costs of management measures.

10 http://www.bis.gov.uk/policies/better-regulation/policy/scrutinising-new-regulations/preparing-impact-assessments

2.2.1 Information on Biodiversity Features

Information on the distribution of biodiversity features has been collated within ArcGIS, from the following sources:

- Information held by JNCC and the SNCBs used to support the identification of the dSACs (IAMMWG, 2015)
- Information held by JNCC and NRW used to support the identification of marine dSPAs (NRW, pers. comm.);

These data sources have been used to develop a best understanding of the spatial distribution of the biodiversity features for which each dSAC and dSPA site is being proposed, together with information on supporting habitats where relevant.

2.2.2 Information on Human Activities

Relevant available data on the spatial distribution and intensity of marine activities occurring within and adjacent to the proposed dSAC and dSPA sites has been collated, particularly focusing on those activities for which JNCC and the country nature conservation agencies consider management measures may be required under one or more of the management scenarios (see section 2.3.2 below and Appendix D). This has included the following activities:

- dSACs:
  - Aggregates;
  - Aquaculture - finfish;
  - Commercial fisheries (mobile gears; set nets, salmon nets);
  - Offshore renewables (offshore wind, tidal stream, tidal lagoon);
  - Military activities;
  - Oil & gas;
  - Ports & harbours;
- dSPAs:
  - Aggregates;
  - Commercial fisheries;
  - Offshore renewables;
  - Oil and gas;
  - Ports and harbours; and
  - Recreational boating.

The study has also sought to take account of possible changes in the distribution and intensity of human activity over the time period of the assessment to provide a dynamic baseline. This has drawn on previous UK studies that have sought to develop dynamic baselines, for example, the Scottish Nature Conservation MPA assessment (Marine Scotland, 2013a), the MCZ impact assessment (Defra, 2012) and the South Plans Analytical Report (MMO, 2014a).

Key data sources have included:

- Information from The Crown Estate on Lease and Agreement-for-Lease locations;
- DECC Oil and Gas licensing round awards;
- DECC oil and gas geophysical survey activity reports;
- Welsh Marine Plan Strategic Scoping Exercise (Cefas *et al*, 2014);
- RYA Sailing/cruising routes;
- ICES rectangle landings data for fishing vessels broken down by gear type (published by MMO); and
- Aquaculture (finfish) (Aquadat database).

Limited consultation has been undertaken with relevant socio-economic interests to determine whether they may be able to provide additional data within the time scales for the study and to discuss assessment approaches and assumptions.

2.2.3 Ecosystem Services Data

There is limited data for marine ecosystem services provided by MPA features. The National Ecosystem Assessment (NEA) includes a synthesis of valuation data available up to 2010 (Austen *et al*, 2011). Some further information is available from the NEA Follow-on Project (UKNEA, 2014) and from eftec *et al* (2015). Much of this data is aggregated and valuation data for specific features is largely lacking. The data limitations impose significant constraints on the extent to which changes in ecosystem service (ES) provision can be quantified. Given these limitations, the assessment of ecosystem services impacts has been largely qualitative, although it has been possible to estimate network impacts using value transfer from existing studies, as presented in the Nature Conservation MPA assessment (Marine Scotland, 2013a).

In addition information on the ecosystem services provided by individual MPA features has been collated. Bournemouth University and ABPmer (2010) collated information for many benthic habitat and benthic species MCZ features. This work was expanded upon by Potts *et al* (2013) to encompass additional features, including mobile features such as harbour porpoise and one bird species – black guillemot. These studies together are considered to provide sufficient qualitative information on the types and level of ES provided by features proposed for protection by the dSAC and dSPA proposals.

2.2.4 Other Information Requirements

In addition to baseline data, a range of additional data and information has been collected to inform the assessment. In particular, information on licensing costs and management measures has been used to estimate cost impacts for activities, together with information on enforcement, surveillance and monitoring costs to estimate impacts on the public sector. Some relevant information is available from previous impact assessments such as the Nature Conservation MPA assessment (Marine Scotland, 2013a) MCZ IA (Defra, 2012), and for IAs that have accompanied the UK Marine & Coastal Access Act and Marine (Scotland) Act, on which this study has drawn. Where necessary additional information on cost impacts has been sought from the sectors likely to be affected.

2.2.5 Use of Baseline Information

Collated spatial data has been managed within a project-specific spatial database (ArcGIS). All incoming data has been checked for validity and accuracy prior to acceptance within the project in accordance with internal quality procedures.

The baseline information has been used to develop baseline descriptions of the relevant biodiversity features within each of the dSAC and dSPA sites together with information on the spatial distribution and intensity/economic value of relevant marine activities within or adjacent to each site. Assumptions have been used to project the baseline forward over the 20 year assessment period, making best use of available information on current and potential future trends. The baseline information has also provided context for the consideration of combined impacts at a national level.

Where information on economic values or costs of mitigation measures has been used within the assessment of costs and benefits, these values have been converted to 2015 prices using the latest GDP deflators[11].

The baseline information has been summarised in reporting templates for each dSAC and dSPA (See Appendix G Table 3 for activities potentially affected by management measures and Table 5 for activities assumed not to be affected by management measures). Contextual information on each relevant marine activity has been documented in Appendices B (for dSACs) and C (for dSPAs), including: sector definition, key information sources, overview of economic value and estimated future baseline.

2.3 Assessment of Costs and Benefits

The methodology to be applied has been similar to that previously used for the assessment of the Scottish Nature Conservation MPAs (Marine Scotland, 2013a) and four further Nature Conservation MPA proposals and a number of marine dSPAs in Scottish waters (Marine Scotland, 2015a) (see Figure 2). The methodology includes:

- Scoping of impacts;
- The development of scenarios;
- Approach to site assessments; and
- Approach to combined assessment.

11 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/394588/GDP_Deflators_Qtrly_National_Accounts_December_2014_update.csv/preview

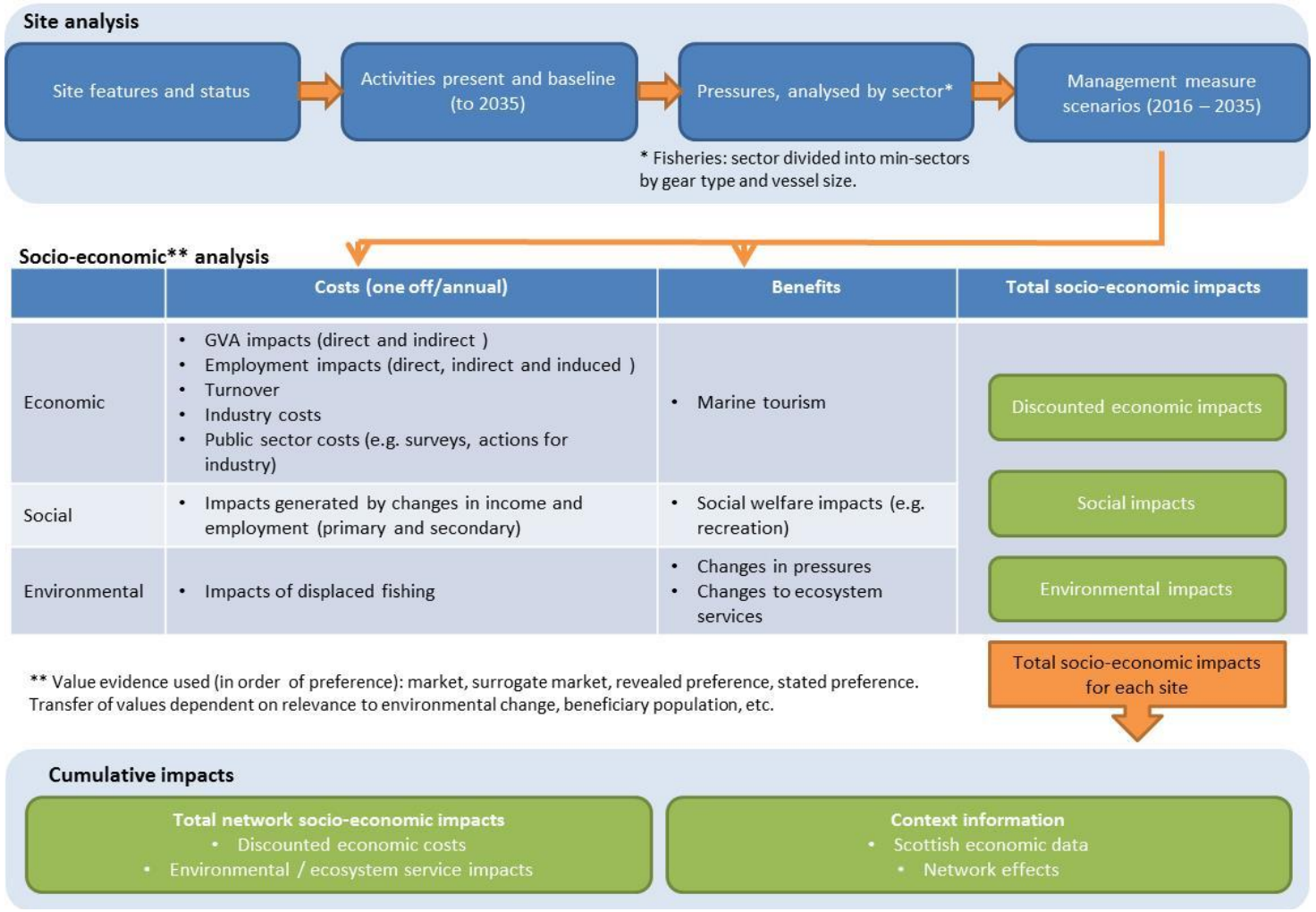

Figure 2. Process for economic and social analysis

2.3.1 Scoping of Impacts

JNCC and the other SNCBs have considered the potential requirements for management measures within each dSAC and dSPA proposal and have developed management scenarios for each site (IAMMWG , 2015; NRW, pers. comm.). JNCC and the other SNCB's views on requirements for management measures have been based on:

- The location and intensity of existing and potential future human activities within and surrounding the proposed sites;
- Judgements on the sensitivity of features proposed for designation in relation to the scale and intensity of pressures associated with the specific human activities within and surrounding the proposed sites[12]; and
- Judgements on the existing condition of features proposed for designation (and supporting habitats).

Where an activity was identified as having the potential to interact with one or more features proposed for protection within a dSAC or dSPA and thus might require some form of management, these interactions were scoped in for further assessment for the relevant site(s). Where there was clearly no potential for significant interaction, the activity/interaction was scoped out. This information has been documented in the site assessment reports (see Tables 3 and 5 of Appendix G for activities scoped in/out respectively).

2.3.2 Development of Scenarios

There are a number of key uncertainties associated with the requirements for management measures which, in turn, means there is some uncertainty concerning the costs and benefits associated with designating each site.

Three scenarios have therefore been developed for each site:

- **Lower scenario** – which assumes that while designation will introduce a requirement for HRA for plans and projects and a Review of existing consents, existing and planned activity is assumed to be consistent with the achievement of site conservation objectives and therefore no additional mitigation measures are required;
- **Intermediate scenario (most likely)** – in addition to the measures under the lower scenario, it is assumed that some mitigation measures may be required to support achievement of conservation objectives
- **Upper scenario (very unlikely)** – it is assumed that highly protective management measures are required to support achievement of site conservation objectives.

These seek to reflect differing levels of management measure that might be required to support achievement of the conservation objectives. The assumptions for these scenarios are documented in Appendix D. The scenarios have been developed **only** to help inform the impact assessment and should not be seen as prejudging the outcome of any project level

[12] In the case of proposed SPAs consideration has also been given to the sensitivity of relevant supporting habitats

appropriate assessments at such time as these may be required, or indeed prejudging later decisions about the management of any ongoing commercial or non- commercial activities in and around the sites. The management scenarios have been used to assess the potential range of regulatory impact associated with designation of the proposed sites, between the most minimal impact (i.e. no additional regulation or management) and a hypothetical upper scenario entailing significant additional regulation or management measures[13]. This is to enable the Impact Assessment to give a hypothetical upper and lower range for the potential impacts of the proposed designations, rather than just a single estimate based only on what is considered at the present time to be the most likely management scenario.

For some sectors, the upper scenario (i.e. assumes sites designated as a highly protected area) includes the potential for prohibition of new development activity. While such a policy would be subject to the provisions of Article 6 of the Habitats Directive[14], for the purposes of this assessment and on a conservative and worst case basis, it has been assumed that new development would not proceed and a gross estimate of the associated costs has been made. In reality, it is possible that some new development could be approved in accordance with the provisions of Article 6, although there is very limited experience of identifying and implementing compensatory measures for harbour porpoise or sea birds.

The scenarios have not taken account of potential differences in the location and scale of new development activity. This is because such assumptions would introduce inconsistencies into the future baseline between scenarios. For example, if different assumptions were made about the future level of offshore renewables activity, this would create multiple future baselines whereas it is a requirement of impact assessment that all options are considered against a consistent baseline.

2.3.3 Assessment of Individual Sites

The assessment of impacts for each dSAC and dSPA has taken account of the following factors:

- Impacts to the marine environment associated with the designation and management of sites:
  - Benefits to marine features protected within designated sites (and associated habitats);
  - Changes in the level of ecosystem services, greater certainty of long-term protection ;
  - Costs of degradation of marine features where activity is displaced to areas outside of designated sites;

[13] The upper scenario might be considered to reflect measures that could be applied within a highly protected marine area, broadly similar to those proposed by Dolman *et al* (2015).

[14] Article 6 provides for damaging developments to proceed in the absence of alternatives and where the project can be justified for 'imperative reasons of overriding public importance', subject to the provision of appropriate compensatory measures.

- Economic impacts to marine activities and the UK economy:
  - Costs of complying with management measures to support achievement of site-specific conservation objectives;
  - Impacts on GVA and employment;
  - Benefits associated with an increased level of ecosystem service provision;
- Economic costs to the public sector associated with monitoring, management and enforcement activities for designated sites;
- Social impacts to individuals, communities and society:
  - Primary and secondary social impacts associated with any changes in income and employment (e.g. on people's way of life, culture, community, health, fears and aspirations); and
  - Benefits to individuals, communities and society through increased access to and use of the marine environment.

It is recognised that there are inevitably risks of double counting within such a large range of impacts. The methodology adopted explicitly enables identification of these. For example, the social benefits may double-count with some ecosystem service benefits (e.g. in relation to enhanced recreation). However, the link between such impacts is recognised in the reporting format and care has been taken to ensure they are differently quantified (e.g. covering social outcomes, such as the population with access to the environment, and economic outcomes characterised through the value of that access, respectively). Impacts have been assessed for the three scenarios ('lower', 'intermediate' and 'upper') compared to the 'do nothing option' i.e. not to proceed with the proposed designations.

Impacts have been assessed over a 20 year period, starting in 2015 (the year the designations are expected to be made) and running to 2034. Monetary impacts have been discounted over this time period using a 3.5% discount rate in line with the Green Book (HM Treasury, 2003). Employment impacts have not been discounted. All calculations have been clearly documented in Excel spreadsheets and provided to JNCC as part of the audit trail for the project.

The methods used in carrying out these assessments are described below.

2.3.3.1 Economic impacts to marine activities

Detailed assessment methods for relevant marine activities scoped in to the assessment at one or more proposed sites are presented in Appendices B (for dSACs) and C (for dSPAs).

All the methods generally entail making estimates of the cost of implementing management measures and/or the impact of implementing the management measures on operating revenues. For some sectors, there may also be impacts on investor confidence.

Where appropriate, the effect of planned management measures in relation to existing designations has been recognised. The assumptions used have been documented in Appendix D.

Where possible impacts are quantified in monetary terms, these values have been converted to current (2015) prices using the relevant GDP deflators.

Where impacts on economic activities may give rise to a potential change in the level of output, these have been estimated in terms of impacts on GVA and employment. The specific methods for these assessments are provided in Appendices B and C. Depending on the availability of information to prepare these estimates the results have been expressed in terms of direct[15] and indirect[16] GVA and employment or total (direct, indirect and induced[17]) GVA and employment.

2.3.3.2 Economic costs to the public sector

Following a decision to designate individual sites, costs may be incurred by the public sector in the following broad areas, although not all measures listed will be needed at all sites, i.e. these requirements will be site specific:

- Preparation of Marine Management Schemes;
- Preparation of Statutory Instruments (e.g. fisheries management measures);
- Development of voluntary measures;
- Site monitoring;
- Additional measures for geophysical surveys;
- Compliance and enforcement;
- Promotion of public understanding;
- Regulatory and advisory costs associated with licensing decisions; and
- Costs to The Crown Estate.

Standard assumptions have been developed for the estimation of public sector cost impacts associated with nature conservation designation proposals within previous impact assessments, for example, as part of the Scottish Nature Conservation MPA assessment (Marine Scotland, 2013a) and the MCZ IA (Defra, 2012). An outline of the approaches used is provided in Appendix E.

The estimated public sector cost impacts for each site are reported within the site reporting template, (Table 2b of Appendix G).

2.3.3.3 Social impacts on individuals, communities and society

Social impacts are effects on individuals, communities and society. They can vary in their desirability, scale, extent of duration (temporal and spatial), intensity and severity, as well as the extent to which they affect particular groups or are compounded by cumulative effects.

Employment is recognised as being a particularly important generator of social benefit. It is the key means by which individuals fulfil material wellbeing, as well as being central to social linkages, individual identity, social status and an important contributor to physical and mental health. Conversely, unemployment can be detrimental to physical and mental health and a key cause of deprivation and associated community cohesion issues.

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15 Direct GVA - output less intermediate consumption.
16 Indirect GVA – the effect of expenditure in supply chains.
17 Induced GVA – the effect of spending by those directly and indirectly employed by the sector.

There is no single definition of what social impacts are, and no single list that characterises them. In the assessment of the Scottish Nature Conservation MPAs (Marine Scotland, 2013a), the social impact typology identified by the Government Economic Service/Government Social Research Social Impacts Taskforce (Defra 2011) was adopted. This identified a list of key areas (access to services, culture and heritage, income and employment, crime, education, environment and health) and defined impacts for each key policy area in terms of 'access' and/or experience.

Since 2013, however, a research project (MMO, 2014b) has drawn together current evidence on the potential social impacts that can occur from marine interactions. This study established a framework which defines the process through which social impacts are generated by marine interactions and how interactions between marine activities can create social impacts. Conceptually, the research is grounded in the 'capitals approach' put forward by the work of the Social Impacts Taskforce (and hence is entirely consistent with it) but goes further to develop a preferred social impact typology for the marine sector (see Table 3) and a framework that can be used to better understand the potential social impacts than can occur from marine interactions.

Table 3. Social impact typology

Impact Type	Description
People's way of life	How people live, work (including employment and income), play and interact with one another on a day-to-day basis
Culture	Their shared beliefs, customs, values and language or dialect Change in opportunity to access culture and heritage Change in existence of culture/ heritage, or knowledge of it (especially loss) Change in number of visits to cultural/heritage sites
Community	Its cohesion, stability, character, sense of place, services and facilities
Political systems	The extent to which people are able to participate in decisions that affect their lives, the level of democratisation that is taking place, and the resources provided for this purpose
Environment	The quality of the landscapes and seascapes, the quality of the air and water people use; the availability and quality of food they eat; the level of hazard or risk, dust and noise they are exposed to; the adequacy of sanitation, their physical safety, and their access to and control over resources
Health	Health is a state of complete physical, mental, social and spiritual wellbeing and not merely the absence of disease or infirmity
Personal and property rights and equity	Particularly whether people are economically affected or personally disadvantaged, which may include a violation of their civil liberties; equalities and effects on minority groups or other relevant or disadvantaged groups
Fears and aspirations	Their perceptions about their safety, their fears about the future of their community, and their aspirations for their future and the future of their children

(Source: MMO (2014b), Social Impacts and Interactions Between Marine Sectors)

MMO (2014b) presents social interaction tables and evidence for 14 marine sector and sub-sectors (which include the sectors/activities occurring within, and adjacent to, the proposed dSAC and dSPA sites). Each table represents the potential interactions that a given sector is susceptible to, and describes the pathways that can lead to primary and secondary social

impacts. Each table is also supported by evidence on the impact pathways and social impacts, which is based on the currently available literature as well as stakeholders' views.

The social impact assessment has used the relevant impact-interaction tables to identify the potential social impacts of designating the proposed dSACs and dSPAs, for those sectors where designation is expected to have impacts on GVA and employment. For each relevant sector, the assessment has identified the:

- Non-social consequences that may occur due to the interaction;
- Primary social impact: the first order social impact that may occur due to the consequence;
- Secondary social impact: the second order social impact that may occur due to the first order social impact.

The tables have been combined with relevant quantitative (e.g. potential employment impacts) and qualitative information to assess whether social impacts are likely to occur, and if so, the potential significance of the social impacts identified. Mitigation measures for potentially significant social impacts have been highlighted.

The significance of the social impacts has been assessed using the following definitions:

- xxx/+++: significant negative/positive effect; This is defined as where it is probable that an impact will be noticed and is potentially significant;
- xx/++ : possible negative/positive effect This is defined as where it is possible that an impact will be noticed;
- x/+ : minimal effect, if any. This is defined as where it is probable that an impact is unlikely to be noticeable; and
- 0: no noticeable effect expected.

The social impact assessment has been conducted for each relevant individual dSAC and dSPA and for the suite of dSACs and dSPAs as a whole. The results of the social impact assessment for each site are reported in Table 6a of the Reporting Template (Appendix G).

A distributional analysis has been conducted to assess the distribution of the impacts on GVA and employment (and hence social impacts) across specific geographical locations, (e.g. regions, districts) and on specific groups within the UK (including, for example, different age groups, genders and vulnerable social groups).

Table 4 sets out the relevant locations and groups that may be affected by the potential economic (and hence social) impacts of designation on the commercial fishing sector[18].

[18] The table will be adapted as necessary for reporting of other sectors, such as offshore renewables.

Table 4. Commercial Fishing Sector: Locations and groups who may be affected by economic and social impacts

Location	Groups Distinguished By					
	Age	Gender	Fishing Group	Income	Minority	Other
Region Port Rural/ urban/ coastal and island	Children Working age Pensionable age	Male Female	Gear type Vessels type Species type	10% most deprived 10% most affluent Remaining 80%	Crofters10% most deprived 10% most affluent Ethnic minorities Religion Sexual orientation	With disability or long-term sick Special Interest Groups

The findings of the distributional assessment for relevant activities for each site have been reported in Tables 6b and 6c of the Reporting Template (Appendix G).

2.3.3.4 Benefits

There is potential for the site designations to have both positive and negative impacts of the environment. However, the potential negative impacts are not considered to be extensive. They mainly relate to:

- The potential for displacement of activity to other locations that are equally or more sensitive to their impacts. For example, displacement of fishing activity from designated sites could increase its intensity and therefore its impacts on new areas, including increased by-catch which could be detrimental to harbour porpoise.
- Potential for increased fuel consumption and therefore higher emissions of pollutants like greenhouse gases, for example by fishing boats or other marine activities, as a result of complying with marine management measures.

Although these can be significant factors in marine management, their scale in the context of the activities and sites in this study are considered to be very low at any individual site. Therefore, they are not discussed further here, but are considered further in the cumulative analysis of the network of sites in Section 5.4.

The remainder of this section describes the approach taken to the assessment of beneficial impacts from the proposed designations.

The principal beneficial impacts to the marine environment are likely to include:

- Benefits to marine features protected within designated sites; and
- Increases in the level of ecosystem services, greater certainty of long-term protection.

Benefits to Marine Features

This section considers the benefits that could arise from the proposed designations. These benefits are assessed based on the implementation of the potential management measures

used to consider the likely costs in previous sections. As with the costs, a range of management scenarios (lower, intermediate, upper) have been used to reflect the range of possible future management approaches.

This analysis of benefits adopts an ecosystem services approach. It is important to note that it assesses the expected *changes* in ecosystem services as a result of designation and management – it is not an assessment of the total ecosystem services arising from the proposals. The change in ecosystem services is assessed relative to the baseline of the expected condition of the sites in the absence of designation and management. This is a source of considerable uncertainty, as the extent and condition of the features of the proposed sites, and their response to management measures, are not fully understood.

Owing to the lack of robust quantitative evidence on the ecosystem services changes that might occur, a qualitative approach has been adopted to assess the potential benefits within each site (see individual site assessments presented in Table 7 of Appendix G).

Discussion of the evidence on the values of the potential changes in ecosystem services for dSACs and dSPAs is provided in Sections 3.5.3 and 4.5.3 respectively and discussion on the total economic value associated with marine ecosystem services in Sections 3.5.4 and 4.5.4 respectively. The available evidence on changes that are relevant to an impact assessment (i.e. increases in welfare in the UK) is limited. Therefore, much of the discussion is on general changes, with more specific observations (for example, identifying where sites are known to play a specific role in marine wildlife tourism) provided in Table 7 of Appendix G. The overall benefits of the proposed dSAC and dSPA designations are then summarised drawing on the previous discussions (Section 3.5.5 and 4.5.5 respectively). Any synergies (or network effects) arising from the collective designation of sites, are discussed in the analysis of cumulative benefits in Section 5.4.

Ecosystem Services Benefits

The biodiversity features of a site contribute to the delivery of a range of ecosystem services (ES). Designation of the site and its subsequent management may improve the quantity and quality of the beneficial services provided, which may, in turn increase the value (contribution to economic welfare) of them. Impacts on the value of ecosystem services may occur as a result of the designation, management and/or achievement of the conservation objectives of the dSAC or dSPA.

A healthy marine environment provides a large number of benefits to human populations. The benefits and the beneficiaries are not uniform and cover a wide range of ecosystem functions and interdependencies. The concept of 'ecosystem services' is used to capture the benefits provided. ES are the outcomes from ecosystems that directly lead to good(s) that are valued by people (Natural Capital Committee, 2013)

The ES concept provides a framework to identify the range and type of benefits provided by an ecosystem. This study uses the terminology from the UK Nation Ecosystem Assessment (2011, first used in the Millennium Ecosystem Assessment, 2005) which splits the benefits provided by UK environments into the following services:

- Provisioning Services – the tangible goods and associated benefits produced by an ecosystem.
- Regulating Services – the benefits from the regulation of ecosystem processes.
- Cultural Services – the non-tangible ecosystem benefits either from experience of the ecosystem or knowledge of its existence.
- Supporting Services – those services whose function underlies all other ecosystem service provision.

The assessment of ES benefits is a gross assessment of the impacts of designating an individual site. This approach mirrors that in the costs assessment, where costs to activities (e.g. fishing) are gross assessments of the costs of management measures. A more realistic analysis of impacts of both costs and benefits would be a net assessment of likely changes. In particular this would take into account displacement of fishing effort, which could both reduce the costs of designation in terms of reduced fishing landings, and reduce the benefits by displacing damage caused by some fishing gears to other areas, (albeit ones probably with marine biodiversity features of lesser conservation concern).

The ES analysis provides a qualitative description of the potential changes in ES provision associated with the implementation of management measures to support the achievement of conservation objectives for individual features. This draws on the work of Bournemouth University and ABPmer (2010) and work to extend that analysis to all relevant Scottish MPA features (Valuing Nature Network (Potts *et al*, 2013)).

In applying economic valuation evidence the analysis has sought to clearly link management measures under different management scenarios ('lower' to 'upper') to changes in ecosystem services and the economic value of these. The analysis has been summarised in the reporting template (Table 7 in Appendix G).

In addition to the summary of anticipated ES benefits under the lower, intermediate and upper scenarios, the summary includes four columns of information to clarify understanding of the qualitative changes in ecosystem services arising from (non-) designation (see Table 7 in the Reporting Template (Appendix G)):

Relevance:	Relating to the amount of ecosystem good or function arising from site;
Value weighting:	Categorisation of how valuable the amount of ecosystem good or function from the site is in providing benefits to human population;
Scale of benefits:	Consideration of actual potential to deliver benefits (for example considering leakage, delivery to human population, etc.);
Confidence:	Level of confidence in our current knowledge of all other categories (in other words, scale of benefit, level of improvement, etc.).

Based on the above categories, an overall level of each ecosystem service has been defined with its own confidence level. An overall level of total benefits has also been defined.

The baseline level and impact on each ecosystem service, and the parameters under each of the four categories listed above, have been assessed qualitatively on the following scale:

Nil:	Not present/none;
Minimal:	Present at a very low level, unlikely to be large enough to make a noticeable impact on ecosystem services;
Low:	Present/detectable, may have a small noticeable impact on ecosystem services, but unlikely to cause a meaningful change to site's condition;
Moderate:	Present/detectable, noticeable incremental change to site's condition;
High:	Present/detectable order of magnitude impact on sites condition.

The approach provides a qualitative summary of the expected ES benefits to ensure all relevant impacts are captured in the analysis.

The information used to analyse ES is subject to considerable uncertainty. First, current evidence is known to reflect a variable and substantially incomplete literature on whether, and at what level, different marine features provide different ES. Second, the physical extent and baseline condition of many of the features in the proposed is poorly understood, as reflected in the site designation information. The lack of baseline information is particularly crucial as an assessment of benefits is based on expected changes from designation relative to a baseline scenario of 'no designation'. However, there is evidence (Friedrich *et al*. 2013) at both global and UK levels, underpinning the assumption of a deteriorating ecological baseline. It identifies evidence that human pressures have led to the depletion of marine species and populations, to the destruction of marine habitats, and has prompted changes to the composition of marine communities in UK seas. This has detrimental impacts on their ability to provide regulating, supporting and provisioning ES essential for human wellbeing.

Third, the speed and extent to which protection of features will result in increases in ES is poorly understood. Fourth, the benefits analysis is mainly based on consideration of ES from protected features (due to the available information). In reality, designated sites are likely to contain marine biodiversity features that are not designated features, but which give significant levels of ES as a result of protection under site management measures.

As a result of these uncertainties, a key part of the ES analysis for each site is that the level of confidence in each assessment is explicitly recorded. In general, confidence is only moderate or high for ES which are not expected to change significantly at a site. For most potential positive impacts at individual sites, the analysis of ES changes has low confidence. This issue is discussed further in Sections 3.5.3 and 4.5.3.

Some key issues in the assessment of levels of different ES in the site assessments are discussed below.

Provisioning Services

The potential management measures for the proposed sites could increase the level of provisioning services, in particular biomass of commercially exploited fish species. Gubbay (2006) found some evidence of positive species community effects such as greater complexity of food webs and increase primary and secondary productivity in sites as a consequence of protection. This study considered the benthic habitats relevant to the proposed sites.

The most significant provisioning service is of fish (and shellfish) for human consumption. While the status of commercial fish stocks in UK waters are variable and not fully known, the assessment is based on the fact that UK populations of several important commercial species are at suboptimal levels. It is assumed that protected areas can potentially help with stock recovery. This effect can result from reduction of fishing pressures, most strongly from protection of key stages (e.g. spawning, nursery grounds) in species life cycles.

A reduction in fishing pressure would therefore be of benefit to fish populations as a whole. Providing spatial or species protection, has been shown to boost fish populations, which potentially can have a benefit on fishery yields. As expected there is more evidence for shellfish in this regard: In Lundy it has been shown that there is the potential for spillover benefits from no-take zones into the surrounding lobster population. On Skomer the scallop population has increased four to eight fold over 20 years of protected area designation according to anecdotal evidence. In the Lyme Bay statutory fishing closure the increased densities of scallops have spilled over into surrounding areas.

For mobile fish species spillover benefits are more complex, and the benefits of the proposed sites will depend on other factors, in particular the implementation of recent CFP reforms.

The actual impact of protected areas on fish stocks is complex and controversial, and is known to depend on many factors including the size of the site, its position in an MPA network, the size of that network, the mobility of the species, the distribution of fishing effort and so on. Detailed modelling of these issues is beyond the scope of this work.

Regulating Services

In line with the 2013 round of MPA designations in Scotland (Marine Scotland, 2013a) three regulating services were considered for this analysis ((hazard protection, climate regulation and remediation of pollutants). Within this list the likelihood of the management measures under consideration at the proposed sites having an influence on regulating services was considered very low. This is due to:

- A lack of shallow water/primary production within the sites and/or in the features targeted by proposed measures;
- Large areas of seas and strong currents that serve to disperse potentially significant pollutants; and
- A lack of significant human settlements around most of the sites, resulting in a lack of need for hazard protection or major pollution problems.

On the basis that impacts of management measures on regulating services will be minimal, they have been excluded from further analysis.

Cultural Services

Cultural services are the least-well understood group of final ecosystem services from the marine environment. The significance of the proposed sites has been assessed for research and education, recreation activities, and non–use benefits. It can be argued that the proposed sites produce a range of other cultural values. These include direct use values such as the maintenance of traditional fishing communities. The literature also describes more indirect

values such as meaningful places or socially valued landscapes, symbolic benefits (aesthetic, heritage, spiritual), and philosophical, inspiration values. However, there is little conclusive evidence on these issues.

Most of the sites considered have some relevance to recreational activities, either due to them taking place in the site (e.g. angling, recreational boating routes and wildlife tourism), or their features playing a role in wildlife tourism in neighbouring areas. For example, the Southern Sea of Hebrides dSAC, while remote from urban centres, can still be argued to play an indirect role in wildlife tourism, as it supports populations of harbour porpoise and other cetaceans, and bird species, which are part of the tourism assets of the West coast of Scotland. The value of these activities may be enhanced by designation if users of sites will encounter higher levels of biodiversity and environmental quality.

The value of non-use benefits is considered further under the valuation evidence below.

Supporting Services

Sites provide a significant number of supporting services. These services are the foundation for all other ecosystem services. Perhaps most significantly is the support that these services provide for provisioning services such as the protection of features which provide habitats for larval and juvenile life stages of marine species.

There are several relevant supporting services associated with MPAs as shown in Table 5. These supporting services are in general not closely related to the features the proposed sites are being designated for. Therefore they are not expected to be significantly impacted by the proposed management measures, and are not subject to further analysis in this report.

Table 5. Supporting ecosystem services provided by MPAs

Ecosystem Service	
Larval gamete supply	
Secondary production	
Food web dynamics	
Nutrient cycling	
Formation of species habitat	
Primary Production	
Species diversity	
Formation of physical barriers	

(Source: Potts *et al*, 2013)

Supporting services are not valued due to a risk of double-counting their value where it is reflected in other ecosystem services, and the likely very limited impact on them from the management measures at most of the sites. The list of final ES considered is provided in Table 6.

Table 6. List of Final Ecosystem Services Considered in the Assessment

General Ecosystem Service Categorisation	Final Ecosystem Services to be Used
Provisioning	Provision of fish and shellfish for human and non-human consumption
Cultural	Recreation
	Research and education
	Non-use

2.3.4 Combined Assessment

The combined assessment has considered:

- The combined impacts of the suite of dSAC proposals;
- The combined impact of the suite of dSPA proposals; and
- The combined impact of the dSAC and dSPA proposals together.

It has also taken account of current proposals for the designation of four new Scottish Nature Conservation MPAs and fourteen marine dSPAs in Scottish waters (Marine Scotland, 2015a). In particular, there is significant spatial overlap between three of the four new Nature Conservation MPA proposals and some of the dSAC proposal with both types of site seeking to protect marine mammal features (Nature Conservation MPAs seeking to protect minke whale and Risso's dolphin). Some of the management measures proposed for cetacean features within the new Nature conservation MPA proposals may also provide protection for harbour porpoise. Given that both exercises are effectively progressing in parallel, care has been taken to seek to avoid double counting of costs and benefits associated with these measures.

In addition, consideration has been given to how the significance of impacts might vary when taking account of the total impact as a result of all marine environment protected areas, particularly where there is overlap between these and dSAC and dSPA proposals. For commercial fisheries, the combined assessment has also taken account of potential impacts associated with offshore renewables development. To present this analysis we have drawn on information contained within previous assessments of MPA proposals and offshore renewable energy plans. This information provides context for the additional impacts estimated to occur as a result of implementation of the dSAC and dSPA proposals, particularly where these additional impacts may affect activities and communities that will or are experiencing impacts as a result of earlier decisions on MPAs or offshore renewables developments.

The combined assessment has particularly sought to explore whether the combined impacts associated with groups of sites at regional or national levels may be larger or smaller than the sum of the individual impacts.

In general, an additive approach to assessing combined impacts has been used unless the impacts are predicted to be particularly significant within a region or locality, in which case expert judgement has been applied.

2.3.4.1 Impacts to activities

The starting point for assessing the cumulative impacts on activities has been to add together the impacts identified for each individual dSAC and dSPA proposal, taking account of any measures that might be 'shared' with new Scottish Nature Conservation MPAs incorporating marine mammal features (Marine Scotland, 2015a). In areas where there are concentrations of sites affecting a particular activity (as identified by the distributional analysis), further consideration has been given to the potential combined impact to describe qualitatively whether the combined impact might be larger or smaller than the sum of the individual impacts.

The scale of the sectors affected has been used to provide context for assessing the significance of combined impacts to activities. The significance of combined impacts has been assessed dependent on the scale of the impacts incurred by different sectors and the relative importance of each sector to national economies (now and in the future).

Information has also been presented on the total impact as a result of all marine environment protected areas and current or planned offshore renewable development (for commercial fisheries only) to provide context for the estimated impacts of the dSAC and dSPA proposals on specific marine activities and provide qualitative commentary on whether this context might increase or decrease the significance of the impacts considered within this assessment.

2.3.4.2 Impacts to the public sector

A top-down approach has been used to assess costs to the public sector, using national assumptions, applied at site level. In such circumstances adopting an additive approach provides a reasonable estimate of the combined costs. Consideration has been given to the scope for economies of scale in relation to monitoring work for groups of designated sites.

2.3.4.3 Social impacts

The assessment of combined social impacts has taken account of the distributional analysis to identify whether specific local communities or groups may be affected by multiple designations. Where there is the potential for multiple impacts, the analysis provides a qualitative assessment of the combined impacts on these communities or groups.

Information has been provided on the total impact as a result of all marine environment protected areas and current or planned renewable development (for commercial fisheries only) to provide context for the estimated impacts of the new dSAC and dSPA proposals on specific marine activities and provide qualitative commentary on whether this context might increase or decrease the significance of the impacts considered within this assessment.

2.3.4.4 Environmental impacts

Part of the rationale for an ecologically-coherent network of MPAs is the concept that the value of the network is greater than the sum of its parts. However, scientific understanding of the relationships between individual sites and the network is limited and it is therefore difficult to provide any quantification of the combined benefits.

The selection of potential new SACs and SPAs has been based on the relevant selection guidelines (JNCC, 2009; Stroud *et al*, 2001). These guidelines include a number of elements that relate to the wider benefits of a network, for example, replication supports resilience and connectivity supports linkages between marine ecosystems.

Value Transfer techniques have been used to apply existing valuation data for MPA networks to the proposals to designate the dSACs and dSPAs using a similar approach to that applied for the Scottish Nature Conservation MPA assessment (Marine Scotland, 2013a) and drawing on further information published as part of the UKNEA Follow-on Project (UKNEA, 2014).

Information has also been used on the total impact as a result of all marine environment protected areas to provide context for the estimated impacts of the dSAC and dSPA proposals on specific marine activities and provide qualitative commentary on whether this context might increase or decrease the significance of the impacts considered within this assessment.

2.4 Outputs

2.4.1 Reporting Template

Site specific impacts have been reported using a consistent reporting template (see Appendix F).

The template includes the following tables:

Table 1: Summary of Proposed Protected Features, Data Confidence and Conservation Objectives

Tables 2 a to d Summary tables for human activity costs, public sector costs, social impacts and environmental benefits

Table 3: Human Activities that Would Be Impacted by Designation of the Site

Table 4: Human Activities that Would Benefit from Designation of the Site

Table 5: Human Activities that are Present but Which Would be Unaffected by Designation of the Site

Tables 6 a to c: Social and Distributional Analysis of Impacts from Designation of the Site

Table 7: Summary of Ecosystem Service Impacts Arising from Designation of the Site

3. Site Assessments - dSACs

3.1 Introduction

This section summarises the estimated costs and benefits associated with the designation of each of the eight dSACs including:

- Costs to activities;
- Public sector costs;
- Social impacts; and
- Benefits.

Details of the costs and benefits for individual sites are presented in the site assessment reports (Appendix G).

3.2 Costs to Activities

Quantified cost estimates are presented in a series of tables for each sector that has been identified as potentially incurring significant costs as a result of one or more of the site designation proposals. These tables only include those dSACs for which quantified cost impacts have been identified.

The costs have been estimated on a conservative basis. Costs estimates are provided for the 'lower', 'intermediate' and 'upper' scenarios. The intermediate scenario is considered to be the most likely scenario for management, with the lower scenario illustrating the most minimal impact (no additional regulation or management) and the upper scenario entailing significant additional regulation or management measures that would result from a highly protected status.

It is possible that other sectors could incur minor costs associated with individual projects but generally such costs are considered unlikely to be significant. For emerging sectors such as Carbon Capture and Storage, it is possible that more significant costs could be incurred by potential future projects that are brought forward within the time period of the IA, but the timing and location of such developments is currently too uncertain for inclusion in the IA.

3.2.1 Aggregates

The potential management measures that could be applied to the marine aggregate sector for each management scenario are presented in Table 7. The detailed assumptions that have been applied in developing cost estimates for the potential management measures are described in Appendix B.1.

Potential quantified impacts to the sector in relation to each management scenario are summarised in Table 8. The impacts are associated with additional HRA costs required to take account of the harbour porpoise dSAC feature and the costs of mitigation measures to reduce or limit the impacts of geophysical surveys within site boundaries. The impacts would affect operating costs within the sector

Table 7. Potential management measures for the marine aggregate sector

Management Measure	Scenario		
	Lower	Intermediate	Upper
Habitats Regulations Assessment of geophysical surveys within site boundaries	✔	✔	✔
Enhanced mitigation measures to reduce or limit impacts of geophysical surveys within site boundaries		✔	✔
Limiting the number and duration of geophysical surveys within site boundaries			✔

Under the upper scenario (highly protected) there is a potential measure to limit the number and duration of geophysical surveys within site boundaries. However, the costs of this impact would be site and project specific and it has not been possible to quantify this impact. The quantified impact for the intermediate scenario has been used, recognising that the management measure may give rise to additional costs which cannot be quantified.

In addition, there are also some potential costs relating to a potential industry contribution to a strategic HRA for noisy activities. These costs have been assessed at national level and have not been assigned to individual dSACs.

Estimated impacts range from £106k (present value over the assessment period (2015 to 2034) at 2015 prices (PV)) under the lower scenario (requirement for HRA of geophysical surveys only) up to £142k under the intermediate and upper scenarios (HRA and implementation of mitigation measures (use of Marine Mammal Observers; adoption of measures comparable to EPS guidelines)).

The estimated costs for preparing HRAs assume that a strategic HRA for noisy activity is in place (see Appendix E.8.1) and that a streamlined approach to completing these HRAs is adopted by the regulators (MMO and Welsh Government). Should the requirements be more onerous, the impacts could be substantially greater. The impacts under the intermediate scenario are uncertain and could be an order of magnitude greater, should larger survey vessels be required. The impacts under the upper scenario are also uncertain because it is not possible to estimate the impact of controls on the timing of geophysical surveys. Such costs could be large if they result in project delays or push survey activity to less favourable times of year.

Table 8. Quantified potential impacts to the marine aggregate sector

Site Name	Quantified Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Southern North Sea	85	120	120
Bristol Channel Approaches / Dynesfeydd Môr Hafren	10	12	12
Total	**96**	**132**	**132**
Costs assessed at national level: ▪ Contribution to strategic HRA of noisy activities	10	10	10

3.2.2 Aquaculture – Finfish

The potential management measures that could be applied to the finfish aquaculture sector for each management scenario are presented in Table 9. The detailed assumptions that have been applied in developing cost estimates for the potential management measures are described in Appendix B.2.

Table 9. Potential management measures for the finfish aquaculture sector

Management Measure	Scenario		
	Lower	Intermediate	Upper
Habitats Regulations Assessment of new applications or extensions within or near site boundaries	✓	✓	✓
Review of existing permissions/licences within or near site boundaries	✓	✓	✓
Adoption of good practice measures for anti-predator net tensioning for installations within site boundaries		✓	✓
Controls on use of ADDs for installations within site boundaries		✓	
Prohibition of ADDs for installations within site boundaries			✓

Potential quantified impacts to the finfish aquaculture sector are summarised in Table 10. Impacts are expected to arise in only two of the eight dSACs and would affect operating costs for aquaculture installations located within these dSACs. The potential costs are associated with the requirement to undertake additional HRA for new developments or project extensions (all scenarios), controls on the use of ADDs in the intermediate scenario (replacement with harbour porpoise friendly ADDs at 50% of aquaculture installations within site boundaries) and prohibition of the use of ADDs in the upper scenario (replacement of ADDs with anti-predator nets). No significant costs to the finfish aquaculture sector have been identified associated with the Review of Consents process (costs would be borne by the public sector) or costs associated with adopting good practice in use of anti-predator nets (virtually all operators already adopt good practice).

Table 10. Quantified potential impacts to the finfish aquaculture sector

Site Name	Quantified Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
North Minch	76	168	601
Southern Sea of Hebrides	153	612	2,642
Total	**229**	**780**	**3,243**

The estimated costs (PV) range from £229k under the lower scenario (requirement for HRA only) up to £3.2m under the upper scenario (prohibition on use of ADDs and replacement with anti-predator nets) and around £780k under the intermediate (most likely) scenario. In practice, it is likely that the use of anti-predator nets rather than ADDs would result in the industry incurring additional costs associated with predation damage from seals but it has not been

possible to quantify these potential costs. The upper scenario estimate is therefore considered to be a partial assessment of the costs associated with the management measure.

The estimated annual average costs of around £50k for the intermediate scenario are minor relative to the annual turnover of the industry (approximately £550m in 2012 (SSPO, 2014)). However, the costs would be borne by a small proportion of finfish aquaculture installations within Southern Sea of Hebrides and North Minch dSACs. Salmon farming is an international industry subject to strong competition and any additional costs for individual installations could affect their competitiveness.

There are significant uncertainties for the intermediate scenario concerning the potential costs of using harbour porpoise friendly ADDs. Such devices are currently not available commercially and a market to supply such devices has yet to develop. The estimated cost differential between standard ADDs and harbour porpoise friendly ADDs is therefore a rough industry estimate and the differential could be higher or lower that the figure used to inform the assessment. The cost of moving to harbour porpoise friendly ADDs will also depend on the timing of the transition. The assessment has assumed that finfish aquaculture installations will be required to acquire harbour porpoise friendly ADDs at such time as existing equipment requires replacement (approximately every 6 years). If a more rapid transition was required, this would significantly increase costs to the industry.

3.2.3 Commercial Fisheries

The potential management measures that could be applied to the commercial fisheries sector[19] for each management scenario are presented in Table 11. These measures are applied where relevant for individual sites. The detailed assumptions that have been applied in developing cost estimates for the potential management measures are described in Appendix B.3.

Table 11. Potential management measures for the commercial fisheries sector

Management Measure	Scenario		
	Lower	Intermediate	Upper
Bycatch mitigation measures for harbour porpoise (pingers) on all vessels using static nets within dSACs, (applies to vessels under-12m, as over-12m vessels are already required to use them) (non-GVA cost impact).		✓	
Closure of static nets within site boundary (GVA impact).			✓
Mitigation measures on fixed engines* within site to reduce harbour porpoise bycatch, as appropriate; seasonal or annual (non-quantified impact).		✓	✓
10% reduction in mobile bottom gear effort across the site (likely to be focussed seasonally) (GVA impact).			✓
10% reduction in pelagic gear effort across the site (likely to be focussed seasonally) (GVA impact).			✓
* Fixed engines are types of static nets used to catch salmon in coastal areas.			

[19] Commercial fisheries relates to all commercial fishing activity within UK waters and includes the subsequent handling and processing of catches. It includes wild salmon and sea trout fisheries.

Under the upper scenario, as a worst case, it has been assumed that some reduction in fishing effort could be required within the dSACs to support achievement of site conservation objectives. For the purposes of the assessment, this has been expressed as a 10% overall reduction in fishing effort. However, should such measures prove necessary, it is likely that they would be targeted towards specific locations and activities rather than a general blanket reduction in fishing effort. It is recognised that the upper scenario is considered very unlikely to occur.

Some of the proposed management measures could result in impacts on GVA while other measures will simply affect operating costs. These impacts have been presented separately below.

Potential impacts to GVA for the commercial fisheries sector are summarised in Table 12. The equivalent figures expressed in terms of potential impacts on landings are presented in Table 13.

Table 12. Present value reduction in GVA in £ millions for quantified impacts to commercial fisheries (direct effect and the combined direct and indirect effect) (discounted over assessment period, 2015 prices)

Site Name	Quantified GVA Impact over Assessment Period (Present Value of Total Costs, £m)					
	Lower		Intermediate		Upper	
	Direct	Direct & Indirect	Direct	Direct & Indirect	Direct	Direct & Indirect
Southern North Sea	0	0	0	0	8.956	12.538
Outer Moray Firth	0	0	0	0	2.460	3.444
North Minch	0	0	0	0	1.390	1.946
Southern Sea Of Hebrides	0	0	0	0	2.630	3.682
North Channel And Outer Solway	0	0	0	0	3.022	4.230
North Anglesey Marine / Gogledd Môn Forol	0	0	0	0	1.848	2.587
West Wales Marine / Gorllewin Cymru Forol	0	0	0	0	3.426	4.797
Bristol Channel Approaches / Dynesfeydd Môr Hafren	0	0	0	0	5.693	7.970
Total	**0**	**0**	**0**	**0**	**29.424**	**41.194**

These impacts could arise as a result of reduced landings from areas in proposed dSACs where fishing effort would be restricted under the proposed management measures for each site. The assessment has assumed the worst case that all affected effort is lost. In reality it is likely that some of the effort will simply be displaced to other areas. Marine Scotland (2014a) investigated potential displacement associated with the designation of 30 Nature Conservation MPAs, suggesting that fishing effort was only likely to be lost in limited circumstances.

There are no impacts on fisheries GVA associated with the lower and intermediate scenarios, because the proposed management measures assessed for these scenarios do not involve any restriction of fishing effort. Under the upper scenario, which is considered very unlikely to occur, the sites that could potentially be most affected are Southern North Sea and Bristol

Channel Approaches / Dynesfeydd Môr Hafren dSACs, although West Wales Marine / Gorllewin Cymru Forol and North Channel and Outer Solway also have direct impacts on fisheries GVA of over £3 million over the assessment period. The impacts for the Southern North Sea dSAC (upper scenario) mainly fall on the under-10m vessels (55% by landings value), predominantly netters. Over-10m demersal trawl and beam trawl also bear 19% and 15% of the impact on value of landings affected, respectively). The impacts of the Bristol Channel Approaches / Dynesfeydd Môr Hafren dSAC predominantly fall on the under-10m sector (63%), predominantly static netters, and also on the over-10m static netters, beam trawlers and demersal trawlers.

Table 13. Average annual loss in value of landings, assuming zero displacement of fishing activity, in £ thousands for quantified impacts to commercial fisheries (2015 prices)

Site Name	Quantified Impact (Annual Average Loss of Value of Landings, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Southern North Sea	-	-	1,365
Outer Moray Firth	-	-	441
North Minch	-	-	254
Southern Sea Of Hebrides	-	-	450
North Channel And Outer Solway	-	-	487
North Anglesey Marine / Gogledd Môn Forol	-	-	279
West Wales Marine / Gorllewin Cymru Forol	-	-	479
Bristol Channel Approaches / Dynesfeydd Môr Hafren	-	-	-
Total	**-**	**-**	**3,756**

Potential impacts on operating costs are presented in Table 14. There are one-off cost impacts for implementing by-catch mitigation measures for net fisheries under the intermediate scenario only. This has been interpreted as a requirement for all under-12m vessels using static nets to install pingers at intervals throughout their nets (see Appendix B.3 for further details). It is recognised that nets may vary greatly in length (for example, information from the EIFCA indicated that they may vary from 50m to 6,500m, and may be even greater in other regions) and therefore the cost estimates have significant uncertainties associated with them. Better information on length of nets used by under-12m vessels in each region would improve these estimates, which should be revisited before this management measure is taken forward. Further consideration should be given to the potential impact on harbour porpoise of large numbers of nets deploying pingers, which may result in the exclusion of harbour porpoise from important feeding and mating areas, together with the feasibility of implementation and enforcement of such a measure.

Table 14. Quantified potential impacts on operating costs for commercial fisheries sector associated with harbour porpoise by-catch measures (Present Value, £'000)

Site Name	Quantified Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Southern North Sea	-	250	-
Outer Moray Firth	-	-	-
North Minch	-	6	-
Southern Sea Of Hebrides	-	-	-
North Channel And Outer Solway	-	1	-
North Anglesey Marine / Gogledd MÃ´n Forol	-	30	-
Bristol Channel Approaches / Dynesfeydd MÃ´r Hafren	-	544	-
West Wales Marine / Gorllewin Cymru Forol	-	30	-
Total	**-**	**861**	-

Potential direct and indirect impacts on employment for the commercial fisheries sector are summarised in Table 15. These impacts arise as a result of the reduced landings and impacts on fisheries GVA discussed above, which may have knock-on effects on employment in the catching sector (direct) and the upstream supply chain (indirect).

Table 15. Average annual employment impact (direct and indirect) in numbers of full-time equivalents related to commercial fisheries

Site Name	Estimated Employment Impact (Number of jobs)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Southern North Sea	0	0	22
Outer Moray Firth	0	0	7
North Minch	0	0	4
Southern Sea Of Hebrides	0	0	7
North Channel And Outer Solway	0	0	8
North Anglesey Marine / Gogledd Môn Forol	0	0	4
West Wales Marine / Gorllewin Cymru Forol	0	0	8
Bristol Channel Approaches /Dynesfeydd Môr Hafren	0	0	12.0
Total	**0**	**0**	**72**

Non-quantified costs on commercial fisheries include: under the intermediate and upper scenarios, mitigation measures within site, as appropriate, seasonal or annual, for fixed engines (applicable to Southern Sea of Hebrides, North Channel and Outer Solway, and Outer Moray Firth dSACs). Although these costs have not been quantified, the salmon and sea trout catch from fixed engines in Scotland in 2014 was 43,507 kg (a fall from 53,515 kg in 2013) (Marine Scotland, 2014b; Marine Scotland, 2015b). The maximum monthly median netting effort and total catch (averages for 2013 and 2014) from those stations that lie within the

dSACs[20] are shown in Table 16. The average total catch from fixed engines within the three dSAC sites was 7,956 kg of salmon and sea trout (2013–2014). Assuming a price per kilo of £12.50 (estimated from price information from Billingsgate Market from 2011–2013 for wild salmon in Cefas *et al*., 2014), the total value of catches from the sites was £99,449.

Table 16. Catch and effort from fixed engines within dSAC sites

Site	Max Monthly Median Netting Effort (Average 2013–2014) (Number of Nets)	Average Total Catch (2013-2014) (kg)	Total Annual Value of Catches (£)
Outer Moray Firth dSAC	19.5	7,136	89,200
Southern Sea of Hebrides dSAC	2.0	806	10,069
North Channel and Outer Solway dSAC	1.0	14	180
Total		**7,956**	**99,449**

Notes: Price per kilo £12.50, estimated from Cefas *et al*., 2014
GVA estimated at 59%, taken from under-10m drift and fixed nets (sea fisheries) from SeaFish, 2014

3.2.4 Military Activities

The potential management measures applied to military activities for each management scenario are presented in Table 17. The detailed assumptions that have been applied in developing cost estimates for the potential management measures are described in Appendix B.4.

Table 17. Potential management measures for military activities

Management Measure	Scenario		
	Lower	Intermediate	Upper
Update to MoD Environmental Protection Guidelines to encompass the proposed sites and any seasonal sensitivities		✓	✓
Compliance with Environmental Protection Guidelines		✓	✓

Potential impacts to military activities at a national level are summarised in Table 18. The estimated costs (PV) range from zero under the lower scenario to £182k under the intermediate and upper scenarios. The costs relate to the need for MoD to amend and update its Marine Environment and Sustainability Assessment Tool (MESAT) (and other MoD environmental tools) and additions to electronic charting by the Hydrographic Office together with subsequent costs to maintain these updates and to comply with management requirements during military exercises. The assessment has been made at a national level because it is not possible to assign these costs to individual site proposals.

20 The location of stations within districts may vary and fisheries are not required to report the exact position of nets. The district catches used may approximate to the catches taken within dSACs, but there is no way of apportioning the proportion of that catch to the dSAC should the borders of the two areas not coincide.

Table 18. Quantified potential impacts to military activities

Site Name	Quantified Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
National Assessment	0	182	182
Total	**0**	**182**	**182**

It is recognised that there are a number of other nature conservation designation processes being progressed in similar time scales, including the designation of further MPAs and dSPAs in Scottish waters and the designation of MCZs in English and UK offshore waters. This offers the potential to co-ordinate the update of MESAT and other MoD environmental tools and updates to electronic charts and thus to minimise costs to the MoD.

3.2.5 Offshore Renewables

The potential management measures that could be applied to the offshore renewables sector for each management scenario are presented in Table 19. The detailed assumptions that have been applied in developing cost estimates for the potential management measures are described in Appendix B.5.

Table 19. Potential management measures for the offshore renewables sector

Management Measure	Scenario		
	Lower	Intermediate	Upper
Habitats Regulations Assessment (HRA) of new development and geophysical surveys within or near site boundaries	✓	✓	✓
Review of consents for existing offshore renewables developments within or near site boundaries	✓	✓	✓
Limited spatio-temporal conditions on piling activity or reducing sound levels at source within site boundaries		✓	
Prohibition on pile driving within boundaries			✓
Additional mitigation measures for tidal turbines (tidal stream, tidal range) to reduce or limit collision risk within site boundaries		✓	
Removal or avoidance of collision risk pressure with tidal turbines within site boundaries			✓
Enhanced mitigation measures to reduce or limit impacts of geophysical surveys within site boundaries		✓	
Limiting the number and duration of geophysical surveys within site boundaries			✓

No management measures have been identified for wave energy developments and they have been scoped out of the assessment. There are no currently planned tidal range developments in any of the dSACs. Should further tidal range proposals come forward within the time period of the assessment that are within or near a dSAC, it is possible that additional costs could be incurred for these developments, but such costs are currently too uncertain to include in the

assessment. The assessment has therefore focused on offshore wind and tidal stream developments.

Under the lower and intermediate (most likely) scenarios the potential management measures are only likely to give rise to minor increases in operating costs. Under the upper scenario (which is very unlikely), there is some potential for impacts on GVA and employment, where relevant these impacts have been presented separately below.

3.2.5.1 Offshore wind

Potential quantified impacts on operating costs to the offshore wind sub-sector are summarised in Table 20. The potential impacts in the Southern North Sea, Outer Moray Firth and North Channel and Solway dSACs comprise estimated additional costs of undertaking HRA for new development (or providing additional information for consented development) and for geophysical survey campaigns (all scenarios) and the cost of mitigation measures to reduce or limit the impacts of geophysical surveys (intermediate and upper scenarios), except in Scotland, where EPS provisions already require such mitigation measures.

A Review of Consents for consented but not yet implemented offshore wind farms will be required following site designation. While the Review of Consents is carried out by the relevant regulators with input from the SNCBs, there could be a requirement for offshore wind developers to provide additional information to inform each review – the potential costs for such work have been included in the assessment.

Under the upper scenario there is a potential measure to limit the number and duration of geophysical surveys within site boundaries. However, the costs of this impact would be site and project specific and it has not been possible to quantify this impact.

In addition, there are also some potential costs relating to potential industry contributions to national monitoring and assessment programmes, and to a strategic HRA for noisy activities (see Appendix E.8.1). These costs have been assessed at national level and have not been assigned to individual dSACs. The costs could be shared with the tidal stream sub-sector but for the purposes of this assessment have been shown against the offshore wind sub-sector on which the majority of such costs might be expected to fall.

Table 20. Quantified potential impacts to the offshore wind sub- sector

Site Name	Quantified Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Southern North Sea	536	606	376
Outer Moray Firth	210	210	58
North Channel and Outer Solway	0	0	29
Total	**746**	**816**	**463**
Costs assessed at national level:			
▪ Contribution to site monitoring and assessment costs	548	548	548
▪ Contribution to strategic HRA of noisy activities	19	19	19

The estimated impacts on operating costs (PV) range from around £1.3m under the lower scenario, £1.4m under the intermediate scenario and £1.0m under the upper scenario. The estimated impact on operating costs in the upper scenario for Southern North Sea and Outer Moray Firth dSACs are lower than in the lower intermediate scenario because some of the impacts under this scenario are expressed in terms of impacts to GVA and employment (see Table 21 below).

The lower scenario costs (PV) relate to the costs associated with providing information to inform HRAs for new development, to inform the Review of Consents process or for geophysical surveys. These estimates have assumed that the project specific HRAs are underpinned by a strategic HRA for noisy activities covering each dSAC and that the requirements for the project specific HRAs are simple, streamlined and based on existing data. Should there be a requirement to collect additional data or for further Examination in Public under the process for Nationally Significant Infrastructure Projects (NSIPs), or should the requirements be complex, the offshore wind industry has expressed a concern that this could give rise to significant additional costs and project delays which could affect the viability of projects. JNCC and SNCB advice is that the most likely management scenarios should not impose significant additional requirements and therefore there should not be significant additional costs or delays.

The intermediate scenario costs (PV) include additional mitigation measures for noisy piling activity and mitigation measures for geophysical surveys (except in Scotland, where EPS provisions already require such mitigation measures), but are broadly similar to the lower scenario costs. Within the assessment, based on informal advice from DECC, it has been assumed that the limited spatio-temporal controls on noisy piling activity that may be required to support achievement of site conservation objectives can be accommodated at minimal cost. This is on the basis that the likely installation rate of offshore wind farms within the Southern North Sea and Outer Moray Firth dSACs over the next five years is unlikely to exceed the indicative limits for noisy piling activity[21] being considered by JNCC and the other SNCBs. Beyond the next five years, while installation rates within the Southern North Sea dSAC might increase and possibly exceed the indicative limits for noisy piling activity, this is subject to considerable uncertainty in the timing of future offshore wind farm development. The industry is also exploring a range of technologies that could avoid or limit underwater noise from noisy piling activity which may become available within the next five years. The assessment has therefore concluded that, under the intermediate scenario, significant cost impacts associated with spatio-temporal restrictions on piling activity are likely to be avoided.

The costs associated with mitigation measures for sub-bottom profiler surveys have assumed a requirement for the presence of Marine Mammal Observers (MMOs), except in Scotland, where EPS provisions already require such mitigation measures. Given the limited number of sub-bottom profiler surveys undertaken by offshore wind developers, these costs are estimated to be relatively small (PV estimated to be less than £100k). However, should the use of MMOs

21 The indicative limit has been suggested by JNCC as 2 – 3 noisy piling event occurring concurrently within the Southern North Sea or Moray Firth dSACs for a period of 8 years.

require the use of larger survey vessels, the cost impacts could be an order of magnitude greater.

Under the upper scenario, as a worst case, the assessment has considered the potential impact of a management measure to prohibit noisy piling activity within dSACs. It is recognised that this scenario is very unlikely to occur. The assessment has interpreted this scenario as the cancellation of planned offshore wind farm development within the dSAC in the period 2016 to 2020 (after which time it is assumed that alternative technologies may become commercially available. The cancellation of planned offshore wind farm development would result in a loss of GVA and employment.

The potential gross impacts to total (direct, indirect and induced) GVA and employment for the offshore wind sub-sector associated with this scenario are presented in Table 21. The values are indicative only, but highlight the potentially very large economic costs associated with project cancellations. For example, for the Southern North Sea dSAC this might equate to around £1.9bn total GVA and over 5,000 construction jobs. Such impacts, should they occur, would not only affect the offshore wind sector, but also its supply chains, including ports and harbours. They might also affect the future viability of the offshore wind industry as a whole.

Table 21. Potential impacts to GVA and employment (FTE jobs) for offshore wind sub-sector

GVA £m (Direct, Indirect and Induced) (Present Value Over Assessment Period (2015 – 2034) at 2015 Prices) and Employment (Undiscounted) Impacts			
Area	**Lower Estimate**	**Intermediate Estimate**	**Upper Estimate**
Southern North Sea			
GVA:			
▪ Construction	0	0	1,035
▪ Operation	0	0	888
▪ Total	0	0	1,924
Employment (average):			
▪ Construction (2017 – 2021)	0	0	5,353
▪ Operation 2020 – 2034)	0	0	730
Outer Moray Firth			
GVA:			
▪ Construction	0	0	454
▪ Operation	0	0	400
▪ Total	0	0	854
Employment (average):			
▪ Construction (2016 – 2023)	0	0	1,470
▪ Operation (2020 – 2034)	0	0	326

It should be noted that further offshore wind development is likely to come forward for licensing during the period of the assessment but the location and nature of such development is uncertain and therefore has not been included. This means that the cost estimate is potentially an underestimate of the costs likely to be incurred over the period of the assessment.

3.2.5.2 Tidal stream

The possible management measures could affect planned tidal stream developments in Scottish and Welsh waters. Potential quantified impacts to operational costs for the tidal stream sub-sector are summarised in Table 22. The estimated impacts (PV) range from £231k under the lower scenario, £441m under the intermediate scenario and £0 under the upper scenario. The estimated impacts on operating costs in the upper scenario are zero because, as a worst case assumption it has been assumed that the developments do not proceed and the impact is therefore assessed in terms of potential gross impacts to GVA and employment (see Table 23 below).

The potential cost impacts in the North Channel and Outer Solway, North Anglesey Marine / Gogledd Môn Forol and West Wales Marine / Gorllewin Cymru Forol dSACs comprise estimated additional costs of undertaking HRA for new development (or providing additional information for consented development) and geophysical survey campaigns (lower and intermediate scenarios), implementing measures to reduce collision risk (intermediate scenario) and the cost of mitigation measures to reduce or limit the impacts of geophysical surveys (intermediate scenario for Welsh dSACs only (it has been assumed that measures would already be required under EPS legislation in Scotland)).

A Review of Consents for consented but not yet implemented tidal stream developments will be required following site designation. The only consents to which this would apply are the Anglesey Skerries Tidal Array and the Ramsey Sound tidal turbine. While any Review of Consents would be carried out by the relevant regulator r (e.g. NRW licensing) with input from NRW (advisory), there could be a requirement for the developer to provide additional information to inform the review – the potential costs for such work have been included in the assessment.

Under the upper scenario there is a potential measure to limit the number and duration of geophysical surveys within site boundaries. However, the upper scenario already assumes a worst case scenario that development would be prohibited (subject to the provisions of Article 6 of the Habitats Directive). Thus it is presumed that the geophysical surveys would not proceed and therefore no cost estimate has been made.

Table 22. Quantified potential impacts to the tidal stream sub- sector

Site Name	Quantified Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
North Channel and Outer Solway	39	248	0
North Anglesey Marine / Gogledd Môn Forol	109	110	0
West Wales Marine / Gorllewin Cymru Forol	83	83	0
Total	**231**	**441**	**0**

The lower scenario costs (PV) relate to the costs associated with providing information to inform HRAs for new development, to inform the Review of Consents process or HRA for geophysical surveys. These estimates have assumed that the project specific HRAs are

underpinned by a strategic HRA for noisy activities covering each dSAC and that the requirements for the project specific HRAs are simple, streamlined and based on existing data. The tidal stream industry has expressed concern that should there be a requirement to collect additional data, or should the requirements be complex, this could give rise to significant additional costs and project delays which could affect the viability of projects. JNCC and the other SNCB's advice is that the most likely management scenarios should not impose significant additional requirements and therefore there should not be significant additional costs or delays.

The intermediate scenario estimate (PV) includes additional costs associated with implementing mitigation measures to limit collision risk (Scotland only) and mitigation measures for geophysical surveys (except in Scotland, where EPS provisions already require such mitigation measures).

The potential costs for implementing mitigation measures to limit collision risk have been based on the installation of animal detection e.g. active sonar systems on 20% of tidal turbines within Scottish dSAC boundaries which can provide for shutdown of the turbines if harbour porpoise encroach within 30m). (For developments within Welsh dSACs, it has been assumed that such measures would already be required under EPS legislation, the estimated cost of installing such systems for planned developments within Scottish dSACs is estimated to be around £200k (PV). However, there is very limited experience of commercial scale or long-term deployment of active sonar/detection systems and the costs are therefore uncertain. In addition, it has not been possible to estimate the potential impact of turbine shutdowns on electricity generation. Should the number and duration of shutdowns at any site result in a material reduction in the amount of electricity generated, this could affect project viability. Such uncertainties may also act as a deterrent to investment and lead to project cancellations. It has not been possible to quantify these potential risks within the assessment.

The costs associated with mitigation measures for sub-bottom profiler surveys have assumed a requirement for the presence of Marine Mammal Observers (MMOs) except in Scotland, where EPS provisions already require such mitigation measures. Given the limited number of sub-bottom profiler surveys that are likely to be undertaken by tidal stream developers and the small areas likely to be covered by arrays, these costs are estimated to be very small. Such costs are only estimated for Welsh dSACs as SNH has indicated that such measures would already be required for Scottish dSACs under EPS legislation.

The upper scenario provides an indication of the potential worst case impacts to GVA and employment should planned developments within Scottish and Welsh dSACs not proceed. The potential gross impacts to total (direct, indirect and induced) GVA and employment for the tidal stream sub-sector are presented in Table 23. The values are indicative only, but highlight the potentially large economic costs associated with project cancellations. Such impacts would not only affect the tidal stream sub-sector, but also its supply chains, including ports and harbours.

For the West Anglesey and South Pembrokeshire Demonstration Zones, it is unclear what scale of development might occur within these zones and it has therefore not been possible to quantify the cost impact should these zones not be consented.

Table 23. Potential impacts to GVA and employment (FTE jobs) for tidal stream sub-sector

GVA £m (Direct, Indirect and Induced) (Present Value Over Assessment Period (2015 – 2034) at 2015 Prices) and Employment (Undiscounted) Impacts			
Area	**Lower Estimate**	**Intermediate Estimate**	**Upper Estimate**
North Channel and Outer Solway			
GVA: ▪ Construction ▪ Operation ▪ Total	 0 0 0	 0 0 0	 34 12 46
Employment (average): ▪ Construction (2018 – 2019)) (average number of jobs p.a. during construction period) ▪ Operation (2020 – 2034)) (average number of jobs p.a. during operation)	 0 0	 0 0	 525 25
North Anglesey Marine / Gogledd Môn Forol			
GVA: ▪ Construction ▪ Operation ▪ Total	 0 0 0	 0 0 0	 24 9 32
Employment (average): ▪ Construction (2016 – 2019) (average number of jobs p.a. during construction period) ▪ Operation (2018 – 2034) (average number of jobs p.a. during operation)	 0 0	 0 0	 175 16
West Wales Marine / Gorllewin Cymru Forol			
GVA: ▪ Construction ▪ Operation ▪ Total	 0 0 0	 0 0 0	 13 5 19
Employment (average): ▪ Construction (2016 – 2017)) (average number of jobs p.a. during construction period) ▪ Operation (2017 – 2034)) (average number of jobs p.a. during operation)	 0 0	 0 0	 196 9

3.2.6 Oil and Gas

The potential management measures that could be applied to the oil and gas sector for each management scenario are presented in Table 24. The detailed assumptions that have been applied in developing cost estimates for the potential management measures are described in Appendix B.6.

Table 24. Potential management measures for the oil and gas sector

Management Measure	Scenario		
	Lower	Intermediate	Upper
Habitats Regulations Assessment (HRA) of geophysical surveys or decommissioning activities using explosives within or near site boundaries	✓	✓	✓
Review of consents for proposed geophysical surveys or decommissioning activities using explosives within or near site boundaries	✓	✓	✓
Enhanced mitigation measures to reduce or limit impacts of geophysical surveys within boundaries		✓	
Limiting the number and duration of geophysical surveys within site boundaries			✓
Enhanced mitigation measures to reduce or limit impacts associated with use of explosives during decommissioning activities within or near site boundaries		✓	
Prohibition on use of explosives in decommissioning activities within or near site boundaries			✓

Potential quantified impacts are summarised in Table 25. Costs have been identified for only 2 of the 8 dSACs, reflecting the expected distribution of oil and gas exploration and decommissioning activity. The costs include undertaking HRA for geophysical survey campaigns (all scenarios), and the cost of mitigation measures to reduce or limit the impacts of seismic surveys (intermediate and upper scenarios).

No significant additional costs are anticipated to arise in relation to any Review of Consents process for licensed geophysical surveys. It has not been possible to quantify the impacts for the following management measures:

- Limiting the number and duration of geophysical surveys (upper scenario) - the impacts would be site and project specific and cannot be readily quantified. The quantified cost estimate for the intermediate scenario has been used, recognising that the management measure may give rise to additional costs which cannot be quantified;
- Enhanced mitigation measures to reduce or limit impacts associated with the use of explosives during decommissioning – the management measure could require seasonal restrictions on the use of explosives within dSACs. Depending on the nature of these possible restrictions, this could mean that the activities had to be undertaken outside of the most favourable seasons leading to an increase in costs due to weather delays/downtime. Such costs could be up to several hundreds of thousands of pounds per project; and
- Prohibition of the use of explosives during decommissioning – the cost impacts would be project specific and could range from £0 up to several million pounds.

In addition, there are also some potential costs relating to a potential industry contribution to a strategic HRA for noisy activities (see Appendix E.8.1). These costs have been assessed at national level and have not been assigned to individual dSACs.

The quantified site costs (PV) range from £486k in the lower scenario, up to £1.9m in the intermediate scenario. The intermediate scenario is considered to be a partial estimate as it has not been possible to quantify the potential costs associated with possible seasonal restrictions on the use of explosives during decommissioning.

The upper scenario estimate has been set at the same value as the intermediate scenario. However, this is considered to be a partial estimate as it has not been possible to quantify the potential costs associated with limiting the number and duration of geophysical surveys or prohibiting the use of explosives during decommissioning activities.

The scale of the quantified costs relative to annual turnover in the oil and gas sector is very small (production revenues of £24.4bn in 2014). Costs of this scale would not generally be considered material to investment decisions which are more strongly governed by current and expected oil and gas prices. However, the cost estimates are partial and it is possible that the actual costs could be significantly larger under the intermediate and upper scenarios.

Table 25. Quantified potential impacts to the oil and gas sector

Site Name	Quantified Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Southern North Sea	448	1,824	1,824
Outer Moray Firth	38	85	85
Total	**486**	**1,909**	**1,909**
Costs assessed at national level: ▪ Contribution to strategic HRA of noisy activities	19	19	19

3.2.7 Ports and Harbours

The potential management measures that could be applied to the ports and harbours sector for each management scenario are presented in Table 26. The detailed assumptions that have been applied in developing cost estimates for the potential management measures are described in Appendix B.7.

Table 26. Potential management measures for the ports and harbours sector

Management Measure	Scenario		
	Lower	Intermediate	Upper
Habitats Regulations Assessment (HRA) of port developments involving percussive piling or use of explosives within or near site boundaries	✓	✓	✓
Review of consents for consented but not yet built port developments involving percussive piling or use of explosives within or near site boundaries	✓	✓	✓
Enhanced mitigation measures to reduce or limit impacts of port developments involving percussive piling or use of explosives within or near site boundaries		✓	
Prohibition on port developments involving percussive piling or use of explosives within or near site boundaries			✓

Potential quantified impacts to the ports and harbours sector are summarised in Table 27. The costs that have been quantified relate to the possible requirement to undertake HRA for major port developments that involve noisy construction activity (percussive piling of large monopiles or use of explosives).

The Review of Consents process is not considered likely to give rise to significant costs to the port sector – none of the identified 'consented but not yet built' port developments are within 26km of any dSAC and thus it is unlikely that regulators would seek to review these consents or require the project promoters to provide additional information.

It has not been possible to quantify the potential impacts to the ports sector associated with measures to reduce or limit noisy construction activity (intermediate scenario) or to prohibit such activity (upper scenario).

Previous experience has demonstrated that it is possible for port developments to accommodate seasonal windows for construction activity. However, such considerations are site and project specific. There is limited experience of using underwater noise reduction measures within port development projects and the costs of management measures is site and project specific. The costs of measures could potentially run into hundreds of thousands of pounds for individual projects.

The quantified cost estimates (PV) range from £314k in the lower and intermediate scenarios up to £501k in the upper scenario.

Under the upper scenario, should noisy construction activity be prohibited (subject to the provisions of Article 6 of the Habitats Directive), the cost impacts could potentially be very significant and may result in project cancellation. Currently there may be no alternative to percussively piled foundations for some types of port development or the use of explosives to facilitate deepening of navigation channels. The cost impacts would be site and project specific. However, this scenario is considered very unlikely to occur.

The estimated direct impacts on the ports and harbours sector are generally small (Table 27) and are not considered significant relative to annual turnover. Under the upper scenario (which is very unlikely) there would also be the potential for a significant indirect effect on the sector as a consequence of impacts to the offshore renewables sector. Should offshore wind and tidal stream projects be cancelled, this would result in the loss of activity for ports both during construction and operation. The impacts on GVA and employment for the ports sector have not been estimated separately, but are included in the overall cost impacts to the offshore renewables sector which include indirect GVA and employment associated with offshore renewables supply chains. The main ports that could be affected include:

- Planned offshore wind construction centres such as Green Port Hull and Able Marine Energy Park on the Humber and at Arderseir and Nigg in Scotland;
- Installation and operational support bases along the East coast of England and in Scotland; and
- Tidal stream construction and operational facilities in south-west Scotland and Pembroke and Milford Haven in Wales.

Table 27. Quantified potential cost impacts to the ports and harbours sector

Site Name	Quantified Cost Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Southern North Sea	83	83	209
Outer Moray Firth	22	22	42
Southern Sea of Hebrides	21	21	21
North Channel and Outer Solway	104	104	104
North Anglesey Marine / Gogledd Môn Forol	21	21	21
West Wales Marine / Gorllewin Cymru Forol	42	42	42
Bristol Channel Approaches / Dynesfeydd Môr Hafren	21	21	63
Total	**314**	**314**	**501**

3.3 Impacts to the Public Sector

Estimated costs to the public sector are shown in Table 28 and Table 29. The main costs under the lower and intermediate scenarios relate to ongoing monitoring requirements to assess the condition of features within sites once designated (around £0.6m under the intermediate scenario, (PV)). Other public sector costs associated with preparing Statutory Instruments to implement fisheries management measures, compliance and enforcement activities, additional costs associated with geophysical surveys and regulatory and advisory costs are individually estimated to be relatively minor (around £0.45m in total for intermediate scenario, PV). Under the upper scenario, potentially much larger impacts could occur as a result of leasing income that might be foregone should some offshore renewables projects not proceed. However, this scenario is considered very unlikely.

Table 28. Quantified potential impacts to the public sector by activity

Activity	Quantified Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Preparation of Marine Management Schemes	0	0	0
Preparation of Statutory Instruments	0	41	60
Development of voluntary measures	0	0	0
Site monitoring	572	572	572
Additional costs of geophysical survey costs	119	119	119
Compliance and enforcement	0	0	0
Promotion of public understanding	0	0	0
Regulatory and advisory costs associated with licensing decisions and Review of Consents	293	293	263
Costs associated with potential leasing revenues foregone	0	0	504,664
Total	**984**	**1,025**	**505,678**

In relation to individual sites, the greatest potential costs under the lower and intermediate scenarios are associated with the Southern North Sea dSAC relating to regulatory and advisory costs in respect of oil and gas and offshore wind farm developments. Under the upper

scenario, the greatest potential costs are associated with the Southern North Sea dSAC and Outer Moray Firth dSAC relating to impacts to leasing income (Table 29) which could be foregone should some offshore wind farm projects be cancelled. However, this scenario is considered very unlikely to occur.

Table 29. Potential cost impacts to the public sector by site

Site Name	Quantified Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Southern North Sea	155	163	324,956
Outer Moray Firth	40	40	173,031
North Minch	18	18	21
Southern Sea of Hebrides	45	45	54
North Channel and Outer Solway	31	39	3,248
North Anglesey Marine / Gogledd Môn Forol	23	31	2,311
West Wales Marine / Gorllewin Cymru Forol	25	33	1,399
Bristol Channel Approaches / Dynesfeydd Môr Hafren	27	35	39
Total	**364**	**404**	**505,057**
National Costs not assigned to individual sites:			
▪ Strategic HRA for noisy activities	48	48	48
▪ dSAC monitoring/modelling	572	572	572

3.4 Social Impacts

The analysis presented in Section 3.2 above has demonstrated that under the intermediate and upper scenarios the dSAC proposals have the potential to generate economic costs (in terms of loss of GVA and employment) on two sectors:

- Commercial fisheries; and
- Energy generation.

For the commercial fisheries sector, the majority of the designations have the potential to affect economic activity, but only under the upper scenario and such impacts are therefore considered very unlikely to occur.

For the offshore renewables sector, offshore wind developments will potentially be affected at two dSACs, but, only under the upper scenario and such impacts are therefore considered very unlikely to occur. In addition, three dSACs sites would potentially be affected for tidal stream developments under the upper scenario only. Again, these impacts are considered very unlikely to occur.

This section identifies the social consequences (primary and secondary) that would be generated by the potential economic impacts on these sectors associated with management measures for the dSACs and assesses the potential significance of these impacts.

The distribution of economic impacts (e.g. across geographical locations and groups in society) is central in determining the significance level of social impacts. A detailed analysis of the distribution of the potential economic (and hence social) impacts for the affected sectors has therefore been undertaken and is presented in full in Appendix H. In relation to the commercial fishing sector, reductions in the quantity of fish landed locally at UK landing ports could have impacts (economic and social) on the fish processing sector.

A social and distributional analysis for each relevant individual dSAC is presented in Tables 6a, b and c of the site assessment reports in Appendix G.

3.4.1 Commercial Fisheries

Table 30 presents the 'social impact pathways' for the commercial fishing sector; these start with the two potential interactions associated with the new dSAC proposals under the upper scenario:

- Loss of traditional fishing grounds (i.e. assumes zero displacement of activity); or
- Displacement of fishing activity from traditional fishing grounds to other areas.

Table 30 sets out the social impacts associated with a loss of or displacement from traditional fishing grounds as assessed under the upper scenario. If traditional grounds are lost (and there is zero displacement of fishing activity to other areas) there would be social costs in the form of a loss of potential future income and employment.

There is a significant body of evidence (e.g. Acott *et al.,* 2012; Creative Research, 2009; Reed and Courtney, 2011) which recognises that for fishers, fishing is not just a job but a 'way of life', providing a sense of personal and community identity. As part of this, fishing provides a range of intangible social benefits which can be valued more highly than the income attained from fishing. For example, many fishers come from fishing families — often stretching back many generations — and they are extremely proud of this tradition. Fishing also provides social benefits in terms of independence, adventure and achievement. A loss of employment, therefore, not only results in a loss of income but also a loss of 'way of life' (and the broad range of intangible benefits associated with that).

The risk, under the upper scenario, of primary impacts on income, employment and 'way of life', can trigger an array of secondary adverse social impacts, not only for the individuals concerned, but also for their families and dependants, fishing communities, wider society and the public purse. For example, when a fisher's way of life is affected, and when the future is uncertain, there can be negative effects on individual (and family) health through stress. If fishers are put out of business, this can also lead to low morale within the community and can jeopardise the underlying infrastructure of the fishery (e.g. markets, processors) which can in turn result in the degradation of fishing communities and encourage out-migration. Outward migration has been witnessed in fishing communities as individuals seek more secure employment. This can reduce social capital and cohesion and affect the viability of local service provisions (e.g. schools). It can also generate crew recruitment problems which can compromise safety and lead to an increase in accidents. These and other potential secondary impacts are described in Table 30.

Table 30. Commercial fisheries interactions – Risk of potential social impacts under upper scenario

Potential Interactions	Consequences	Social Impacts	
		Primary	Secondary
Risk of exclusion from traditional fishing grounds (assuming no displacement)	Reduced income and employment:	**Reduced income and employment** can generate range of other primary social impacts: **'Way of life' and individual identity** – fishing is just not a job but a 'way of life' providing a sense of identity to fishers. Fishing provides a range of intangible benefits which are highly valued and not related to income. Many fishers come from fishing families, sometimes stretching back several generations and they are extremely proud of this tradition.	**Health** – reduced income can result in a loss of job security, uncertainty and stress which can have negative effects on fishers (and family) health. **Community** – uncertainty can hinder the ability of fishing businesses to plan for future and debt can lead to low morale within the community. If fishers are put out of business this can jeopardise the underlying infrastructure of the fishery which can result in degradation of fishing communities and encourage out-migration. A reduction in the number of fishers can reduce social capital and social cohesion. **Women** – diminishing fishing incomes have seen many wives and partners become significant secondary of primary earners. Reductions in fishing income and employment will encourage this trend. **Recruitment** – a decline in profitability and inability to plan can result in difficulties in recruiting. Further, young people are discouraged from entering the industry. In Scottish fishing communities, use of migrant workers has been a reluctant response to recruitment problems. A reduction in recruitment through families and neighbours has been associated with loss of loyalty to, and from, crews. Insufficient recruitment can, in turn, compromise safety and lead to increase in accidents.
Risk of displacement from traditional fishing grounds	Reduced income (through decreased revenues/ increased costs).	**'Way of life' (income and identity)**.	**Health** **Community** **Women** **Recruitment** (as above)

Potential Interactions	Consequences	Social Impacts	
		Primary	**Secondary**
	Changes in fishing patterns including areas fished, gears used and species targeted	**Rights and equity** – exclusion of particular gear types can create a sense of unfairness and discrimination among affected gear types.	Can, in turn result in communities becoming more socially stratified and result in loss of **social cohesion**.
	Diminishing fishing grounds can increase conflict with other fishing vessels/gear types	**Conflict** -where gear conflict results in fishers losing or damaging gear, this can affect costs and income which can impact on employment and hence '**way of life**'. 1. Equally, gear conflict could reduce where gears are restricted/prohibited.	**Loss of social cohesion** - Competition between fishers can increase social tensions and erode social cohesion among fleets. This can remove 'shared management' of the resource and in certain cases the depletion of common resources due to lack of co-ordinated use. In such cases would be knock on effect on 'way of life' (and hence income, employment).
	Increased safety at sea risks through, e.g. fishing in more distant/ lesser known areas without safety of home port, spending longer time at sea in vessels not designed for long trips, fishing in rougher weather.	**Health & Safety**– all examples of changes in fishing practices can have adverse impacts on health of fishers and of their families as they spend more time away from home and cause worry about safety, particularly in bad weather.	
	Targeted management of fishing practice of a single sub-Sector	**Impacts on rights and equity**	**Social stratification** within communities and loss of **social cohesion**.
	Increased environmental impacts in new areas targeted by displaced fishers –potential reduction in marine productivity, landings & income	Impact on **way of life** (in relation to income, employment and identity)	**Health** **Community** **Women** **Recruitment** (as above)
	Improved environment resulting from improved fish stocks from de facto closed areas, refuge for species, protection of important habitats (spawning grounds) which can result in improved fish landings	Impact on **way of life** (in relation to income, employment and identity)	**Health** **Community** **Women** **Recruitment** (as above)

Table 30 also sets out the social-impact pathways that can be generated when fishing activity is displaced rather than lost. This interaction has a range of additional consequences, each generating another 'pathway' of different primary and social impacts. For example, diminishing fishing grounds can increase competition and conflict with other fishing vessels and gear types. Where gear conflict results in fishers losing or damaging gear, this can affect costs and income which can impact on employment and hence 'way of life'. Exclusion of particular gear types can also inflict social costs on affected gear types by creating a sense of unfairness and discrimination and this in turn can increase social tensions and erode social cohesion among fleets. Displacement can also lead to changes in fishing practices - for example, fishing in more distant/lesser known areas, spending longer time at sea in vessels not designed for long trips, fishing in rougher weather – all of which can have adverse impacts on fishers' health (and that of their families) as fishers spend more time away from home and the changes compound families' fears about their safety.

It is important to highlight that there are also potential beneficial social impacts associated with the environmental benefits generated by the dSAC proposals. The exclusion or displacement of fishers, or, certain gear types, for example, can provide refuge for species and protect important habitat resulting in improved fish stocks. The social impacts will stem primarily through any improved and/or more secure income and employment that is supported as a result, with positive effects instead of the negative impacts discussed under 'way of life' and positive secondary social impacts for example on health, cohesion etc.

3.4.1.1 Commercial fisheries - Establishing the scale and significance of social impacts for individual sites

While the social impact pathways set out in Table 30 are helpful in identifying the social impacts that could occur, they do not provide a firm conclusion on whether, and to what extent, these impacts will occur as a result of the dSAC proposals, or, how significant they are likely to be. That depends on the:

- Scale of the primary employment impact associated with each site;
- Distribution of primary impacts across regions and ports and key groups; and
- Characteristics of the individuals or communities affected (e.g. economic vulnerability, existence of alternatives, resilience and adaptability).

3.4.1.2 Scale of primary impact on GVA and employment

Tables 12 and 14 in Section 3.2.3 summarise the potential reductions in landings and employment that could arise as a result of proposed dSACs where fishing effort would be restricted under the proposed management measures for each site. It is important to note that impacts are only expected under the upper scenario. Thus while there is a risk of adverse impacts, they are not considered likely. There is no impact on fishing activity under the lower or intermediate scenarios, and hence these would not generate any social impacts.

Under the upper scenario, there is a risk of loss of approximately £2m of fish landings and 72 FTE jobs. Such impacts would be significant for the sector, and could have social impacts in particular communities. However, they are only a risk identified under the upper scenario, and

are expected to be distributed around the UK, as the dSACs are widely spread across UK seas. The distribution of these potential impacts across the dSACs are shown in Table 31.

The impacts presented reflect direct and indirect employment, and thus combine impact on employment in the catching sector with impact on employment in the upstream supply chain (boat builders, fuel, bait and gear suppliers etc.). The impacts of the dSACs may be an overestimate as they include impacts from areas overlapping the other existing and proposed designations.

Table 31. dSACs with potential to generate social impacts under the upper scenario as a result of impacts to the commercial fisheries sector

Site Name	Potential job losses >1FTE (Direct and Indirect)
Southern North Sea	21.7
Outer Moray Firth	7.0
North Minch	4.0
Southern Sea of Hebrides	7.2
North Channel and Outer Solway	7.7
North Anglesey Marine / Gogledd Môn Forol	4.4
West Wales Marine / Gorllewin Cymru Forol	7.6
Bristol Channel Approaches / Dynesfeydd Môr Hafren	12.0

It is clear from Table 31 that, under the upper scenario, there is a risk of significant employment impacts associated with the new dSACs. If these job losses occurred, there would be social impacts at the individual (and family) level in terms of 'way of life' and some of the secondary social impacts associated with that set out in Table 30. These estimates are worst-case estimates, based on the assumption of zero displacement of fishing activity. In reality, it is likely that some commercial fishing activity will be displaced to other grounds and hence it is likely that the impacts on employment are likely to be lower than those estimated. Further, it is possible that the potential reductions in income associated with designation would be spread out over a number of fishermen (e.g. by reducing the number of hours they work), resulting in lower incomes rather than job losses. However, for any fishers who do lose their jobs, the economic and social costs would be significant at the individual (and family) level. The small numbers affected at a national scale make it unlikely that the impacts on individuals would result in the generation of broader-level social impacts at the community level (e.g. on social cohesion etc.). Displacement of fishing activity can generate further costs, however, that are not quantified, such as increased steaming times, increased fuel consumption, changes in catch-per-unit-effort, potential costs of accessing quota for different areas, and environmental impacts in areas previously unexploited or less exploited by fisheries. Finally, these impacts only arise under the upper scenario, so are not considered to be likely to occur.

3.4.1.3 Distribution of primary impacts

Significant impacts are only present as a risk under the upper scenario, are widely distributed across UK fishing ports and the data to link the affected catches to specific ports is not available. Therefore, no further distributional effects in determining the significance level of

social impacts are considered in this analysis. The distributional impacts data analysis for the sites is presented in Tables 6b and 6c of the site assessment reports in Appendix G.

Six different aspects have been assessed as part of the distributional analysis:

- Location;
- Age groups;
- Gender groups;
- Fishing groups;
- Income group; and
- Social groups.

The risk of impacts in terms of age, gender and incomes groups are identified qualitatively, but no further significant effects are identified from the designations.

It should be noted that the social impacts from some site designations (e.g. Southern Sea of Hebrides) may be more significant if they occur in small island communities where depopulation associated with employment opportunities poses a risk to the viability of communities.

The assessment presented above assumes zero displacement of fishing activity. If, as expected, some displacement occurs, then the employment impacts would be expected to be lower but individuals and communities could experience different types of social costs (including on their rights and equity, health and safety, conflict and social cohesion).

3.4.1.4 Characteristics of the individuals and groups affected economic vulnerability, existence of alternatives, resilience and adaptability)

The distributional analysis for each individual dSAC (presented in Tables 6b and 6c of the site assessment reports in Appendix G) has assessed the impact on different groups, including age, gender, income and vulnerable groups. This suggests that for all dSACs:

- The social impacts from income and employment losses are mainly a risk in the male, working age population;
- Would risk of having an impact on income groups falling into lowest paid 10% (and the middle 80%) of workers; and
- Designation would not have any noticeable impact on ethnic minorities, people who are long-term sick, or, crofters.

The distributional analysis for each individual dSACs has also assessed the impact on different fishing groups by gear type and vessel length. The key results under the upper scenario show the greatest risks are to fishing with demersal trawl/seine, dredging and fixed net gears.

The length of vessels and gear types that are affected varies across the sites. Risk under upper scenario is mainly for impacts to the following gear types: Beam trawl; Demersal trawl/seine; Dredge; Drift and fixed nets; Gears using hooks; Other mobile gears; and Pelagic seine, and to both under 10m and over 10 m vessels.

3.4.1.5 Summary

Table 32 summarises the potential scale and significance of the social impacts that are likely to be generated by the designation of each the individual dSACs.

No social impacts are expected under the lower or intermediate scenarios. Under the upper scenario, there is a risk that the potential management measures required to protect marine biodiversity have the potential to impact on the 'way of life' of fishers (through impacts on income, employment and identity). The risk of job losses associated with the individual dSACs is small (< 10), with the exception of the Southern North Sea site. However, the particularly large geographical extent of this site mean the risk of 22 job losses would be spread across a number of fishing ports. Any affected fishers would experience significant social impacts (primary and secondary) at the individual level. The small numbers involved, however, suggests that effects on income at the individual level are unlikely to result in the broader community-level social impacts identified in Table 30.

If, as expected, some displacement of fishing activity occurs, then the risk of employment impacts under the upper scenario would be expected to be lower than those set out in Table 32 but individuals and communities could experience different types of social costs (including on their rights and equity, health and safety, conflict and social cohesion). The scale of the affected landings, however, suggests that these impacts would be moderate at worst.

If, as expected, some displacement of fishing activity occurs, although the impact on 'way of life' (in relation to income and employment) will be lower, there could be potential additional adverse social impacts associated with the consequences of displacement (e.g. increased conflict due to competition for fishing ground). However, the large geographical extent of the Southern North Sea dSAC makes this unlikely. The largest share of the costs that could occur would fall on under-10m drift and fixed nets, and over 10m beam and demersal trawlers in East coast ports.

Table 32. Summary of the scale and significance of social impacts relating to the commercial fisheries sector, upper scenario only

dSAC Site Name	Lower and Intermediate Scenarios	Upper Scenario				
		Average (Mean) Number of Jobs Affected (Direct and Indirect), FTEs /Significance of Social Impact	Region	National Level	Region/ Community Level	Individual Level
Southern North Sea	No significant social or economic impacts identified	22	East Coast of England	0	X	XXX
Outer Moray Firth		7	North East Scotland	0	X	XXX
North Minch		4	North West Scotland	0	X	XXX
Southern Sea of Hebrides		7		0	X	XXX
North Channel and Outer Solway		8	South West Scotland	0	X	XXX
North Anglesey Marine / Gogledd Môn Forol		4	North West Wales	0	X	XXX
West Wales Marine / Gorllewin Cymru Forol		8	West Wales	0	X	XXX
Bristol Channel Approaches / Dynesfeydd Môr Hafren		12	South West Wales and South West England	0	X	XXX

Impacts:
xxx/+++: Significant negative/positive effect;
xx/++: Possible negative/positive effects;
x/+: Minimal negative/positive effect, if any;
0: No noticeable effect expected.

3.4.2 Energy Generation – Offshore Renewables (Offshore Wind and Tidal Stream)

For the offshore renewables sector, offshore wind development will potentially be affected but only under the upper scenarios at two dSACs. Three dSACs sites will be potentially affected for tidal stream developments, again only under the upper scenario.

Table 33 identifies the non-social consequences likely to be associated with these interactions and the potential primary and secondary social impacts generated as a result. If designation of the dSACs constrains or prevents further offshore renewable energy generation development, there would be a number of consequences.

First, there would be a loss of investment into the sector which would be significant enough to generate social costs in the form of a loss of potential future employment[22]. This is estimated as a potential loss of 7,719 short-term jobs during construction and 1,106 long-term jobs associated with operation (upper scenario only).

There are significant secondary social benefits associated with job creation, including:

- Enabling people to fulfil their material well-being;
- Improvements to physical and mental health;
- The creation of social and economic ties and incentives for communities to work together;
- Improving an individual's social capital and creating chances for new linkages to be formed and for socially integrated individuals to have greater access to use job information flows;
- Improving unemployment rates for a local area which has an existing market that matches the profile of jobs required;
- An inflow of highly paid and skilled employment that can increase spend in the local area and demand for social and cultural activities;
- Improved rights and equity for young people – young people benefit from better social linkages, improved future employment chances and reduced chances of crime and welfare dependency from moving into employment;
- Improved rights and equity for migrants – who can bring a range of social benefits to local areas including social cohesion and new experiences (as well as displacement of jobs); and
- Reductions in crime – as unemployment rates rise, crime tends to rise, especially property crime. Alcohol consumption and drink driving can also decrease in the short term when there is a drop in unemployment.

22 As noted previously, these figures represent the potential gross number of jobs that might be foregone. The actual number of jobs foregone would depend on the alternative means by which electricity generation might occur in the absence of development at the dSACs.

These potential social benefits would be reduced or lost if a designation resulted in refusal of consent for proposed windfarm or tidal stream development (either in part or whole). There would also be potential social costs associated with the loss of any community projects that the developers would have funded.

Second, the increase in renewable energy capacity promised by the proposed development would have supported the wider social benefits of improved energy security and reduced greenhouse gas emissions. Linked to this would be the provision of, and connection to, the electricity network which provides security of supply (Offshore Grid, 2011) and increased consumer choice for household energy. These potential wider social benefits would be reduced/forgone if the proposed development was restricted or refused.

Third, refusal of consent could also generate positive social impacts by avoiding some of the adverse socio-economic impacts on commercial fisheries, recreation and tourism sectors; these are largely associated with loss of traditional fishing grounds, the visibility of the developments from the shoreline and disturbance during construction.

The significance of the economic and social costs could be greater/smaller depending on the particular regions, local areas, communities, businesses and workers that would have benefitted from the development as currently proposed and hence who will be adversely affected if the projects are constrained or consent refused.

The distribution of economic impacts cannot be accurately assessed as that would depend on many factors that are not known, for example, the extent to which UK firms would be successful in securing contracts and the location of these firms.

Table 33. Social impacts associated with management measures for offshore renewables, upper scenario only

Potential Interactions	Non-Social Consequences	Social Impacts		Significance of Social Impact		
		Primary	Secondary	National and Sector Level	Region/ Local Area Level	Individual Level
Upper scenario wind Southern North Sea: Loss of £1,924m of GVA. Outer Moray Firth: Loss of £854m of GVA.	▪ Loss of investment in sector	▪ Loss of future job creation		XXX Short-term: ▪ 6,823 construction jobs (annual average 2016-2023) Long term: ▪ 1,056 operational jobs p.a. (2020-2034)	XXX North East Scotland, Eastern England	XXX
	▪ Reduced renewable energy	▪ Social cost of loss of carbon reduction		XXX	n/a	n/a
		▪ Loss of benefits associated with improved energy security/increased consumer choice for household energy		XX	XX	XX
	▪ Avoidance of adverse impacts recreation and tourism sectors	▪ Socio-economic benefits from avoiding adverse visual impact of windfarm on seascape and disturbance during construction		0	+ Tourist/ recreation businesses in vicinity of affected shoreline	+ Individuals living or undertaking tourist/ recreation activities in vicinity of affected shoreline

Potential Interactions	Non-Social Consequences	Social Impacts		Significance of Social Impact		
		Primary	Secondary	National and Sector Level	Region/ Local Area Level	Individual Level
	▪ Avoidance of economic impacts on commercial fishing sector	▪ Social benefits from avoiding potential negative impacts on income and employment of commercial fisheries (and hence 'way of life' and the secondary social impacts associated with that)	▪ Health ▪ Community ▪ Women ▪ Recruitment	0	++	++
Upper scenario tidal stream North Channel and Outer Solway: Loss of £46m of GVA. North Anglesey Marine / Gogledd Môn Forol: Loss of £32m of GVA. West Wales Marine / Gorllewin Cymru Forol: Loss of £19m of GVA.	▪ Loss of investment in sector	▪ Loss of future job creation		XX Short-term: ▪ 896 construction jobs (annual average across all projects during construction) Long term: ▪ 50 operational jobs p.a. during operation	XXX South-west Scotland, Wales	XXX
	▪ Reduced renewable energy	▪ Social cost of loss of carbon reduction		XXX	n/a	n/a
		▪ Loss of benefits associated with improved energy security/increased consumer choice for household energy		XX	XX	XX

Potential Interactions	Non-Social Consequences	Social Impacts		Significance of Social Impact		
		Primary	Secondary	National and Sector Level	Region/ Local Area Level	Individual Level
	▪ Avoidance of adverse impacts recreation and tourism sectors	▪ Socio-economic benefits from avoiding adverse visual impact of tidal stream developments on seascape and disturbance during construction		0	+ Tourist/ recreation businesses in vicinity of affected shoreline	+ Individuals living or undertaking tourist/ recreation activities in vicinity of affected shoreline
	▪ Avoidance of economic impacts on commercial fishing sector	▪ Social benefits from avoiding potential negative impacts on income and employment of commercial fisheries (and hence 'way of life' and the secondary social impacts associated with that)	▪ Health ▪ Community ▪ Women ▪ Recruitment	0	+	+

Impacts:
xxx/+++: Significant negative/positive effect;
xx/++: Possible negative/positive effects;
x/+: Minimal negative/positive effect, if any;
0: No noticeable effect expected.

Tables 34 and 35 summarise the relevant information and evidence that is available on the likely distribution of the economic costs associated with the potential loss of investment in the sector. Six different aspects are assessed as part of the distributional analysis:

- Location;
- Age groups;
- Gender groups;
- Sectors;
- Small businesses; and
- Social groups.

Unlike the analysis for commercial fisheries, it is not possible to provide quantitative estimates of the distribution of GVA and employment losses by geographical region. However, the analysis does identify those geographical areas where impacts are likely to be concentrated and provides a qualitative assessment of the expected significance of the impact. For other aspects (e.g. age, gender, small businesses and social groups), the analysis indicates whether designation of the dSAC is likely to impact on these groups, and, if so, whether the impact is anticipated to be zero, minimal, negative, or significantly negative.

Tables 34 and 35 show that:

- Location: the loss of future economic activity associated with the capital elements of the proposed wind farm and tidal stream developments would be felt predominantly in the South West and North East Scotland, Eastern England, and West Wales. Although ultimately, the distribution of GVA and employment losses will depend on the ability of local, regional and UK companies to secure the construction contracts and the location of these companies, there is evidence to suggest that construction expenditure, which accounts for the majority of the capital spend, has the greatest potential to directly benefit local economies (BVG Associates, 2011). This suggests that businesses and workers in these regions would bear a disproportionate share of the expected loss in future GVA and employment. Although this is expected to be a short-term economic cost over the construction period, the scale of the anticipated GVA and employment losses are such that this would represent a very significant negative impact;
- Age/Gender – the loss of future jobs will have a direct negative impact on the male, working age population (as the construction sector is male dominated). If male workers become or remain unemployed as a result of the potential decision to refuse consent, however, there would also be significant negative impacts on all members of the household (including women, children and retirees);
- Sectors affected – construction companies, ports and harbours, professional services (legal, technical, engineering), facilities for manufacturing and pre-assembly of turbines, manufacturers of foundations, cables and electrical infrastructure. Further impacts throughout the supply chain; and
- Small businesses – Likely to be significantly affected as the large majority of engineering and construction enterprises are small businesses and therefore the loss of potentially lucrative construction contracts and demand for highly skilled professionals in technical services (including legal services and engineering) is likely to have a significant negative adverse impact on small businesses, particularly in the regions affected.

Table 34. Distribution of social impacts (location, age and gender) arising from the designation and management of the dSACs (over 2015 to 2034 inclusive), offshore renewables, upper scenario only

Sector/Impact	Scale of Impact by Location			Age			Gender	
	At National Level	Regional /Cities	Rural, Urban, Coastal or Island Communities	Children	Working Age	Pensionable Age	Male	Female
▪ Construction sector/ adverse impact on future job creation (2016-2020) ▪ Renewable Energy Sector/ adverse impact on future job creation ▪ Supply chain impacts throughout economy	XXX Significant impacts in England, Scotland and Wales	XXX Significant impact, concentrated in: South West and North East Scotland, Eastern England, West Wales:	XXX Rural & urban coastal	XXX Significant negative effect at individual level if parents lose opportunity for employment	XXX Significant negative effect at individual level if individual loses opportunity for employment	XX Potential negative effect if retirees own construction businesses of live in household of affected future workers	XXX Main direct impact on working age males as women significantly under-represented in construction sector	XXX Significant negative effect if member of household loses opportunity for employment

Impacts:
xxx/+++: Significant negative/positive effect;
xx/++: Possible negative/positive effects;
x/+: Minimal negative/positive effect, if any;
0: No noticeable effect expected.

Table 35. Distribution of social impacts (business, income and vulnerable social groups) arising from the designation and management of the dSACs (over 2015 to 2034 inclusive), offshore renewables, upper scenario only

Sector/Impact	Business Groups			Income Groups			Vulnerable Social Groups	
	Small	Medium	Large	10% Most Deprived	Middle 80%	10% Most Affluent	Ethnic Minorities	With Disability or Long-Term Sick
▪ Construction sector/ adverse impact on future job creation (2016-2020) ▪ Renewable Energy Sector/ adverse impact on future job creation ▪ Supply chain impacts throughout economy	XXX Construction represents large industry sector	XXX	XXX	XXX	XXX	XX Not clear if this group affected as severely, likely to have greater alternative employment opportunities.	XX Small percentage of construction employment is people from ethic minority groups	No employment data available.

Impacts:
xxx/+++: Significant negative/positive effect;
xx/++ : Possible negative/positive effects;
x/+: Minimal negative/positive effect, if any;
0 : No noticeable effect expected.

3.5 Benefits

3.5.1 Benefits of Site Designations

The approach to assessing benefits is described in the methods in Section 2.3.3.4.

3.5.2 Ecosystem Services from SACs

The assessment of ecosystem services impacts focuses on four services, as described in Section 2.3.3.4. The list of final ES that has been considered is provided in Table 6.

3.5.3 Values of Benefits from SACs

3.5.3.1 Recreation and tourism

The marine environment provides a location for recreational activities and tourism, with many if not all activities inherently linked to the quality of the marine environment. Much 'marine' recreation activity information relates to beaches, and therefore is not always relevant to the expected impacts of site designation. Limited economic valuation evidence for marine recreation relevant to the proposed sites is available.

The features of the proposed sites could play a significant role in wildlife tourism in the UK. Evidence on the scale of this activity is discussed further in Appendix I. No UK wide figures on marine wildlife tourism are available, but it is understood to be a significant part of nature-based tourism in coastal regions. For example, nature-based tourism is a significant industry in Scotland with a direct economic impact of £1.4 billion per year, supporting 39,000 jobs (full-time equivalent) - nearly 40% of all tourism spending; and in Wales wildlife-based activity has estimated direct outputs of £1.43bn.

The feature of the SACs considered for designation in this study is harbour porpoise. The management measures for this feature may also improve the general quality of the marine environment in a manner that enhances recreation and tourism:

- Parsons *et al*. (2003) estimated that the direct economic income from cetacean-related tourism in Scotland was approximately £1.77 million per annum, with £7.8 million of total gross income generated by cetacean-related tourism in rural West Scotland. However, harbour porpoise are small and relatively inconspicuous, and therefore are less usually a subject for marine wildlife tourism compared to other cetaceans.
- Marine angling is also inherently linked to the quality of the marine environment, directly through the availability of fish, and indirectly through the quality of the experience at locations where it is undertaken. A Defra funded Sea Angling Survey found that in 2012, approximately 1.08 million people in Great Britain went sea angling; this is comprised of 884,000 from England, 125,000 from Scotland, and 76,000 from Wales (Armstrong *et al*., 2013). They further estimated that angler spend in 2012 was £1.23 billion.

One study provides evidence on the economic value of the benefits of marine designations for recreation. Kenter *et al* (2013) looked at the value of proposed marine protected area designations through UK waters to divers and anglers. An increase in the quality, or avoidance of deterioration, of marine environments is connected to an increased value of the experience of recreational activities in the marine environment, such as walking at the coast or recreational boating. The value of marine protected areas in England, Wales, and Scotland for two groups of users – anglers and divers – are identified within this study. The suitability of the Kenter *et al* (2013) for value transfer to this analysis is considered moderate, as summarised in Table 36. This study's non-use value results are discussed in detail in Section 3.5.4.

The study identified use values for these two user groups using the travel-cost valuation method. The total recreational values of sites are identified for these user groups for the sites under different management scenarios. The 'no restrictions' value identifies the total recreational value of the site, after designation. Note this value is safeguarded by designation, but is not the impact of designation *per se*. The difference between the 'no restrictions' scenario and the other scenarios with restrictions indicate the potential change in value as a result of stricter management measures at the sites.

Table 36. Comparison of Kenter *et al* (2013) study to the proposed designations to assess suitability for value transfer

Selection Criteria – Similarity Between Study and Policy Goods in Terms of:	Policy Good and Site (Proposed Designations)	Kenter *et al* (2013) Study	Comment
The good itself	Designation of marine protected areas, mostly for harbour porpoise, but some for seabirds	Designation of marine protected areas, generally for a broader range of features that under the policy good	Moderate fit, harbour porpoise is just one of several features that may be present in the sites studied by Kenter *et al*., 2013.
The change	Designation of a further 8 SACs to add to existing network of UK marine sites.	Looked at designation of 25 sites in Scotland (MPAs), 119 English sites (rMCZs), and 7 Welsh sites (SACs).	Proposed designations are partly a subset and partly and extension of the change studied by Kenter *et al*., 2013 – acceptable fit.
The location	UK marine environment.	UK-wide study	Results are good fit.
The affected populations	Population of the UK marine wildlife tourists from overseas.	Divers and anglers in the UK	Reasonable fit, divers and anglers are a large subset (in terms of values) of beneficiaries.
The number and quality of substitutes	Existing designations in UK waters.	By looking at values across UK network of sites, implicitly considers substitutes.	By using numbers for a selection of the Scottish and Welsh sites considered by Kenter *et a*l, 2013, good fit.
The market constructs	Public policy delivering protected areas.	Public policy delivering protected areas.	Moderate fit, due to a more limited set of site features under the policy good that within Kenter *et al.* 2013.
Study quality: moderate. There are concerns over the robustness of beneficiary numbers in Kenter *et al,* 2013, but study has been reviewed and published. Overall comparison: In general the evidence from Kenter *et al* 2013, is a moderate fit for the proposed designations. It is used to indicate the scale of value of the activities at sites, but not to calculate values for the impacts of the designations.			

This study is directly relevant to three of the dSACs (Southern Sea of Hebrides, Outer Moray Firth, and West Wales Marine) considered in the current round of designations. These are shown in Table 37. Their survey included variables on 'sea life' and 'vulnerable species protected' both of which are relevant to these sites.

The values in Table 37 illustrate:

- The significant recreational value of sites, estimated at between approximately £3 - 18 million post designation per site across the three sites, would be safeguarded by designation
- The increases in the value of recreational visits to the proposed protected areas of between approximately £0.3 and £3.7 million per site across the three sites as a result of designation and restrictive management measures.
- The higher values of sites with higher visitor numbers (e.g. West Wales Marine / Gorllewin Cymru Forol dSAC).

It must be noted that the proposed SACs of concern for this report are around a single feature (harbour porpoise) compared to those in the Kenter *et al*. 2013, study. Furthermore, all the values in Kenter *et al* 2013, are sensitive to the estimated numbers of anglers and divers. There is some evidence that these users may be overestimated (e.g. in Riddington *et al*, 2014).

Table 37. Recreational values comparable to proposed MPAs identified in Kenter *et al* 2013

Site (With Similarity to Kenter *et al*. 2013 Sites)	Anglers			Divers		
	Number of Visits (1,000's)	Total Value of Site (Safeguarded by Designation) £m	Increased Value from Stricter Measures (£m/yr)	Number of Visits (1,000's)	Total Value of Site (Safeguarded by Designation) £m	Increased Value from Stricter Measures (£m/yr)
Southern Sea of Hebrides dSAC (Eye Peninsula to Butt of Lewis)	143 - 261	5.16 – 9.39	0.7 – 1.2	52 - 87	5.11 – 8.51	0.3 – 0.5
West Wales Marine / Gorllewin Cymru Forol dSAC (Cardigan Bay)	403 - 732	4.16 - 7.57	1.9 – 3.5	17 - 29	1.22 - 2.04	0.11 – 0.18
Outer Moray Firth dSAC (Southern Trench)	44 - 81	1.75 – 2.9	0.2 – 0.4	22 - 37	1.55 – 2.82	0.1 – 0.2

In interpreting this evidence it is necessary to consider the existing designations for other biodiversity features at many of the sites. These designations will also, to some extent, protect the features which are the subject of existing or pending designations. Therefore, the additional recreational benefit from these designations relates to the extent that they increase the richness of all the biodiversity and other features and characteristics (not just those they are designated for). This additionality is very difficult to determine and cannot be quantified in a way that allows quantified adjustment of the valuation data.

As a result, applying the figures in Table 37 directly to the dSAC designations is subject to considerable uncertainty, and quantification of the value of the proposed designations based on this data is not considered sound. The data suggests that the designated sites may have a recreational value to divers and anglers of at least £100,000's and possibly much higher at larger sites with greater activity.

It should be noted that there are social benefits associated with these recreational and tourism activities, and therefore the proposed designation and management of sites could improve social welfare through access to a healthier marine environment. This impact is also noted within the social analysis, and therefore care is needed not to double-count its effects in this analysis.

The lack of published valuation studies showing the effects of conserving harbour porpoises on the level of marine nature-based recreational activities found in the UK (or similar locations) is a limitation in understanding what impacts the designation of the dSACs will have on recreational users. This in turn restricts the ability to identify socio-economic benefits from increased recreation activity as a result of designation and management of these proposed sites.

It should also be noted that any socio-economic benefits associated with recreation and tourism will occur in coastal, often remote communities. These communities may be the same as those where many of the costs identified in Section 3.2 occur.

Finally, some of the site management measures include potential restrictions on recreational activities. This could create opposing impacts of value - while protection would enhance the recreational experience, it could also potentially decrease access to the enhanced environment. In reality, the extent of the potential restrictions on recreation are considered modest, such that they would not significantly compromise the opportunities for recreation and tourism within the sites. Therefore, this conflict is not analysed further.

3.5.4 Total Economic Value

There are a small number of studies that provide evidence on the non-use value of marine designations. None provide evidence that is directly relevant to conserving harbour porpoise in the locations of the proposed dSACs. Nevertheless they indicate that people in the UK do hold a positive non-use value for conserving the marine environment. This evidence is generally at a UK or regional scale, so is not relevant to individual sites, and is discussed in detail in Section 5.4. In addition, the existence of UK based cetacean NGOs demonstrates the importance that people attach to cetacean conservation.

The exception to this is the contingent valuation results in Kenter *et al* (2013) which identified the following evidence relevant to the recreational value of the proposed sites:

- For the Southern Sea of Hebrides dSAC (which has similarities boundary to the Eye Peninsula to Butt of Lewis site in the study), it estimated an total economic value associated with designation of between £0.7m and £1.3m for divers and £4.0m – 8.6m

for anglers, giving a total of £4.7m – £9.9m, depending on the level of protection of the site.

- West Wales Marine / Gorllewin Cymru Forol dSAC (which has a similar boundary to the Cardigan Bay site in the study), gives an estimated total economic value associated with designation of between £6.8m - £14.5m for anglers, and £1.2 – £2.3 for divers, giving a total of £8m - £16.8m.
- Lastly, Outer Moray Firth dSAC (which has a similar boundary to the Southern Trench site in the study), gives an estimate of £6.3m - £13.4m for anglers, and £1.2 - £2.3 for divers, with an overall total of £7.5 - £15.7m.

The values in Table 38 illustrate the significant non-use values for designation of the areas of the proposed dSACs as protected areas. The figures illustrate a range of non-use values across the three sites. What proportion of these values for protection of the sites will be realised through the SAC designations is not clear, but is undoubtedly a subset of the values identified in the Kenter *et al* (2013) study.

As discussed for recreational services, in interpreting this evidence it is necessary to consider the existing designations for other biodiversity features at many of the sites. These designations will also, to some extent, protect the feature (harbour porpoise) which are the subject of these designations. Therefore, the additional benefit from these designations relates to the extent that they increase the protection of the all the biodiversity and other features and characteristics (not just those they are designated for). This additionality is very difficult to determine and cannot be estimated in a way that allows quantified adjustment of the valuation data. However, the protection from the proposed designations are assumed to be ecologically significant at most of the sites, if only because they provide powers to prevent future deterioration of the sites. Therefore, it is concluded that the values of designating the sites at least equates to a significant minority of the overall value of the locations in question, suggesting their value is of an order of magnitude of £millions.

Table 38. Total one-off values (£m) for designation of proposed dSACs and dSPAs Identified in Kenter *et al* (2013)

Site (With Similarity to Kenter *et al*. 2013 Sites)	Anglers		Divers		Total	
	Lower	Upper	Lower	Upper	Lower	Upper
Southern Sea of Hebrides dSAC (Eye Peninsula to Butt of Lewis)	4.0	8.6	0.7	1.3	4.7	9.9
West Wales Marine / Gorllewin Cymru Forol dSAC (Cardigan Bay)	6.8	14.5	1.2	2.3	8	16.8
Outer Moray Firth dSAC (Southern Trench)	6.3	13.4	1.2	2.3	7.5	15.7
Total					**20.2**	**42.4**

3.5.5 Summary

It is reasonable to conclude that the proposed SACs will have a significant and positive recreational and non-use benefit to people in the UK. However, the available evidence does not allow a monetary value for this benefit to be estimated.

4. Site Assessments - dSPAs

4.1 Introduction

This section summarises the estimated costs and benefits associated with the designation of each of the three dSPAs including:

- Costs to activities;
- Public sector costs;
- Social impacts; and
- Benefits.

Details of the costs and benefits for individual sites are presented in the site assessment reports (Appendix G).

4.2 Costs to Activities

Quantified cost estimates are presented in a series of tables for each sector that has been identified as potentially incurring significant costs as a result of one or more of site designation proposals. These tables only include those dSPAs for which quantified cost impacts have been identified.

The costs have been estimated on a conservative basis. Costs estimates are provided for the 'lower' , 'intermediate' and 'upper' scenarios. The intermediate scenario is considered to be the most likely scenario for management, with the lower scenario illustrating the most minimal impact (no additional regulation or management) and the upper scenario entailing significant additional regulation or management measures.

It is possible that other sectors could incur minor costs associated with individual projects but generally such costs are considered unlikely to be significant.

4.2.1 Aggregates

The potential management measures that could be applied to the marine aggregate sector for each management scenario are presented in Table 39. The detailed assumptions that have been applied in developing cost estimates for the potential management measures are described in Appendix C.1.

There are currently no production licences, application or option areas within the vicinity of any of the dSPAs. Based on current activity, the impacts are assessed as £0. The potential for commercial aggregate supply to the construction industry from within any of the dSPAs is considered to be low. There could be potential for the supply of marine aggregate for beach nourishment, for example from within the North Cardigan Bay dSPA, but the nature and timing of any requirement is highly uncertain.

Table 39. Potential management measures for the marine aggregate sector

Management Measure	Scenario		
	Lower	Intermediate	Upper
Habitats Regulations Assessment of marine licence applications within site boundaries	✓	✓	✓
Review of consents for existing marine aggregate licences within site boundaries	✔	✔	✔
Refusal of consent for new marine licence applications within site boundaries			✓

4.2.2 Commercial Fisheries

The potential management measures that could be applied to the commercial fisheries sector for each management scenario are presented in Table 40. The reduction in effort for mobile bottom gear and pelagic gear under the upper scenario applies to all sites except Anglesey Terns dSPA, which has no anticipated change to current management measures across all scenarios. The 100% reduction in nets, pots and traps in the Puffin Box between May and August applies to the Skomer, Skokholm and the Seas off Pembrokeshire dSPA under the upper scenario. The 5% reduction in static gear effort under the intermediate scenario and the 10% reduction in nets, pots and traps under the upper scenario apply to Northern Cardigan Bay dSPA. The detailed assumptions that have been applied in developing cost estimates for the potential management measures are described in Appendix C.2.

It should be noted that the potential reductions in fishing effort that could be required within the dSPAs to support achievement of site conservation objectives under the upper scenarios are indicative. Should such measures prove necessary, it is likely that they would be targeted towards specific locations and activities rather than a general blanket reduction in fishing effort. It is recognised that the upper scenario is considered very unlikely to occur.

Table 40. Potential management measures for the commercial fisheries sector

Management Measure	Scenario		
	Lower	Intermediate	Upper
10% reduction in mobile bottom gear effort across the site (likely to be focussed seasonally) (GVA impact).			✓
10% reduction in pelagic gear effort across the site (likely to be focussed seasonally) (GVA impact).			✓
100% reduction in nets gear and pots & traps gear effort in 'Puffin box' (immediately west of Skomer Island) between 1 May and 31 August (GVA impact).			✓
5% reduction in static gear effort across the site (GVA impact).		✓	
10% reduction in nets gear and pots & traps gear effort across the site (GVA impact).			✓

The proposed management measures have all been assessed in terms of potential impacts on GVA. These cost impacts are summarised in Table 41. The equivalent figures expressed in terms of potential impacts on landings are presented in Table 42.

The potential impacts are mainly attributable to Northern Cardigan Bay dSPA. There are no impacts anticipated for Anglesey Terns dSPA. Potential impacts of the Northern Cardigan Bay dSPA are predominantly on over-10m and under-10m dredgers, and under-10m pots and traps. Potential impacts of the Skomer, Skokholm and the Seas off Pembrokeshire dSPA are predominantly on pots and traps (both under-10m and over-10m vessels), and also over-10m beam trawlers and demersal trawlers.

Table 41. Present Value reduction in GVA in £ millions for quantified cost impacts to commercial fisheries (direct effect and the combined direct and indirect effect) (discounted over assessment period, 2015 prices)

Site Name	Quantified GVA Impact Over Assessment Period (Present Value of Total Costs, £m)					
	Lower		Intermediate		Upper	
	Direct	Direct & Indirect	Direct	Direct & Indirect	Direct	Direct & Indirect
Anglesey Terns	0	0	0	0	0	0
Northern Cardigan Bay	0	0	0.095	0.133	0.443	0.621
Skomer, Skokholm and the Seas off Pembrokeshire	0	0	0	0	0.157	0.219
Total	**0**	**0**	**0.095**	**0.133**	**0.600**	**0.840**

Table 42. Average annual loss in value of landings, assuming zero displacement of fishing activity, in £ thousands for quantified cost impacts to commercial fisheries (2015 prices)

Site Name	Quantified Impact (Annual Average Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Anglesey Terns	-	-	-
Northern Cardigan Bay	-	13	63
Skomer, Skokholm and the Seas off Pembrokeshire	-	-	24
Total	**-**	**13**	**87**

Potential direct and indirect impacts on employment for the commercial fisheries sector are summarised in Table 43. These impacts arise as a result of the reduced landings and thus reduced GVA discussed above, which may have knock-on effects on employment in the catching sector (direct) and the upstream supply chain (indirect).

Table 43. Average annual employment impact (direct and indirect) in numbers of full-time equivalents related to commercial fisheries

Site Name	Estimated Employment Impact (Number of jobs)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Anglesey Terns	0	0	0
Northern Cardigan Bay	0	0.2	1.0
Skomer, Skokholm and the Seas off Pembrokeshire	0	0	0.4
Total	**0**	**0.2**	**1.4**

4.2.3 Offshore Renewables

NRW has identified a potential requirement for management measures for the following renewable energy sub-sectors: offshore wind, tidal stream and tidal range. The potential management measures that could be applied to these sub-sectors for each management scenario are presented in Table 44. The detailed assumptions that have been applied in developing cost estimates for the potential management measures are described in Appendix C.3.

There are no existing or planned offshore wind farms or planned tidal range developments in the vicinity of any of the dSPAs. The assessment has therefore focused on tidal stream developments.

Table 44. Potential management measures for the offshore wind, tidal stream and tidal range sub-sectors

Management Measure	Scenario		
	Lower	Intermediate	Upper
Habitats Regulations Assessment (HRA) of new development within or near site boundaries	✓	✓	✓
Review of consents for existing offshore renewables developments within or near site boundaries	✓	✓	✓
Refusal of consent for new developments within or near site boundaries causing significant pressure on dSPA features			✓

The only planned tidal stream developments that overlap with or are within 5km of any dSPA are the Anglesey Skerries Tidal Array, the West Anglesey Demonstration Zone and the Holyhead Deep project all of which are either within or adjacent to the Anglesey Terns / Morwenoliaid Ynys Mon dSPA. NRW has indicated that it considers that HRA for these developments would already be triggered by an existing SPA (Ynys Feurig, Cemlyn Bay and The Skerries) and therefore no additional costs would be incurred by developers over and above those required to assess impacts in relation to the existing SPA.

There is one consented project - the Anglesey Skerries Tidal Array – located within the Anglesey Terns / Morwenoliaid Ynys Mon dSPA. As the proposed management measures and conclusion of low collision/disturbance risk for the project take into account impacts to the features for which the Anglesey Terns / Morwenoliaid Ynys Mon dSPA is proposed, it is assumed no additional measures would be required under the lower or intermediate scenarios and therefore it is assumed that no additional information would be required from the developer.

NRW advice for the Anglesey Skerries Tidal Array states that the development did not place terns (the features for which the Anglesey Terns / Morwenoliaid Ynys Mon dSPA is proposed) at risk of collision and the small-scale of the project did not cause concern about disturbance or non-direct effects (e.g. prey species). Any significant difference in project design envelope from that which was consented would require further consideration of the potential impacts. Under these circumstances, there might be a requirement for developers to provide additional information.

It should be noted that further offshore renewables development is likely to come forward for licensing during the period of the IA but the location and nature of such development is uncertain and therefore has not been included. This means that the cost estimate could be an underestimate of the costs likely to be incurred over the period of the IA.

4.2.4 Oil and Gas

The potential management measures that could be applied to the oil and gas sector for each management scenario are presented in Table 45. The detailed assumptions that have been applied in developing cost estimates for the potential management measures are described in Appendix C.4.

Table 45. Potential management measures for the oil and gas sector

Management Measure	Scenario		
	Lower	Intermediate	Upper
Habitats Regulations Assessment (HRA) of new development within or near site boundaries	✓	✓	✓
Review of consents for existing developments within or near site boundaries	✓	✓	✓
Refusal of consent for new developments within site boundaries			✓

There are no existing oil and gas licences and no current awards under the 26th, 27th or 28th oil and gas licensing rounds within or near any of the dSPAs. Awards for exploration and development may be made in the future, but it is not possible to estimate the number, nature or timing of such awards. Given the lack of historical oil and gas activity within the dSPAs, it is unlikely that significant levels of activity will occur in the future. Based on current information, the cost impact is therefore assessed as £0.

4.2.5 Ports and Harbours

The potential management measures that could be applied to the ports and harbours sector for each management scenario are presented in Table 46. The detailed assumptions that have been applied in developing cost estimates for the potential management measures are described in Appendix C.5.

Table 46. Potential management measures for the ports and harbours sector

Management Measure	Scenario		
	Lower	Intermediate	Upper
Habitats Regulations Assessment (HRA) of new development within or near site boundaries	✓	✓	✓
Review of consents for existing developments within or near site boundaries	✓	✓	✓
Refusal of consent for new developments within site boundaries			✓

Table 47 presents an estimate of potential impacts to the ports and harbours sector. The costs relate to requirements to provide information to support additional HRAs for port development or maintenance dredging licence renewals at locations where such information would not already be required for existing SPA or SAC designations. Seven minor ports and two dredge material disposal sites could be affected in relation to the Northern Cardigan Bay / Gogledd Bae Ceredigion and Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Benfro dSPAs.

The quantified cost impacts under all scenarios are very minor relative to sector turnover (p resent value over the assessment period (2015 – 2034) at 2015 prices) and are not considered significant. However, under the upper scenario, as a worst case, future port development could be prohibited, subject to the provisions of Article 6 of the Habitats Directive. The ports that could possibly be affected by such a measure include:

- Aberystwyth;
- Pensarn;
- Aberdyfi;
- Abersoch;
- Barmouth;
- Portmadoc; and
- Stackpole Quay.

To the extent that restrictions on port development constrained future trade, this could have impacts on GVA and employment. The cost impacts would be site specific and cannot be quantified.

Table 47. Potential quantified impacts to the ports and harbours sector

Site Name	Quantified Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Northern Cardigan Bay / Gogledd Bae Ceredigion	29	29	29
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Benfro	67	67	67
Total	**96**	**96**	**96**

4.2.6 Recreational Boating

The potential management measures that could be applied to the ports and harbours sector for each management scenario are presented in Table 48. The detailed assumptions that have been applied in developing cost estimates for the potential management measures are described in Appendix C.6.

Table 48. Potential management measures for recreational boating sector

Management Measure	Scenario		
	Lower	Intermediate	Upper
Prohibit use of motorised pleasure craft within 500m of known breeding sites for terms within Anglesey Terns / Morwenoliaid Ynys Mon dSPA between 1 May and 31 August			✓
Prohibit use of motorised pleasure craft within most sensitive areas of Northern Cardigan Bay / Gogledd Bae Ceredigion dSPA between 1 October and 31 March			✓
Prohibit use of motorised pleasure craft within the Puffin Box immediately west of Skomer within Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Benfro dSPA between 1 May and 31 August			✓

Potential quantified impacts to the recreational boating sector are summarised in Table 49. The only costs identified relate to effort required from the Welsh recreational boating sector to work with NRW to develop to develop an agreed zoning plan for the Northern Cardigan Bay / Gogledd Bae Ceredigion dSPA. For the other two dSPAs, the costs associated with disseminating information on the voluntary exclusion areas are considered to be negligible.

Should formal marking of the voluntary exclusion areas be required to increase compliance with the measures, it is likely that such costs would need to be funded by the public sector.

Table 49. Potential impacts to the recreational boating sector

Site Name	Quantified Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Northern Cardigan Bay / Gogledd Bae Ceredigion	0	0	1
Total	**0**	0	1

4.3 Impacts to the Public Sector

Estimated costs to the public sector are shown in Table 50 and Table 51. The largest public sector costs relate to ongoing monitoring requirements to assess the condition of features within sites once designated (around £0.3m under the intermediate scenario, (PV)) (Table 50). Other public sector costs associated with preparing Statutory Instruments to implement fisheries management measures, implementation of voluntary measures and regulatory and advisory costs are estimated to be relatively minor (less than £0.02m for intermediate scenario, PV).

Table 50. Potential impacts to the public sector by activity

Activity	Quantified Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Preparation of Marine Management Schemes	0	0	0
Preparation of Statutory Instruments	0	3	12
Development of voluntary measures	4	4	4
Site monitoring	272	272	272
Compliance and enforcement	0	0	0
Promotion of public understanding	0	0	0
Regulatory and advisory costs associated with licensing decisions and Review of Consents	10	10	10
Total	**285**	**289**	**298**

Table 51. Potential cost impacts to the public sector by site

Site Name	Quantified Cost Impact (Present Value of Total Costs, £'000)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
Anglesey Terns / Morwenoliaid Ynys Mon	0	0	0
Northern Cardigan Bay / Gogledd Bae Ceredigion	279	282	282
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Benfro	7	7	15
Total	**285**	**289**	**298**

4.4 Social Impacts

The analysis presented in Section 4.2 above has demonstrated that the dSPA proposals have the potential to generate economic costs (in terms of loss of GVA and employment) for the commercial fisheries sector primarily under the upper scenario, which is considered to be very unlikely. Under the intermediate scenario, there is a potential for a very small impact on GVA (PV) of around £0.13m., assuming zero displacement of fishing activity.

The impacts of the dSPAs on commercial fishing activity are expected to be very minor, with a risk of up to 1.5 FTE job losses, across the three sites under the upper scenario and a notional 0.2FTE under the intermediate scenario. Therefore, the potential for social impacts as a result of these designations is not considered significant, and is not analysed further.

4.5 Benefits

4.5.1 Benefits of Site Designations

The approach to assessing benefits is described in the methods in Section 2.3.3.4.

4.5.2 Ecosystem Services from SPAs

The assessment of ecosystem services impacts focuses on four services, is described in Section 2.3.3.4. The list of final ES that has been considered is provided in Table 6.

4.5.3 Values of Benefits from SPAs

4.5.3.1 Recreation and tourism

The marine environment provides a location for recreational activities and tourism, with many if not all activities inherently linked to the quality of the marine environment. Much 'marine' recreation activity evidence relates to beaches, and therefore is not always relevant to the expected impacts of site designation. Limited economic valuation evidence for marine recreation relevant to the proposed sites is available.

The features of the proposed sites could play a significant role in wildlife tourism in the UK. For example, nature-based tourism activity is a significant industry in Wales with a direct economic impact output of £1.43 billion per year, supporting 39,000 jobs (full-time equivalent) - nearly 40% of all tourism spending . This activity is discussed further in Appendix I.

The features of the SPAs considered for designation in this study are seabirds. The management measures for these features may also improve the general quality of the marine environment in a manner that enhances recreation and tourism:

Some seabirds (e.g. Red throated diver and feeding terns) can be relatively inconspicuous when feeding away from the coast, and therefore are less usually a subject for marine wildlife tourism. By contrast seabirds on the coast can be drivers of wildlife tourism visitor numbers and expenditure. Examples of wildlife tourism destinations relevant to the proposed sites include:

- South Stack RSPB nature reserve in Anglesey is a breeding area for over 4,000 seabirds (Dickie *et al*, 2006). In 2005, it is estimated that the reserve attracted about 36,000 visitors, with a visitor spend of approximately £405,000 (Dickie *et al*, 2006).
- Tourism brings around £330,000 per year to the Pembrokeshire seabird islands of Skomer and Skokholm, and total expenditure of around £60m in case study areas in the Pembrokeshire Coast National Park
- Marine angling is also inherently linked to the quality of the marine environment, directly through the availability of fish, and indirectly through the quality of the experience at locations where it is undertaken. Armstrong *et al*. (2013) estimated following their 2012 Sea Angling survey that there are approximately 884,000 sea anglers in England, and 76,000 from Wales. Direct spend on angling in 2012 was estimated to be £831 million (excluding imports and taxes).

The management measures at the dSPAs may enhance the attractiveness of their surrounding locations for tourism. It is also notable that all of the dSPAs are areas where there is a concentration of recreational boating (source: 'The UK Atlas of Recreational Boating (RYA, 2008) and data from the Royal Yachting Association (RYA)).

One study provides evidence on the economic value of the benefits of marine designations for recreation. Kenter *et al* (2013) looked at the value of proposed marine protected area designations through UK waters to divers and anglers. An increase in the quality, or avoidance of deterioration, of marine environments is connected to an increased value of the experience of recreational activities in the marine environment, such as walking on the coast or recreational boating. The value of marine protected areas in England, Wales, and Scotland for two groups of users – anglers and divers – are identified within this study. The suitability of the Kenter *et al* (2013) for value transfer to this analysis is considered moderate, as summarised in Table 52. This study's non-use value results are discussed in detail in Section 3.5.4.

Table 52. Comparison of Kenter *et al* (2013) study to the proposed designations to assess suitability for value transfer

Selection Criteria – Similarity Between Study and Policy Goods in Terms of:	Policy Good and Site (Proposed Designations)	Kenter *et al* (2013) Study	Comment
The good itself	Designation of marine protected areas, mostly for harbour porpoise, but some for seabirds	Designation of marine protected areas, generally for a broader range of features that under the policy good	Moderate to good fit, seabirds are just one of several features that may be present in the sites studied by Kenter *et a*, (2013).
The change	Designation of a further 3SPAs to add to existing network of UK marine sites.	Looked at designation of 25 sites in Scotland (MPAs), 119 English sites (rMCZs), and 7 Welsh sites (SACs).	Proposed designations are partly a subset and partly and extension of the change studied by Kenter *et al* (2013) – acceptable fit.

Selection Criteria – Similarity Between Study and Policy Goods in Terms of:	Policy Good and Site (Proposed Designations)	Kenter *et al* (2013) Study	Comment
The location	UK marine environment.	UK-wide study	Results are good fit.
The affected populations	Population of the UK marine wildlife tourists from overseas.	Divers and anglers in the UK	Reasonable fit, divers and anglers are a large subset (in terms of values) of beneficiaries.
The number and quality of substitutes	Existing designations in UK waters.	By looking at values across UK network of sites, implicitly considers substitutes.	By using numbers for a selection of the Scottish and Welsh sites considered by Kenter *et al* (2013), good fit.
The market constructs	Public policy delivering protected areas.	Public policy delivering protected areas.	Moderate fit, due to a more limited set of site features under the policy good that within Kenter *et al* (2013).
Study quality: moderate. There are concerns over the robustness of beneficiary numbers in Kenter *et al* (2013), but study has been reviewed and published. Overall comparison: In general the evidence from Kenter *et al* (2013) is a moderate fit for the proposed designations. It is used to indicate the scale of value of the activities at sites, but not to calculate values for the impacts of the designations.			

The study identified use values for these two user groups using the travel-cost valuation method. The total recreational values of sites are identified for these user groups for the sites under different management scenarios. The 'no restrictions' value identifies the total recreational value of the site, after designation. Note this value is safeguarded by designation, but is not the impact of designation *per se*. The difference between the 'no restrictions' scenario and the other scenarios with restrictions indicate the potential change in value as a result of stricter management measures at the sites.

This study is directly relevant to two of the SPAs (Skomer, Skokholm, and Seas of Pembrokeshire, and Northern Cardigan Bay) considered in the current round of designations. These are shown in Table 53. Their survey included variables on 'sea life' and 'vulnerable species protected' both of which are relevant to these sites.

Table 53. Recreational values of sites comparable to proposed SPAs identified in Kenter *et al* (2013)

Site (With Similarity to Kenter *et al*. 2013 sites)	Anglers		Divers		Total	
	Lower	Upper	Lower	Upper	Lower	Upper
Northern Cardigan Bay / Gogledd Bae Ceredigiond SPA (Pen Lyn ar Samau)	8.1	17.2	1.7	3.3	9.8	20.5
Skomer Skokholm and the Seas of Pembroke-shire/ Sgomer, Sgogwm a Moroedd Benfro dSPA (Pembroke-shire Marine)	8.3	17.5	1.7	3.3	10	20.8
Total					**18**	**37.6**

The values in Table 53 illustrate:

- The significant recreational value of sites, estimated at between approximately £4 – 43 million post designation per site, would be safeguarded by designation
- The increases in the value of recreational visits to the proposed protected areas of between approximately £2 and £4 million per site across the two sites as a result of designation and restrictive management measures.
- The higher values of sites with higher visitor numbers (e.g. Skomer Skokholm and the Seas of Pembroke-shire/ Sgomer, Sgogwm a Moroedd Benfro dSPA).

It must be noted that the proposed dSPAs of concern for this report are around a narrower set of features (seabirds) compared to those in the Kenter *et al.* 2013 study. Furthermore, all the values in Kenter *et al* (2013) are sensitive to the estimated numbers of anglers and divers. There is some evidence that these users may be overestimated (e.g. in Riddington *et al*, 2014).

In interpreting this evidence it is necessary to consider the existing designations for other biodiversity features at the sites. These designations will also, to some extent, protect the features which are the subject of existing or pending designations. Therefore, the additional recreational benefit from these designations relates to the extent that they increase the richness of all the biodiversity and other features and characteristics (not just those they are designated for). This additionality is very difficult to determine and cannot be quantified in a way that allows quantified adjustment of the valuation data.

As a result, the applying the figures is Table 53 directly to the dSPA designations is subject to considerable uncertainty, and quantification of the value of the proposed designations based on this data is not considered sound. The data suggests that the designated sites may have a recreational value to divers and anglers of at least £100,000's and possibly much higher at Skomer Skokholm and the Seas of Pembroke-shire/ Sgomer, Sgogwm a Moroedd Benfro dSPA due to the greater numbers of visitors.

It should be noted that there are social benefits associated with these recreational and tourism activities, and therefore the proposed designation and management of sites could improve social welfare through access to a healthier marine environment. This impact is also noted within the social analysis, and therefore care is needed not to double-count its effects in this analysis.

The lack of published valuation studies showing the effects of conserving seabirds on the level of marine nature-based recreational activities found in the UK (or similar locations) is a limitation in understanding what impacts designation of the dSPAs might have on recreational users. This, in turn, restricts the ability to identify socio-economic benefits from increased recreation activity as a result of designation and management of these proposed sites.

It should also be noted that any socio-economic benefits associated with recreation and tourism will occur in coastal, often remote communities. These communities may be the same as those where the costs identified in Section 4.2 occur.

Finally, some of the site management measures include potential restrictions on recreational activities. This could create opposing impacts of value - while protection would enhance the recreational experience, it could also potentially decrease access to the enhanced environment. In reality, the extent of the potential restrictions on recreation are considered negligible, such that they would not significantly compromise the opportunities for recreation and tourism within the sites. Therefore, this conflict is not analysed further.

4.5.4 Total Economic Value

There are a small number of studies that provide evidence on the non-use value of marine designations. Nevertheless they indicate that people in the UK do hold a positive non-use value for conserving the marine environment. This evidence is generally at a UK or regional scale, so is not relevant to individual sites, and is discussed in detail in Section 5.4.

The exception to this is the contingent valuation results in Kenter *et al* (2013) which provide evidence that directly relevant to conserving seabirds in the locations of the proposed SPAs. The study identified the following evidence relevant to the recreational value of the proposed sites:

- The Skomer, Skokholm and Pembrokeshire Seas/ Sgomer, Sgogwm a Moroedd Benfro dSPA has similarities to the Pembrokeshire Marine site in Kenter *et al*, 2013 which has an estimated a total economic value associated with designation of between £1.7m and £3.3m for divers and £8.3m – 17.5m for anglers, giving a total of £10m – 20.8m, depending on the level of protection of the site.
- The Northern Cardigan Bay / Gogledd Bae Ceredigion dSPA has similarities to the Pen Lyn ar Samau SAC, which has values of £8.1m - £17.2m for anglers, and £1.7 – £3.3 for divers, giving a total of £9.8m - £20.5m.

The values in Table 54 illustrate the significant non-use values for designation of the proposed SPAs. Across the sites, a significant non-use value for divers and anglers of approx. £20 – 41m is identified.

Table 54. Total one-off values (£m) for designation of proposed MPAs Identified in Kenter *et al* 2013

Site (Similar to 'Areas of Search')	Anglers		Divers		Total	
	Lower	Upper	Lower	Upper	Lower	Upper
Northern Cardigan Bay / Gogledd Bae Ceredigion dSPA	8.1	17.2	1.7	3.3	9.8	20.5
Skomer, Skokholm, and Seas of Pembrokeshire/ Sgomer, Sgogwm a Moroedd Benfro dSPA	8.3	17.5	1.7	3.3	10	20.8
Total					**19.8**	**41.3**

For Wales the average one-off non-use valuation identified per site by Kenter *et al,* 2013 was £9.4-18.4 million. It is uncertain the extent to which such a value applies to sites like the SPAs considered here. On the one hand, The Pembrokeshire Islands are an iconic site that could mean they have a higher value than this average. On the other hand the expectation of diminishing returns for designating these SPAs on top of the suite of other protected areas, mean they could have lower value than this average.

As discussed for recreational services, in interpreting this evidence it is necessary to consider the existing designations for other biodiversity features at many of the sites. These designations will also, to some extent, protect the features which are the subject of the current round of designations. Therefore, the additional benefit from these designations relates to the extent that they increase the protection of all the biodiversity and other features and characteristics (not just those they are designated for). This additionality is very difficult to determine and cannot be quantified in a way that allows quantified adjustment of the valuation data. However, the protection from the proposed designations are assumed to be significant at most of the sites, and therefore at least equating to a significant minority of the overall value of the locations in question.

Therefore, it is concluded that conserving each of the proposed SPAs, including the remote sites, are likely to have a significant positive non-use value of a few £millions, per site, on average.

4.5.5 Summary

It is reasonable to conclude that the proposed SPAs will have a significant and positive recreational and non-use benefit to people in the UK. However, the available evidence does not allow a monetary value for this benefit to be estimated.

5. Combined Assessments

5.1 Marine Activities

5.1.1 Combined Impacts by Site and Activity

Tables 55 and 56 present information for impacts on operational costs by site and activity.

The total quantified impact on operational costs for the new dSACs (PV) are estimated to range between £2.7m (lower scenario), £6m (intermediate scenario) and £7m in the upper scenario. The total quantified impacts to operational costs for the dSPAs (PV) are estimated to be around £100k for all scenarios.

The impacts on operating costs for dSACs are variable between sites and activities, reflecting the different activities that occur within each site and the differing requirements for management measures (Tables 55 and 56). The sectors potentially experiencing greatest impacts on operational costs are oil and gas, offshore wind, commercial fisheries and finfish aquaculture.

Table 55. Present value (PV) in £'000 for quantified impacts to operating costs for activities by site (costs discounted over assessment period (2015 – 2034), 2015 prices)

Site Name	Scenarios		
	Lower Estimate	Intermediate Estimate	Upper Estimate
dSACs			
Southern North Sea	1,152	2,884	2,529
Outer Moray Firth	269	316	185
North Minch	76	174	601
Southern Sea of Hebrides	174	632	2,663
North Channel and Outer Solway	143	354	133
North Anglesey Marine / Gogledd Môn Forol	130	161	21
West Wales Marine / Gorllewin Cymru Forol	124	155	42
Bristol Channel Approaches / Dynesfeydd Môr Hafren	31	577	75
Costs assessed at national level: ▪ Aggregates ▪ Military activities ▪ Offshore renewables ▪ Oil and gas	 10 0 567 19	 10 182 567 19	 10 182 569 19
Total dSACs	**2,698**	**6,031**	**7,026**
dSPAs			
Anglesey Terns / Morwenoliaid Ynys Mon	0	0	0
Northern Cardigan Bay / Gogledd Bae Ceredigion	29	29	30
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Benfro	67	67	67
Total SPAs	**96**	**96**	**97**

Table 56. Present value (PV) in £'000 for quantified impacts to operating costs to human activities for the proposed dSACs and dSPAs by sector (costs discounted over assessment period (2015 – 2034) at 2015 prices)

Site Name	Scenarios		
	Lower Estimate	Intermediate Estimate	Upper Estimate
dSACs			
Aggregates	106	142	142
Aquaculture – finfish	229	780	3,243
Commercial fisheries	0	861	0
Military activities	0	182	182
Offshore renewables – offshore wind	1,313	1,383	1,030
Offshore renewables- tidal stream	231	441	0
Oil & Gas	505	1,928	1,928
Ports and harbours	314	314	501
Total dSACs	**2,698**	**6,031**	**7,026**
dSPAs			
Aggregates	0	0	0
Commercial fisheries	0	0	0
Offshore renewables	0	0	0
Oil & Gas	0	0	0
Ports and harbours	96	96	96
Recreational boating	0	0	1
Total SPAs	**96**	**96**	**97**

Table 57 presents direct and indirect impacts on GVA for commercial fisheries and Table 58 presents total (direct, indirect and induced) impacts on GVA for offshore renewables (offshore wind and tidal stream).

Potential impacts to GVA may occur for commercial fisheries where effort (and by assumption, landings) is restricted in relation to the designation of both dSACs and dSPAs. For the dSACs, estimated impacts to direct GVA for the sector are only incurred under the upper scenario (i.e. if the sites were to be treated as highly protected areas), and are £29 million (PV). The sites most affected are Southern North Sea and Bristol Channel Approaches / Dynesfeydd Môr Hafren dSACs, although West Wales Marine / Gorllewin Cymru Forol and North Channel and Outer Solway also have direct impacts on GVA of over £3 million over the assessment period. When direct and indirect impacts on GVA are considered, the total for all dSAC sites is £41 million.

For the dSPAs, estimated impacts to direct GVA for the commercial fisheries sector range from £0.1 million under the intermediate scenario to £0.6 million under the upper scenario, mainly attributable to Northern Cardigan Bay dSPA. The direct and indirect impacts on GVA are estimated at £0.1 million for the intermediate scenario and £0.8 million for the upper scenario.

Potential impacts to GVA may occur for the offshore renewables sector in relation to the designation of both dSACs but only under the upper scenario, which is considered very unlikely to occur. The estimated impacts to total GVA (PV) under this upper scenario would potentially be very large, around £2.9 billion (Table 58). The majority of these costs impacts would fall on the offshore wind sub-sector, potentially affecting planned development in or near the Southern North Sea dSAC and Outer Moray Firth dSAC. There is very considerable uncertainty surrounding the scale of these potential costs. Some planned tidal development in the North Channel and Outer Solway, North Anglesey Marine / Gogledd Môn Forol and West Wales Marine / Gorllewin Cymru Forol dSACs could also be affected under the upper scenario.

Table 57. Impacts on GVA in £m for quantified impacts to commercial fisheries (Direct GVA and Direct and Indirect GVA) (costs discounted over assessment period (2015 – 2034), 2015 prices)

Site Name	Quantified GVA Impact over Assessment Period (Present Value of Total Costs, £m)					
	Lower		Intermediate		Upper	
	Direct	Direct & Indirect	Direct	Direct & Indirect	Direct	Direct & Indirect
dSACs						
Southern North Sea	0	0	0	0	8.956	12.538
Outer Moray Firth	0	0	0	0	2.460	3.444
North Minch	0	0	0	0	1.390	1.946
Southern Sea Of Hebrides	0	0	0	0	2.630	3.682
North Channel And Outer Solway	0	0	0	0	3.022	4.230
North Anglesey Marine / Gogledd Môn Forol	0	0	0	0	1.848	2.587
West Wales Marine / Gorllewin Cymru Forol	0	0	0	0	3.426	4.797
Bristol Channel Approaches / Dynesfeydd Môr Hafren	0	0	0	0	5.693	7.970
Total dSACs	**0**	**0**	**0**	**0**	**29.424**	**41.194**
dSPAs						
Anglesey Terns	0	0	0	0	0	0
Northern Cardigan Bay	0	0	0.095	0.133	0.443	0.621
Skomer, Skokholm and the Seas off Pembrokeshire	0	0	0	0	0.157	0.219
Total dSPAs	**0**	**0**	**0.095**	**0.133**	**0.600**	**0.840**
Total	**0**	**0**	**0.095**	**0.133**	**30.024**	**42.033**

It is noted that should the upper scenario impacts on the offshore renewables sector occur, this could also have consequential impacts on the ports sector as ports form an important part of offshore renewables supply chains.

Table 58. Impacts on GVA in £m for quantified impacts to offshore renewables (Direct, Indirect and Induced GVA) (costs discounted over assessment period (2015 – 2034), 2015 prices)

Site Name	Quantified GVA Impact over Assessment Period (Present Value of Total Costs, £m)		
	Lower Estimate	Intermediate Estimate	Upper Estimate
dSACs			
Southern North Sea	0	0	1,924
Outer Moray Firth	0	0	854
North Minch	0	0	0
Southern Sea of Hebrides	0	0	0
North Channel and Outer Solway	0	0	46
North Anglesey Marine / Gogledd Môn Forol	0	0	32
West Wales Marine / Gorllewin Cymru Forol	0	0	19
Bristol Channel Approaches / Dynesfeydd Môr Hafren	0	0	0
Total dSACs	**0**	**0**	**2,875**
dSPAs			
Anglesey Terns / Morwenoliaid Ynys Mon	0	0	0
Northern Cardigan Bay / Gogledd Bae Ceredigion	0	0	0
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Benfro	0	0	0
Total SPAs	**0**	**0**	**0**

5.1.2 Significance of Combined Impacts on Marine Activities and Regions

This section considers the significance of economic impacts to marine activities and geographic areas taking account of the relative scale of the impacts both on their own and in combination with other marine nature conservation designation initiatives, including:

- Possible management measures for Marine Conservation Zones in English territorial waters and English, Welsh and Northern Ireland offshore waters (Defra, 2012):
  - Possible fisheries management measures for European Marine Sites (Defra, 2013);
  - Proposed management measures associated with the designation of 30 Nature Conservation MPAs in Scotland in 2014 (Marine Scotland, 2013a).
- Proposed management measures for inshore Special Areas of Conservation (Marine Scotland, 2014a):
  - Proposed management measures for four additional proposed Scottish MPAs and 14 dSPAs in Scottish Waters (Marine Scotland, 2015a).

For marine aggregates, military activities and oil and gas, the potential cost impacts associated with the designation of dSACs and dSPAs are relatively minor when compared to annual turnover and thus are unlikely to be significant in their own right or in combination with other initiatives. For military activities, it is noted that there are several other parallel MPA designation initiatives which have identified similar requirements for MoD to update its environmental procedures to take account of designations. It is likely that there is an element of double counting of these costs across MPA IAs, particularly if the requirements can be co-ordinated within MoD.

Aquaculture (finfish), commercial fisheries, offshore renewables (offshore wind and tidal stream) and ports and harbours may experience more significant impacts under the intermediate and/or upper scenarios as a result of designation of the dSACs and the cumulative impacts on these sectors and on geographic areas have therefore been considered in more detail.

5.1.2.1 Aquaculture - Finfish

The potential impact on operating costs for the sector associated with the designation of the dSACs is estimated to be £780k (Intermediate scenario, PV) mostly associated with potential measures to limit underwater noise. These costs are expected to fall on finfish aquaculture businesses operating with the Southern Sea of Hebrides and North Minch dSACs.

None of the proposed management measures for Scottish inshore Special Areas of Conservation are expected to affect the finfish aquaculture sector (Marine Scotland, 2014a). The designation of 30 Scottish Nature Conservation MPAs was estimated to result in a total cost of around £0.6m on the finfish aquaculture sector (Intermediate scenario, PV) mostly associated with additional costs of assessment and monitoring for developments within or adjacent to inshore MPAs (Marine Scotland, 2013a). These costs were spread across all MPAs which overlapped with finfish aquaculture installations, particularly Fetlar to Haroldswick and Loch Sunart to the Sound of Jura where there are existing concentrations of finfish farms.

The potential cost impacts on the sector associated with the designation of an additional four MPAs and 14 dSPAs was estimated to be £0.38m (Intermediate scenario, PV) again mostly associated with additional costs of assessment and monitoring for developments within or adjacent to new MPAs or dSPAs (Marine Scotland, 2015a). Around £170k (Intermediate scenario, PV) related to potential cost impacts in the Sea of Hebrides and North East Lewis dMPAs which overlap with the Southern Sea of Hebrides and North Minch dSACs.

There is potential for a combined impact between the 30 existing Scottish Nature Conservation MPAs, the 4 new Scottish Nature Conservation MPAs and the designation of the Southern Sea of Hebrides and North Minch dSACs. Finfish aquaculture generated an estimated annual turnover of approximately £550m in 2012 (SSPO, 2014) and in 2013 employed over 1200 FTE staff (Marine Scotland Science, 2014) primarily in rural and island locations. The scale of the impact relative to the industry as a whole is therefore relatively small. However, the relative impact on finfish aquaculture installation operators within the Southern Sea of Hebrides and North Minch dSACs will be greater. The finfish aquaculture sector competes in a global market and the combined cost impacts therefore have the potential to affect the competitiveness of individual finfish farms operating within the two dSACs. Such risks could be minimised by ensuring that adoption of mitigation measures is linked to industry investment cycles in a phased manner.

5.1.2.2 Commercial fisheries

The potential direct GVA impact on the sector associated with the designation of the dSACs is estimated to be between £0–29.4 million (lower to upper scenario, PV) mostly associated with reduction in effort for mobile demersal and pelagic gears (59% of present value of direct and

indirect GVA impact, mainly demersal trawls and dredges), and with closure of sites to netting activities under the upper scenario to reduce harbour porpoise bycatch (41% of present value of direct GVA impact). These costs are expected to derive mainly from the Southern North Sea and Bristol Channel Approaches / Dynesfeydd Môr Hafren dSACs, but at least 10% of the total value of landings affected also originate from North Channel and Outer Solway, West Wales Marine / Gorllewin Cymru Forol, Southern Sea of Hebrides and Outer Moray Firth dSACs.

The potential cost impacts associated with the designation of the dSPAs is between £0.1–0.6 million (intermediate and upper scenarios, PV), mostly associated with reductions in dredging and under-10m pots and traps in Northern Cardigan Bay / Gogledd Bae Ceredigion dSPA.

The MCZ IA (Defra, 2012) estimated the costs to the commercial fisheries sector associated with the designation and management of a first tranche of 31 MCZs to be around £0.45 m/yr in terms of UK vessel landings and £0.21m/yr in terms of UK GVA (0.07% of total UK vessels GVA in 2010). Over the 20-year timeframe of the MCZ IA, the best estimate of present value for value of landings and GVA affected was £6.4m and £3m respectively. The IA for the second tranche MCZ (Defra, 2014) estimated the costs to the commercial fisheries sector associated with the designation and management of a further 23 MCZ to be around £0.035m p.a.

Designated MCZs only overlap with the Bristol Channel Approaches / Dynesfeydd Môr Hafren dSAC (Padstow Bay and Surrounds MCZ and Lundy SAC and MCZ). Recommended MCZs under Tranche 2 overlap with Bristol Channel Approaches / Dynesfeydd Môr Hafren dSAC, North Channel and Outer Solway dSAC, North Anglesey Marine / Gogledd Môn Forol dSAC, West Wales Marine / Gorllewin Cymru Forol dSAC and Southern North Sea dSAC. The management measures for these (r)MCZs are not yet clear. The MCZ and rMCZ areas are small relative to the size of most of the dSACs therefore there are unlikely to be any significant combined cost impacts on the commercial fisheries sector, and likewise, the potential for measures under the (r)MCZs to offset requirements for measures in the dSACs is likely to be small. The exception is North Anglesey Marine / Gogledd Môn Forol dSAC, where there is a significant overlap with the North St George's Channel rMCZ. In this site there is the potential for significant combined cost impacts on the commercial fisheries sector, but additionally potential management measures for each site should be considered in relation to their contribution for achieving conservation objectives in the other site.

The implementation of the Government's revised approach to fisheries management in European Marine Sites (EMS) in England aims to ensure that all existing and potential commercial fishing activities are carried out in accordance with Article 6 of the European Union (EU) Habitats Directive 92/43/EEC and that the management of sites in UK offshore waters is undertaken in accordance with European Commission guidance. This is likely to result in management measures and restrictions of activity for commercial fisheries. The Welsh Government may implement a similar process in EMS in Welsh waters, but this has not yet been confirmed. No impact assessment is available to assess the potential impacts of such management measures on fisheries. EMS in English waters only overlap with the Southern North Sea dSAC. There are significant overlaps here, with Dogger Bank SAC, North Norfolk Sandbanks and Saturn Reef SAC, Haisborough, Hammond and Winterton SAC and Outer Thames Estuary SPA (and a smaller overlap with Margate and Longsands SAC). These have

the potential to cause significant combined impacts on the commercial fisheries sector, particularly in relation to mobile demersal gear in SACs, and nets in SPAs. The management measures adopted for the SACs and SPAs should be considered in relation to their contribution towards achievement of the conservation objectives for the Southern North Sea dSAC, as there may be complementarities.

In Welsh waters, there are overlaps between West Wales Marine dSAC with Cardigan Bay SAC, Pembrokeshire Marine SAC, Lleyn Peninsula and the Sarnau SAC, Aberdaron Coast and Bardsey Island SPA, Ramsey and St David's Peninsula Coast SPA, Grassholm SPA and Skokholm and Skomer SPA, and with Northern Cardigan Bay and Skomer, Skokholm and the Seas off Pembrokeshire dSPAs (this project). Potential fisheries management measures are not known for these sites, but overlaps are significant and there could be potentially significant combined impacts on the commercial fisheries sector.

The IA for the designation of 30 MPAs in Scottish Waters estimated the impact on direct GVA for the sector to be £36.5 million (Marine Scotland, 2013a). The potential direct GVA impact on the sector associated with the designation of the four new pMPAs and 14 dSPAs was estimated to be £6.4 million (intermediate scenario, PV), associated with the reduction in landings as a result of proposed management measures for each site, and £9.0 million in direct and indirect GVA combined.

North Minch dSAC overlaps with North-East Lewis pMPA, Shiant East Bank pMPA and Wester Ross MPA. These overlaps are significant and could result in significant combined impacts on the sector, particularly for mobile demersal gears. The Southern Sea of Hebrides dSAC has significant overlaps with the Loch Sunary to the Sound of Jura MPA and the Sea of the Hebrides pMPA, and a small amount with the Loch Sween MPA. These overlaps could result in significant combined impacts on the sector, for pelagic gear, mobile demersal gear, and static gear. The Outer Moray Firth dSAC overlaps significantly with the Southern Trench pMPA, for which management measures considered mobile demersal and pelagic gears. There is the potential for significant combined impacts on the commercial fisheries sector. Conversely, the implementation of measures in these existing and proposed sites should be considered in relation to their potential contribution to the conservation objectives of the dSACs. There are no overlaps between the North Channel and Outer Solway dSAC with MPAs, pMPAs or dSPAs in Scottish waters.

Planned and possible future development of offshore renewables in Scottish waters has the potential to affect the distribution of fishing activity and the value of fish landings and GVA of the commercial fisheries sector in the future, by restricting fishing activity in the vicinity of offshore installations. The assessment of potential socio-economic costs estimated possible reductions in landings values of between £3.6m to £19.3m (present costs discounted over the assessment period (2014 to 2035), 2012 prices) (Marine Scotland, 2013b). However, the future development of proposed projects, and therefore the potential for combined impacts, is uncertain.

5.1.2.3 Offshore renewables - Offshore wind

The potential impact on operating costs for the sector associated with the designation of the dSACs is estimated to be around £1.4m (Intermediate scenario, PV). These costs would be

expected to fall on planned offshore windfarm projects within or near the Southern North Sea and Outer Moray Firth dSACs.

The MCZ IA (Defra, 2012) estimated the costs to the offshore renewables sector associated with the designation and management of a first tranche of 31 MCZ to be around £0.09m p.a. The IA for the second tranche MCZ (Defra, 2014) estimated the costs to the offshore renewables sector associated with the designation and management of a further 23 MCZ to be around £0.07m p.a. None of the 30 designated Scottish Nature Conservation MPAs or the proposed 4 additional Scottish MPA and 14 dSPAs are anticipated to give rise to cost impacts to offshore renewables developments in or around the Moray Firth (Marine Scotland, 2013a; 2015). On this basis, the combined impact of all recent and planned designations on the offshore wind sector is unlikely to be materially different from the impact of designating the 8 dSACs on their own. The scale of the impacts are very small relative to anticipated expenditure by the sector, although it is recognised that the competitive CfD regime can make individual projects sensitive to even minor cost increases.

5.1.2.4 Offshore renewables - Tidal stream

The potential impact on operating costs for the sector associated with the designation of the dSACs is estimated to be around £441k (Intermediate scenario, PV) mostly associated with potential measures to manage collision risk. These costs would be expected to fall on planned tidal stream development projects within or near the North Channel and Outer Solway dSAC.

The MCZ IA (Defra, 2012) estimated the costs to the offshore renewables sector associated with the designation and management of a first tranche of 31 MCZ to be around £0.09m p.a. The IA for the second tranche MCZ (Defra, 2014) estimated the costs to the offshore renewables sector associated with the designation and management of a further 23 MCZ to be around £0.07m p.a.

None of the 30 designated Scottish Nature Conservation MPAs or the proposed 4 additional Scottish MPA and 14 dSPAs are anticipated to give rise to cost impacts to offshore renewables developments in or around the North Channel and Outer Solway dSAC (Marine Scotland, 2013a; 2015a). There are no other recent or planned designations that might affect tidal stream development in Welsh waters.

On this basis, the combined impact of all recent and planned designations on tidal stream sector is unlikely to be materially different from the impact of designating the 8 dSACs on their own.

5.1.2.5 Ports and harbours

The quantified impact on operating costs for the sector associated with the designation of the dSACs is estimated to be around £314k (Intermediate scenario, PV). However, it has not been possible to estimate cost impacts under the upper scenario, which in some circumstances could be larger.

The MCZ IA (Defra, 2012) estimated the costs to the ports and harbours sector associated with the designation and management of a first tranche of 31 MCZ to be around £0.18m p.a. The IA for the second tranche MCZ (Defra, 2014) estimated the costs to the ports and harbours sector associated with the designation and management of a further 23 MCZ to be around £0.123m p.a. These cost estimates relate to all relevant English ports and not just those that are relevant to the Southern North Sea dSAC.

None of the 30 designated Scottish Nature Conservation MPAs are anticipated to give rise to cost impacts to the ports and harbours sector in or around the Outer Moray Firth or North Channel and Outer Solway dSACs (Marine Scotland, 2013a). The IA for four proposed additional MPAs and 14 dSPAs in Scottish Waters identified potential cost impacts to the ports and harbours sector (intermediate scenario, PV) of around £250k for Southern Trench dMPA and £290k for Moray Firth dSPA (Marine Scotland, 2015a).

There is some potential for combined impacts to occur to the ports and harbours sector from management measures to support conservation objectives for relevant East coast of England MCZ, although most of the combined impact (if it arises) would be associated with the Southern North Sea dSAC designation. There is also potential for a combined impact to occur in relation to ports and harbours in and around the Outer Moray Firth dSAC associated with the Southern Trench dMPA and Moray Firth dSPA, although again, most of the combined impact (if it arises) would be associated with the dSAC designation. However, the scale of impacts relative to turnover in the sector is very small and not considered to be significant.

5.2 Public Sector

The estimate of public sector costs has primarily adopted a national approach. The estimated total costs presented in Tables 28 and 29 (Section 3.3) and Tables 50 and 51 (Sections 4.3) are considered to provide a reasonable representation of the total national costs likely to be incurred by the public sector.

The main costs under the lower and intermediate scenarios relate to public sector costs relate to ongoing monitoring requirements to assess the condition of features within sites once designated. Other public sector costs associated with preparing Statutory Instruments to implement fisheries management measures, compliance and enforcement activities, additional costs associated with geophysical surveys and regulatory and advisory costs are individually estimated to be relatively minor. Under the upper scenario, potentially much larger impacts could occur as a result of leasing income that would be foregone should some offshore renewables projects not proceed. However, this scenario is considered very unlikely.
The Scottish Nature Conservation MPA IA (Marine Scotland, 2013a) estimated total costs to the public sector of £25m (Intermediate scenario, PV), of which around 80% was associated with future monitoring costs of MPAs. The impact assessment for an additional four Scottish MPAs and 14 dSPAs estimated total public sector costs to be around £2m (PV), mostly related to potential site monitoring costs.

The IA for Tranche 1 MCZ (Defra, 2012) estimated the public sector costs associated with the designation and management of 31 MCZ (of which 27 were subsequently designated) to be around £2.4m p.a. (£1.6m p.a. for ecological surveys and £0.8m p.a. for management). The IA

for Tranche 2 MCZ (Defra, 2014) estimated the public sector costs associated with the designation and management of a further 23 MCZ to be around £1.9m p.a. (£1.17m p.a. for ecological surveys and £0.75m p.a. for management).

Additional public sector costs will arise in relation to further MCZ designations (Tranche 3) and any additional MCZ designations in Northern Ireland territorial waters or Welsh inshore or offshore waters. Further costs may also arise into any further SPA designations in UK waters.

Based on the most likely (intermediate) scenario, there will be a combined impact on public sector resources across all of the designation processes including:

- The costs of site ecological monitoring programmes to be borne by the SNCBs; and
- Regulatory and advisory costs associated with marine licensing of developments within or near MPAs.

5.3 Social Impacts

The analysis presented in Sections 3.2 and 4.2 above have demonstrated that for the dSACs, no significant social impacts are expected under the lower and intermediate scenarios. Under the upper scenario, the dSAC proposals have the potential to generate economic costs (in terms of loss of GVA and employment) on the commercial fisheries and energy generation sectors. No significant social impacts are expected in relation to the dSPA proposals under any of the scenarios.

For the commercial fisheries sector, all of the dSAC designations have the potential to affect economic activity under the upper scenario only. For the offshore renewables sector, offshore wind developments could potentially be affected at two dSACs – Southern North Sea and Outer Moray Firth. Tidal stream developments could be affected at three dSACs - North Channel and Outer Solway, North Anglesey Marine / Gogledd Môn Forol and West Wales Marine / Gorllewin Cymru Forol.

This section considers the combined social consequences (primary and secondary) that are likely to be generated by the potential impacts on these sectors and assesses the potential significance of these impacts. The distribution of economic impacts (e.g. across geographical locations and groups in society) is central in determining the significance level of social impacts. Analysis of the distribution of the potential economic (and hence social) impacts for the affected sectors has therefore been undertaken and is presented in full in Appendix H. In relation to the commercial fishing sector, reductions in the quantity of fish landed locally at UK landing ports could have impacts (economic and social) on the fish processing sector.

A social and distributional analysis for each relevant individual site proposal is presented in Tables 6a, b and c of the site assessment reports in Appendix G.

5.3.1 Commercial Fisheries

As the impacts on commercial fishing from the dSPAs are not considered significant enough to have social impacts, the combined impacts of the sites are largely as described for the dSACs

in Section 3.4. In addition there is a risk, under the upper scenario, of the combined primary impacts on income, employment and 'way of life', having additional social impacts as a result of their cumulative effects.

Such additional cumulative effects will arise where social groups and/or communities are affected by the impacts from more than one site. Data to assess the fishing ports where dSACs impacts will arise is not available, but this issue can be assessed qualitatively by considering the locations of the proposed sites.

The sites are spread widely across UK waters and therefore in general the risks of the combined effects of the sites being significantly different to their individual impacts are generally considered to be low. The exception to this is the a risk of impacts being concentrated in West Wales (e.g. Ports in Pembrokeshire) due to both the West Wales Marine and Bristol Channel Approaches sites. There is possibly a risk of cumulative impacts also arising in the Irish Sea and Western Scotland.

The risk of cumulative impacts from sites on social groups and/or communities could result in greater secondary adverse social impacts, not only for the individuals concerned, but also for their families and dependants, fishing communities, wider society and the public purse. The combined effect of sites could particularly have negative social impacts through outward migration from fishing communities, and by diminishing fishing grounds increasing competition and conflict with other fishing vessels and gear types. Where gear conflicts occur, resulting in fishers losing or damaging gear, this can affect costs and income which, in turn, can impact on employment and hence 'way of life'. Where the combined effects of sites increase displacement of fishing effort, this can also lead to changes in fishing practices - for example, fishing in more distant/lesser known areas, spending longer time at sea in vessels not designed for long trips, fishing in rougher weather – all of which can have adverse impacts on fishers' health (and that of their families) as fishers spend more time away from home and the changes compound families' fears about their safety.

The risks, under the upper scenario, of potential reductions in landings and employment that could arise as a result of proposed dSACs where fishing effort would be restricted under the proposed management measures for each site. The level of economic impacts at the sites range between 4 and 20 FTE jobs. For the sites where there is greatest risk of cumulative effects, the impacts are 8 jobs (West Wales Marine) and Bristol Channel Approaches (12 jobs). The risks of impacts, under the upper scenario, of the combined social impacts of these sites being significantly different to the impacts assessed for the sites individually in Section 3.4, is considered low. Therefore, it is not analysed further.

5.3.2 Offshore Renewables (Offshore Wind and Tidal Stream)

No social impacts are anticipated under the lower or intermediate scenarios as a result of impacts to the offshore renewables sector. However, potentially significant impacts could arise under the upper scenario, although this is considered very unlikely to occur. Table 59 identifies the social consequences likely to be associated with impacts to the offshore renewables sector under the upper scenario and the potential primary and secondary social impacts generated as

a result. If designation of the dSACs leads to cancellation of offshore renewables developments, there would be a number of consequences.

First, there would be a loss of investment into the sector which in turn would generate social costs in the form of a loss of potential future employment[23]. This is estimated to be a potential loss of 7,719 short-term jobs during construction and 1,106 long-term jobs associated with operation.

There are significant secondary social benefits associated with job creation as described in Section 3.4 and 4.4. These potential social benefits would be reduced or lost if a designation resulted in refusal of consent for a proposed windfarm or tidal stream development (either in part or whole). It is likely that the combined social costs from the cumulative impacts of the sites to be greater that the impacts identified for the sites individually.

Second, the increase in renewable energy capacity promised by the proposed developments would have supported the wider social benefits of improved energy security and reduced greenhouse gas emissions. Linked to this would be the provision of, and connection to, the electricity network which provides security of supply (Offshore Grid, 2011) and increased consumer choice for household energy. These potential combined wider social benefits reduced/forgone if proposed developments were restricted or refused across a number of the sites is likely to be greater than the impacts identified for the sites individually.

Third, refusal of consent could also generate positive social impacts by avoiding adverse socio-economic impacts on commercial fisheries, recreation and tourism sectors; these are largely associated with loss of traditional fishing grounds, the visibility of the developments from the shoreline and disturbance during construction. This impact is not expected to differ as a combined effect of the sites compared to the impacts identified to the individual sites.

The significance of the combined economic and social costs could be greater/smaller depending on the combined impacts in particular regions, local areas, communities, businesses and workers that would have benefitted from the development as currently proposed and hence who will be adversely affected if the projects are constrained or consent refused.

The distribution of economic impacts cannot be accurately assessed as that would depend on many factors that are not known, for example, the extent to which UK firms would be successful in securing contracts and the location of these firms.
In addition to the impacts of individual sites, the restriction of multiple developments as a result of designations could result in a loss of confidence from investors in the sector. This could mean a reduction in investment at other sites, and in the UK supply chain.

23 As noted previously, these figures represent the potential gross number of jobs that might be foregone. The actual number of jobs foregone would depend on the alternative means by which electricity generation might occur in the absence of development at the dSACs.

Table 59. Combined (UK wide) upper scenario social impacts associated with management measures for offshore renewables

Potential Interactions	Non-Social Consequences	Social Impacts		Significance of Social Impact		
		Primary	Secondary	National and Sector Level	Region/Local Area Level	Individual Level
Upper scenario wind Southern North Sea: Loss of £1,924m of GVA. Outer Moray Firth: Loss of £854m of GVA.	▪ Loss of investment in sector	▪ Loss of future job creation		XXX Short-term: ▪ 6,823 construction jobs (annual average 2016-2023) Long term: ▪ 1,056 operational jobs p.a. (2020-2034)	XXX North East Scotland, Eastern England	XXX
	▪ Reduced renewable energy	▪ Social cost of loss of carbon reduction		XXX	n/a	n/a
		▪ Loss of benefits associated with improved energy security/increased consumer choice for household energy		XXX	XXX	XXX
	▪ Avoidance of adverse impacts recreation and tourism sectors	▪ Socio-economic benefits from avoiding adverse visual impact of windfarm on seascape and disturbance during construction		0	+ Tourist/ recreation businesses in vicinity of affected shoreline	+ Individuals living or undertaking tourist/ recreation activities in vicinity of affected shoreline

Potential Interactions	Non-Social Consequences	Social Impacts		Significance of Social Impact		
		Primary	Secondary	National and Sector Level	Region/Local Area Level	Individual Level
	▪ Avoidance of economic impacts on commercial fishing sector	▪ Social benefits from avoiding potential negative impacts on income and employment of commercial fisheries (and hence 'way of life' and the secondary social impacts associated with that)	▪ Health ▪ Community ▪ Women ▪ Recruitment	0	++	++
Upper scenario tidal stream North Channel and Outer Solway: Loss of £46m of GVA. North Anglesey Marine / Gogledd Môn Forol: Loss of £32m of GVA. West Wales Marine / Gorllewin Cymru Forol: Loss of £19m of GVA. Anglesey Terns / Gogledd Môn Forol: Loss of £17m of GVA.	▪ Loss of investment in sector	▪ Loss of future job creation		XXX Short-term: ▪ 896 construction jobs (annual average across all projects during construction) Long term: ▪ 50 operational jobs p.a. during operation	XXX South-west Scotland, Wales	XXX
	▪ Reduced renewable energy	▪ Social cost of loss of carbon reduction		XXX	n/a	n/a

Potential Interactions	Non-Social Consequences	Social Impacts		Significance of Social Impact		
		Primary	Secondary	National and Sector Level	Region/Local Area Level	Individual Level
		▪ Loss of benefits associated with improved energy security/increased consumer choice for household energy		XXX	XXX	XXX
	▪ Avoidance of adverse impacts recreation and tourism sectors	▪ Socio-economic benefits from avoiding adverse visual impact of tidal stream developments on seascape and disturbance during construction		0	+ Tourist/ recreation businesses in vicinity of affected shoreline	+ Individuals living or undertaking tourist/ recreation activities in vicinity of affected shoreline
	▪ Avoidance of economic impacts on commercial fishing sector	▪ Social benefits from avoiding potential negative impacts on income and employment of commercial fisheries (and hence 'way of life' and the secondary social impacts associated with that)	▪ Health ▪ Community ▪ Women ▪ Recruitment	0	+	+

Impacts:
xxx/+++: significant negative/positive effect;
xx/++: possible negative/positive effects;
x/+: minimal negative/positive effect, if any;
0: no noticeable effect expected.

Tables 60 and 61 summarise the relevant information and evidence that is available on the likely distribution of the economic costs associated with the potential loss of investment in the sector under the upper scenario only. Six different aspects are assessed as part of the distributional analysis:

- Location;
- Age groups;
- Gender groups;
- Sectors;
- Small businesses; and
- Social groups.

The potential combined economic impacts of the sites are very large, such that they could have significant impacts across society. In other on words, they could affect all the social groups considered. However, it should be noted that only the large impacts on wind energy developments at two east coast sites are expected under the intermediate scenarios. The largest impacts, and the impacts on tidal stream developments, are only expected under the upper scenario, and therefore are regarded as a risk rather than a likelihood.

Tables 60 and 61 show that:

- Location: the combined loss of future economic activity associated with the capital elements of the proposed wind farm and tidal stream developments would be felt predominantly in the South West and North East Scotland, Eastern England, and Wales. Although ultimately, the distribution of GVA and employment losses will depend on the ability of local, regional and UK companies to secure the construction contracts and the location of these companies, there is evidence to suggest that construction expenditure, which accounts for the majority of the capital spend, has the greatest potential to directly benefit local economies (BVG Associates, 2011). This suggests that businesses and workers in these regions would bear a disproportionate share of the expected loss in future GVA and employment. Although this is expected to be a short-term economic cost over the construction period, the combined scale of the anticipated GVA and employment losses are such that this would represent an extremely significant negative impact;
- Age/Gender – the combined loss of future jobs will have a large direct negative impact on employment, and therefore has the potential to impact all social groups;
- Sectors affected – construction companies, ports and harbours, professional services (legal, technical, engineering), facilities for manufacturing and pre-assembly of turbines, manufacturers of foundations, cables and electrical infrastructure. Further impacts throughout the supply chain;
- Small businesses – Likely to be very significantly affected as the large majority of engineering and construction enterprises are small businesses and therefore the loss of potentially lucrative construction contracts and demand for highly skilled professionals in technical services (including legal services and engineering) is likely to have a significant negative adverse impact on small businesses, particularly in the regions affected.

Table 60. Distribution of social impacts for offshore renewables (location, age and gender) arising from the designation and management of the dSACs (over 2015 to 2034 inclusive), upper scenario only

Sector/Impact	Scale of Impact by location			Age			Gender	
	At National level	Regional / Cities	Rural, Urban, Coastal or Island Communities	Children	Working Age	Pensionable Age	Male	Female
▪ Construction sector/ adverse impact on future job creation (2016-2019) ▪ Renewable Energy Sector/ adverse impact on future job creation ▪ Supply chain impacts throughout economy	XXX significant impacts in England, Scotland and Wales	XXX significant impact, concentrated in: Fife, South West and North East Scotland, Eastern England, West Wales:	XXX Rural & urban coastal	XXX significant negative effect at individual level if parents lose opportunity for employment	XXX significant negative effect at individual level if individual loses opportunity for employment	XXX potential negative effect if retirees own construction businesses of live in household of affected future workers	XXX main direct impact on working age males as women significantly under-represented in construction sector	XXX significant negative effect if member of household loses opportunity for employment

Impacts:
xxx/+++: Significant negative/positive effect;
xx/++: Possible negative/positive effects;
x/+: Minimal negative/positive effect, if any;
0: No noticeable effect expected.

Table 61. Distribution of social impacts for offshore renewables (business, income and vulnerable social groups) arising from the designation and management of the dSACs (over 2015 to 2034 inclusive), upper scenario only

Sector/Impact	Business Groups			Income Groups			Vulnerable Social Groups	
	Small	Medium	Large	10% most Deprived	Middle 80%	10% Most Affluent	Ethnic Minorities	With Disability or Long-Term Sick
▪ Construction sector/ adverse impact on future job creation (2016-2020) ▪ Renewable Energy Sector/ adverse impact on future job creation ▪ Supply chain impacts throughout economy	XXX Construction represents large industry sector	XXX	XXX	XXX	XXX	XXX Not clear if this group affected as severely, likely to have greater alternative employment opportunities.	XXX Small percentage of construction employment is people from ethic minority groups	XXX No employment data available.

Impacts:
xxx/+++: Significant negative/positive effect;
xx/++ : Possible negative/positive effects;
x/+: Minimal negative/positive effect, if any;
0 : No noticeable effect expected.

5.4 Benefits

5.4.1 Total Economic Value of the Proposed SPA and SACs

As well as limited evidence on the value of different ecosystem services, there are studies that attempt to estimate the total value of the marine environment. A study by Gubbay (2006) reviewed the evidence for benefits of MPAs set up for the conservation of marine biodiversity. She found some direct evidence that MPAs can protect and enhance ES where habitats and species protected by MPAs are known to provide specific ES. However, they studied highly protected MPAs, whereas the proposed SPAs and SACs generally introduce management measures to protect a limited set of features.

Three studies provide some evidence on the economic value of designating the sites similar to the proposed SACs and SPAs:

1. McVittie & Moran (2008);
2. Jobstvogt *et al* (2014); and
3. Kenter *et al* (2013).

5.4.1.1 McVittie & Moran (2008)

This study derived a primary estimate of benefits from the implementation of the nature conservation measures in the draft Marine Bill, specifically through protected area measures. They identified UK households' aggregate willingness to pay WTP of £487 million to £698 million per year. This figure represents a total economic valuation for the protected area provisions, as described in their CV scenario. Due to the nature of the protected area outcomes, it is suggested that a high proportion of this value will be non-use value. However, the data did not allow the study to categorically isolate this component.

A median value for halting the loss of marine biodiversity (which includes, but is a wider objective than protected area provisions) had an aggregate UK value of £1,170.7 million per year. This value is based on median estimates, and is recommended as it avoids the influence of extreme values and represents the amount that 50% of respondents would be willing to pay.

The values generated within this research were based on the best *ex ante* assessment of the anticipated environmental gains from the UK Marine Bill and Marine Protected Areas, using a hypothetical network scenario. Because of uncertainty, there is potential for disparity between the policy benefits scenarios presented here and what is actually realised as the policy is implemented. It is also important to note that no assumption has been made for the timescale over which these benefits arise. One interpretation is that the values represent preferences for implementation of the Marine Bill, and that these benefits arise immediately from policy implementation. For IA reporting, it is feasible to assume alternative benefits timescales as part of any sensitivity analysis. For example, time lags of 2, 5 and 7 years could reasonably be used to represent the potential delay of returns in line with biological uncertainty about the speed at which marine biodiversity benefits are realised. This analysis is not conducted in this report.

While the proposed SACs and SPAs examined in this study would be expected to contribute to halting the loss of marine biodiversity (the change considered by McVittie and Moran), the extent of this contribution is unclear due to uncertainty in the extent and impact of likely management measures on their designated features and marine biodiversity. Therefore it is concluded that the non-use value of the improvements to marine biodiversity from the sites cannot be accurately valued from the McVittie and Moran study.

5.4.1.2 Jobstvogt *et al* (2014)

This study assesses the value of biodiversity using a discrete choice experiment focusing on Scottish households' WTP for additional MPAs in the Scottish deep-sea (within the deep-sea area of the UK's North and Northwest Exclusive Economic Zone). Jobstvogt *et al* (2014) examines two specific dimensions of biodiversity value, one of which is the existence value of deep-sea species measured by the number of protected species. This study indicates that the Scottish public hold non-use values for marine species that they are unlikely to encounter directly, as is broadly the case for harbour porpoise at the SACs being considered for designation.

The Jobstvogt *et al*. study determines the value of deep sea environments off the UK coast to be £34.83 per household per year for a high level of species protection. In addition, the choice experiment includes an attribute for the potential medical research potential of the genetic diversity of the habitats with a WTP value per household of £35.43 per year. Adopting the methodology of Beaumont *et al* (2008) of applying these values to the total number of households gives a value of approximately £850 to £900 million per year for both non-use and option values for UK marine habitats generally, which is a safe underestimate. This study supports the existence of significant positive non-use values for the proposed SACs and SPAs under consideration.

5.4.1.3 Kenter *et al* (2013)

This study was conducted under the UK National Ecosystem Assessment follow-on project to value marine ecosystem services (UK NEA, 2014). It provides evidence indicating that designation of MPAs will increase use and non-use values to anglers and divers, including through securing the quality of the marine resources they use (i.e. protection against degradation). Its suitability for transfer to this impact assessment is considered moderate to good, as described in Sections 3.5.4 and 4.5.4. Although the management measures analysed by Kenter *et al,* 2013 (including restrictions on fishing gears) overlap with those for the proposed sites, they are significantly different. In particular the large dSACs for harbour porpoise differ from the smaller sites being protected for a range of features examined by Kenter *et al*, 2013.

The recreational values identified in this study are discussed in Sections 3.5.3 and 4.5.3. The study indicates that recreational users of the UK marine environment have a significant positive non-use value for measures that establish MPAs for the purposes of species and habitats conservation. The Kenter *et al*, 2013 study is also relevant to the dSPAs considered here, as it studied several sites with similar features and characteristics, from which valuation evidence

can be transferred to inform policy. Table 62 summarises evidence presented in Sections 3.5.3 and 4.5.3 of relevant recreational values of the proposed dSACs and dSPAs.

Table 62. Total one-off values (£m) for designation of proposed dSACs and dSPAs Identified in Kenter *et al* 2013

Site (similar to 'Areas of Search')	Anglers		Divers		Total	
	Lower	Upper	Lower	Upper	Lower	Upper
Southern Sea of Hebrides dSAC	4.0	8.6	0.7	1.3	4.7	9.9
West Wales Marine/ Gorllewin Cymru Forol dSAC	6.8	14.5	1.2	2.3	8	16.8
Outer Moray Firth dSAC	6.3	13.4	1.2	2.3	7.5	15.7
Northern Cardigan Bay / Gogledd Bae Ceredigion dSPA	8.1	17.2	1.7	3.3	9.8	20.5
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Benfro dSPA	8.3	17.5	1.7	3.3	10	20.8
Total					**40**	**83.7**

The values in Table 62 illustrate the significant non-use values for designation identified by Kenter *et al*, 2013 that are relevant to some of the proposed dSPAs and dSACs. The figures illustrate the higher non-use values of sites with higher visitor numbers (e.g. Skomer, Skokholm and Pembrokeshire Seas / Sgomer, Sgogwm a Moroedd Benfro dSPA) compared to more remote and inaccessible sites (like the Southern Sea of Hebrides dSAC). This is attributed to these sites being more familiar to the groups surveyed.

As discussed for recreational services, in interpreting this evidence it is necessary to consider the existing designations for other biodiversity features at many of the sites. These designations will also, to some extent, protect the features which are the subject of the current round of designations. Therefore, the additional benefit from these designations relates to the extent that they increase the protection of the all the biodiversity and other features and characteristics (not just those they are designated for). This additionality is very difficult to determine and cannot be quantified in a way that allows quantified adjustment of the valuation data.

6. Discussion and Conclusions

6.1 Marine Activities

Based on the assessments undertaken, the quantified impacts on operating costs for marine aggregates, military activities and oil and gas in relation to dSAC designations are assessed as being minor relative to annual turnover under all scenarios. For the dSPAs, the quantified impacts on operating costs for marine aggregates, oil and gas and recreational boating are assessed as being negligible or very minor relative to annual turnover for all scenarios. However, it should be noted that some of these cost estimates are quite uncertain and it has not been possible to quantify some impacts. Therefore, there is the potential for more significant cost impacts on operating costs to arise for individual projects should the IA assessment assumptions (documented in Appendices B and C) prove incorrect.

Potentially more significant impacts could be experienced by the finfish aquaculture, commercial fisheries, offshore renewables (offshore wind and tidal stream) and ports and harbours sectors under the intermediate and/or upper scenarios.

For the finfish aquaculture sector, potentially significant cost impacts could arise for the Southern Sea of Hebrides and North Minch dSACs which may affect the competitiveness of installations located in these areas. This risk can be managed to an extent by ensuring that the implementation of mitigation measures (where required) is linked to normal industry investment cycles.

For commercial fisheries, potential impacts on direct and indirect GVA (PV) range from £0.13m (intermediate scenario) to £42.0m (upper scenario) (Table 57 and Table 12). Impacts on direct and indirect employment (FTE jobs) are estimated to range from 0.2 (intermediate scenario) to 73 (upper scenario) (Table 15 and Table 43). The values presented represent the estimated GVA associated with the value of landings that could be affected by the possible management measures and will be overestimates if some of the effort that could be displaced continues to fish elsewhere. However, there are uncertainties in the estimates of cost impacts, particularly for some of the smaller sites, which may over- or under-estimate impacts. Impacts to operating costs are estimated to be £861k (PV) under the intermediate scenario, attributable to the potential management measure of requiring under-12m vessels fishing with nets to use dolphin deterrent devices (pingers) on their nets. These costs are mainly attributed to the Bristol Channel Approaches and Southern North Sea dSACs.

There are large uncertainties in the estimate of these costs, relating to both the number of vessels that may be affected, and the length of nets used by them, and may significantly over- or under-estimate costs to the sector. Implementation of pingers on such a large scale should also be considered in relation to its potentially negative impact of excluding harbour porpoise from feeding and mating areas, and the feasibility of enforcement. Non-quantified impacts on the sector relate to implementation of seasonal or annual mitigation measures on fixed engines (intermediate scenario) and the potential losses of catch from fixed engines within dSACs as a result of a potential prohibition of acoustic deterrent devices for seals (upper scenario). There are significant overlaps of dSACs and dSPAs with existing SACs, with Nature Conservation

MPAs and pMPAs in Scotland, and with rMCZs. These have the potential to cause significant combined impacts for the Southern North Sea, Bristol Channel Approaches, North Minch, Southern Sea of Hebrides, Outer Moray Firth, North Anglesey and West Wales Marine dSACs, and Northern Cardigan Bay and Skomer, Skokholm and Seas off Pembrokeshire dSPAs. This should be taken into consideration in the establishment of management measures for commercial fisheries, as well as the potential for management measures in existing sites to contribute to the conservation objectives of the dSACs and dSPAs.

The potential impact on operating costs for the offshore wind sub-sector associated with the designation of the dSACs is estimated to be around £1.4m (Intermediate scenario, PV) relating to management measures for the Southern North Sea and Outer Moray Firth dSACs. Under the upper scenario, there is the potential for some offshore wind farm projects to be cancelled. This could give rise to large impacts on GVA and employment. However, this scenario is considered very unlikely to occur.

The potential impact on operating costs for the tidal stream sub-sector associated with the designation of the dSACs is estimated to be around £441k (Intermediate scenario, PV), mostly associated with potential measures to manage collision risk. Under the upper scenario, there is the potential for some tidal stream projects to be cancelled. This could give rise to large impacts on GVA and employment. However, this scenario is considered very unlikely to occur.

The quantified direct impacts on the ports and harbours sector are small and are not considered significant relative to annual turnover. However, it has not been possible to estimate cost impacts under the upper scenario, which in some circumstances could be larger.

6.2 Public Sector

The main costs under the lower and intermediate scenarios relate to monitoring requirements to assess the condition of features within sites once designated (around £0.6m for dSACs and £0.3m for dSPAs under the intermediate scenario, (PV)). Other public sector costs associated with preparing Statutory Instruments to implement fisheries management measures, compliance and enforcement activities, additional costs associated with geophysical surveys and regulatory and advisory costs are individually estimated to be relatively minor (around £0.45m (dSACs) and less than £0.02m (dSPAs) in total for intermediate scenario, PV). Under the upper scenario, potentially much larger impacts could occur as a result of leasing income that would be foregone should some offshore renewables projects not proceed. However, this scenario is considered very unlikely to occur.

6.3 Social Impacts

This report has undertaken detailed analysis of the expected distribution of the economic impacts identified and potential for subsequent socio-economic impacts. There are no significant social impacts identified under the lower or intermediate scenarios. Potential for social impacts could arise in relation to commercial fisheries and offshore renewables under the upper scenario. However, this scenario is considered very unlikely to occur.

There is a risk of the commercial fisheries impacts at all the dSACs having social impacts in fishing communities. The impacts on those employed in the sector could be significant, but are not considered large enough to have significant subsequent impacts on particular social groups in fishing communities or the fish processing sector. In total, the risk across all the sites, in the upper scenario, is that they result in loss of 72 FTE jobs and annual average direct and indirect GVA of £2 million. These impacts could be significant at a local and regional scale. However, as they represent a worst case scenario, and are less than 0.2% of the UK sector, they are not considered to indicate a significant risk of social impacts at a national scale.

There is a risk of significant offshore renewables economic impacts at several sites, including potential loss of employment opportunities, particularly in wind farm construction and operation should some projects be cancelled. There would be very significant secondary social impacts associated with reduced job creation, including impacts on social cohesion in the affected communities. The renewable energy capacity forgone would have supported the wider social benefits of improved energy security and reduced greenhouse gas emissions.

The total employment impacts identified[24] are around 7,719 short-term jobs during construction and 1,106 long-term jobs associated with operation. The scale of the socio-economic impacts should offshore renewables projects be cancelled are such that they would be likely to impact all social groups across society, at least at the regional level where sites are located. It is also likely that the combined social costs from the cumulative impacts of the sites to be greater that the impacts identified for the sites individually. A particular risk is that restrictions at several sites affect investors' confidence in the sector.

6.4 Benefits

The assessment of benefits has focussed on the changes to ecosystem services that are expected to result from site designation and management. While the proposed sites undoubtedly support a considerable range and value of ecosystem services, evidence on the condition of the site features, and on the expected nature of these changes in scientific or economic terms, is sparse. As a result the assessment of changes in ecosystem services at individual sites is highly uncertain (see Table 7 site assessments, Appendix G).

Differences in the assessed changes between sites reflect differences in designated features and other environmental characteristics, management measures, and current activities present at sites (e.g. tourism). The ambiguity and uncertainty associated with the quantification of ecosystem services, as reflected in the evidence reviewed above, reinforces the necessity for a largely qualitative approach to the assessments of benefits at a site level.

A key part of the values of the ecosystem services are the recreational and non-use values of the sites. These are informed by only a few studies, of which Kenter *et al* (2013) provides the

[24] As noted previously, these figures represent the potential gross number of jobs that might be foregone. The actual number of jobs foregone would depend on the alternative means by which electricity generation might occur in the absence of developments.

most relevant economic values. Interpretation of this study for the proposed sites is subject to uncertainty for several reasons.

First, the extrapolation used to estimate the values in the study has been questioned by Marine Scotland over the representativeness of the surveyed sample of Divers and Anglers. Secondly, the numbers of visits to the different sites are estimates that are subject to uncertainty. Indeed, Riddington *et al* (2014) provide some evidence that the numbers of anglers are over-estimated, but also suggest that the non-use benefits per angler are underestimated.

Second, the total economic value figures in the study show little variation between the 'no restrictions' and 'restrictions on damaging activity' scenarios. At each end of the range of data, shown in Table 19, page 103 of Kenter *et al* (2013), the values with management measures are approximately 10% higher than those for 'no restrictions'. This suggests that most of the value of sites is 'insurance' relating to designation providing enhanced powers to conserve sites in the face of future pressures.

This latter factor makes interpreting the Kenter *et al*, 2013 data in the ecosystem service analysis table (Table 7 in Appendix G) complex. On the one hand, the non-use values could be attributed fairly equally to all the management scenarios (across the 'non-use value' row). On the other hand, and as the analysis shows, the higher non-use values could be only attributed to the scenarios that involve management measures (generally the upper scenarios). This is justified because such management is deemed necessary to realise the non-use values in the long run.

This interpretation of the Kenter *et al* (2013) evidence is also chosen because it produces a broad range of results. This range also reflects the other uncertainties (such as over numbers of non-users) that affect the values of the different scenario's. As a result, the site ecosystem services assessments mainly identify low - moderate non-use values for the MPAs, with a low-moderate level of confidence. The broad qualitative range in the analysis reflects all the uncertainties involved in the interpretation of economic evidence, such as the Kenter *et al, (*2013) study, in this context.

Overall, the monetary valuation of the benefits of designating proposed sites is considered to be significant, but is highly uncertain and cannot be quantified.

6.5 Limitations and Uncertainties

All of the estimates of costs and benefits are subject to significant uncertainties. The development of the scenarios has sought to encompass some of these uncertainties. In particular, different assumptions have been used concerning the requirements for management measures within the scenarios to take account of uncertainty in the management requirements. This influences the scale of costs and benefits which vary by several orders of magnitude across the scenarios. However, the intermediate scenario is the most likely scenario with the upper scenario considered very unlikely to occur.

Uncertainties in the location and nature of future activity in the marine environment also introduce an uncertainty in the estimation of costs and benefits. For example, future finfish

aquaculture developments have been estimated based on industry advice. For other sectors such as offshore renewables and oil and gas, the location and scale of future development is particularly uncertain and the assessment has therefore focused on planned and proposed development. Given that further development proposals are likely to come forward within the time period of the assessment (2015 to 2034), it is possible that costs to these sectors could be underestimated. Similar uncertainties relate to future trends in ongoing activities such as commercial fishing (where landings values have been assumed to remain constant over the assessment period). Such assessments are therefore based on a significant degree of speculation about future levels of activity and are thus inherently uncertain.

The timing of planned offshore wind farm development also creates a particular uncertainty concerning whether the suggested threshold for noisy piling activity might be exceeded within the Southern North Sea dSAC. It is particularly noted that the scale of impact is sensitive to assumptions on the timing of development within this dSAC.

The quality of spatial data on which some assessments have been based has been suboptimal. There are significant limitations associated with some of the commercial fisheries data which has been used. For example, the estimates of landings values that have been used to assess the cost impacts of effort reductions are based on ICES rectangle data as this was the only data that was available within the time scales of the study.

For commercial fisheries, the cost impacts have been based on GVA estimates of the value of potential landings foregone. These values will overestimate impacts to the commercial fisheries sector as they assume that all of the displaced effort will be lost, although in practice a proportion of the displaced effort will relocate and continue fishing in other areas. There is also an inherent uncertainty in the multipliers used to estimate GVA, which are not site specific.

The main potential social impacts identified within the assessment relate to impacts on the commercial fishing and offshore renewables sectors under the upper scenario. Given the uncertainties relating to the economic impacts identified above, the social consequences of these impacts are also similarly uncertain.

The assessment of benefits has largely been limited to a qualitative and order of magnitude monetary assessment owing to the limited evidence on expected changes in ecosystem services and on the value of those changes. The assessment has also been hampered by the lack of knowledge of the baseline condition of many features in the dSACs and dSPAs, and the impact of management measures on features and ecosystem services within those sites. There are uncertainties in the few available studies that provide evidence on the potential economic value of the benefits of designating the sites. For example, the results in Kenter *et al (*2013) are sensitive to the numbers of beneficiaries, and the McVittie and Moran study value 'halting marine biodiversity loss through a network of marine protected areas' is not the expected outcome from the proposed designations, and may not even be a realistic policy scenario (as halting biodiversity loss would need measures other than through MPAs). Furthermore, the Kenter *et al* (2013 study was undertaken relative to a baseline of very few UK marine designations, whereas the designations considered here build on sites designated in the last two years.

The combined assessment poses particular challenges owing to the complexity of such assessments and the limited scientific understanding of impacts. Within this study, combined effects have generally been assessed as the sum of the individual impacts on individual sites, but the potential for combined cost impacts has been recognised, particularly in relation to aquaculture and commercial fisheries. The assessment of combined benefits is subject to the same limitations as those identified for the site assessments. However, at this scale, additional evidence on the network value of protected areas is relevant. For example, after careful analysis to identify additional impacts from designation, there is little evidence to suggest diminishing returns from designating the suite of proposed sites. Furthermore, the sites can cumulatively contribute to the resilience of marine ecosystem services in a way that is greater than the sum of their parts, but there is little if any quantified evidence available to support this.

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Scottish Government BRIA Guidance: http://www.scotland.gov.uk/Topics/Business-Industry/support/better-regulation/guidance/Guidance.

Appendices

Appendices

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Appendix A

Stakeholders Contacted During Study

A. Stakeholders Contacted During Study

A.1 Aquaculture

Bangor Mussel Producers Association and Menai Strait Fishery Order Management Association
Conwy Mussels
DARDNI
Marine Scotland (MS) - Head of Aquaculture policy
MS-LOT – AA/HRA specialist
Queens Dock mussel operation
Scottish Salmon Producers Organisation
The Crown Estate
Welsh Government

A.2 Aggregates

BMAPA
The Crown Estate

A.3 Commercial Fisheries

ANIFPO
Cornwall Fish Producers Organisation
Cornwall IFCA and district
DARDNI.
Devon and Severn IFCA and district
Eastern IFCA and district
Kent and Essex IFCA and district
Marine Scotland
MMO
NFFO
NIFPO
North Eastern IFCA and district
Northumberland IFCA & district
NUTFA
Scottish Creel Fishermen's association
SFF
Sussex IFCA and district
The Salmon Net Fishing Association Of Scotland
Welsh Fishermen's Association.
Welsh Government

A.4 Offshore Renewables

Atlantis Resources Ltd
BOWL
DECC
East Anglia Offshore Wind
Forewind
Galloper Wind Farm Ltd
Hywind Scotland Demo site
Marine Energy Pembrokeshire
Menter Mon
Minesto
MMO
MORL
MS-LOT
NRW
Renewable Energy Association
Renewables UK
Scottish Renewables
Smartwind
SSE
The Crown Estate
Tidal Energy Limited
Vatenfall
Wave Hub Limited
Welsh Government

A.5 Oil & Gas/Seismic

DECC O&G
Oil & Gas UK

A.6 Military Activities

MOD

A.7 Ports and Harbours

ABP
BPA
DRDNI
Milford Haven Port Authority

MMO
Marine Scotland
NRW's Marine Licensing Team
Transport Scotland
UKMPG
Welsh Government

A.8 Recreational Boating

RYA
RYA Cymru Wales
RYA Scotland

A.9 Shipping

Chamber of Shipping
DfT
MCA
Welsh Government

Appendix B

Context for Marine Activities and Proposed Assessment Methods for dSACs

(Document Provided Separately)

B. Context for Marine Activities and Proposed Assessment Methods for dSACs

See Sep Document

Appendix C

Context for Marine Activities and Proposed Assessment Methods for dSPAs

(Document Provided Separately)

C. Context for Marine Activities and Proposed Assessment Methods for dSPAs

See Sep Document

Appendix D

Scenarios for Recommended dSAC and dSPA Proposals

(Document Provided Separately)

D. Scenarios for Recommended dSAC and dSPA Proposals

See Sep Document

Appendix E

Public Sector Costs

E. Public Sector Costs

E.1 Management Schemes

As part of the process of designation, approaches for management will be developed for each new SAC and SPA, setting out the preferred management option and how it will be delivered. These represent a sunk cost as the work will largely be completed ahead of the decision to designate individual sites. For many sites, the management proposed is likely to provide a sufficient basis for coordinating management efforts. However, for sites where a large number of activities may be occurring, it may be necessary to develop a more formal Scheme of Management which sets out the roles and responsibilities of different public authorities so that there is clarity concerning how these authorities will be delivering their statutory functions to support achievement of the conservation objectives for protected features within the sites. These management schemes will be considerably more detailed than the management plans.

For the purposes of this assessment, JNCC and NRW have indicated that they think it is unlikely that specific new Schemes of Management will be developed for any of the dSAC and dSPA sites. For some sites, such as Northern Cardigan Bay, where the dSPA largely overlaps an existing SAC, it may be possible to integrate the site within existing Schemes of Management but the administrative costs of this would be very small. The estimated costs are therefore assessed as £0.

E.2 Statutory Instruments

A number of different mechanisms may be used to regulate works or activities potentially affecting new SACs or SPAs:

- Special Nature Conservation Orders under the Habitats Regulations to protect Natura 2000 sites from damaging unlicensed activities;
- Fisheries management measures under national legislation for sites within 6nm (or 12nm where only UK vessels would be affected) ; and
- Fisheries management measures beyond 12nm under the Common Fisheries Policy for SACs or SPAs (or beyond 6nm where non-UK vessels would be affected).

E.2.1 Special Nature Conservation Orders

Special Nature Conservation Orders (SNCO) can be made under the Habitats Regulations to protect Natura 2000 sites from damaging unlicensed activities. Such Orders are seen as a last resort where other interventions have failed. No requirements for SNCOs have been identified for the dSAC or dSPA proposals. If fisheries management measures are required, it is likely that these will be brought forward under fisheries legislation (see below).

E.2.2 Inshore Fisheries Management Measures

Should fisheries management measures be required in inshore waters, it is likely that these would be pursued under fisheries legislation.

For the purposes of this assessment, it has been assumed that a Fisheries Order will be required for each site which is wholly or partially within 6nm for which new fisheries management restrictions may be required under one or more of the assessment scenarios (see Table E.1.).

The cost associated with the making of such Orders (or modifying existing Orders) has been assumed to be £3,500 (at 2009 prices), being the mid-range of the estimate provided in RPA & ABPmer (2009). This equates to £3,950 uprated to 2015 prices.

Table E.1 Sites for which Fisheries Orders may be required

Lower Scenario	Intermediate Scenario	Upper Scenario
dSACs ▪ None	**dSACs** ▪ Sites within which set nets are used: Bristol Channel Approaches; North Anglesey Marine; North Channel and Outer Solway; Southern North Sea; West Wales Marine	**dSACs** ▪ Sites where fishing effort reduction required (All sites)
dSPAs ▪ None	**dSPAs** ▪ Sites where static gear effort reduction required (Northern Cardigan Bay)	**dSPAs** ▪ Sites where fishing effort reduction required (Skomer, Skokholm and the seas off Pembrokeshire; Northern Cardigan Bay)

For the purposes of this IA, it has been assumed that all orders will be made in 2016.

For sites wholly or partly between 6 to 12nm where UK vessels have exclusive access, it has been assumed that any required fisheries management measures will be implemented through amendments to licence conditions for individual vessels. Modifications to fishing licences is a minor administrative task and the costs of amending a proportion of fishing licences could therefore be absorbed within existing activity. It is assumed that amendments to fisheries licences, if required, would be made in 2016, but would not represent a significant additional cost to the public sector.

For sites wholly or partly between 6 to 12nm where non-UK vessels have historic fishing rights, measures to manage non-UK vessels would need to be pursued under the CFP. Where sites overlap the 12nm boundary, CFP measures would necessarily be required if fishing activity required additional regulation but a single CFP measure would address areas both within and beyond the 12nm limit.

It is assumed that the following sites which include sea areas between 6nm to 12nm may require CFP measures:

- dSACs (intermediate scenario) - sites within which set nets are used between 6nm and 12nm by non-UK vessels. For the purposes of this IA, where UK vessel activity occurs between 6 to 12nm it has been assumed that there will also be some non-UK vessel activity. On this basis CFP measures would potentially be required for the following sites: Bristol Channel Approaches; North Anglesey Marine; North Channel and Outer Solway; Southern North Sea; West Wales Marine
- dSACs (upper scenario) - sites where fishing effort reduction may be required within 6 to 12nm by non-UK vessels. For the purposes of this IA, where UK vessel activity occurs between 6 and 12nm it has been assumed that there will also be some non-UK vessel activity. On this basis CFP measures would potentially be required for all dSACs except North Minch (which is wholly within the 6nm limit).
- dSPAs (upper scenario) - sites within which set nets are used between 6nm and 12nm by non-UK vessels. For the purposes of this IA, where UK vessel activity occurs between 6 to 12nm it has been assumed that there will also be some non-UK vessel activity. On this basis CFP measures would potentially be required for the following site: Skomer, Skokholm and the seas off Pembrokeshire, although the same could be said of the existing Skokholm and Skomer SPA. North Cardigan Bay dSPA is almost entirely within the 6nm limit and the Anglesey Terns dSPA is not considered likely to require management measures for fisheries over and above what would be required in relation to the existing Ynys Feurg, Cemlyn Bay and The Skerries SPA.

E.2.3 Offshore Fisheries Management Measures

If fisheries management measures are required in offshore waters (beyond 12nm), these would need to be pursued through the CFP in consultation with the European Commission. These measures, if approved, would control the activities of all fishing vessels. The measures could introduce spatial restrictions on gear types, the targeting of particular species and the time periods for which such prohibitions would apply.

The following dSACs which include sea areas beyond 12nm may require CFP measures (the Welsh dSPAs are all wholly within the 12nm limit):

- dSACs (intermediate scenario) - sites within which set nets are used beyond 12nm by non-UK vessels (probably excludes all Scottish only sites). For the purposes of this IA, where UK vessel activity occurs beyond 12nm it has been assumed that there will also be some non-UK vessel activity. On this basis CFP measures would potentially be required for the following sites: Bristol Channel Approaches; North Anglesey Marine; North Channel and Outer Solway; Southern North Sea; West Wales Marine
- dSACs (upper scenario) - sites where fishing effort reduction may be required. For the purposes of this IA, where UK vessel activity occurs beyond 12nm it has been assumed that there will also be some non-UK vessel activity. On this basis CFP measures would potentially be required for the following sites: all dSACs with the exception of North Minch (which is wholly within 6nm limit) and Southern Sea of Hebrides (which is wholly within 12nm limit).

It is noted that most of these sites may also require CFP measures in relation to management measures required between 6 to 12nm. In such circumstances it has been assumed that a single CFP measure would be pursued for each site covering both areas.

The cost associated with negotiating such measures has been assumed to be £5,000 per site (at 2013 prices) (Marine Scotland, pers. comm., 2013), although there is no available evidence on which to base this estimate. This equates to around £5,200 at 2015 prices.

It has been assumed that if required, these measures would be developed during 2016 and 2017 with the cost spread evenly over these 2 years.

E.3 Voluntary Measures

For some sites, it may be appropriate for public bodies to develop voluntary measures to manage certain activities. This may be particularly appropriate for recreational activity affecting SPAs.

The cost associated with developing and publicising voluntary measures is uncertain, but considered likely to be similar to the costs of preparing Fishery Orders (assumed to be £3,500 (at 2009 prices), being the mid-range of the estimate provided in RPA & ABPmer (2009)). This equates to around £3,950 at 2015 prices. It has been assumed that this cost is incurred in 2016 for relevant scenarios within each site where such measures may be required.

For the purposes of this IA, it has been assumed that voluntary measures might only developed for the Northern Cardigan Bay SPA in relation to managing the spatial impact of recreational boating activity.

E.4 Site Assessment and Monitoring

The costs of site surveys to characterise SACs and SPAs in advance of designation have been treated as sunk costs because the expenditure has already occurred or has been budgeted.

Following designation, there will be an ongoing requirement to undertake site assessment and monitoring within SACs and SPAs, both to improve understanding of the distribution of features and to monitor the condition of features to assess achievement of the feature-specific conservation objectives. The approach to site-based assessment and monitoring following designation will be set out in a detailed monitoring strategy that will be developed by the relevant SNCBs as part of a UK-wide marine monitoring strategy that is being coordinated by JNCC in collaboration with the statutory nature conservation bodies.

The costs of site assessment and monitoring individual SACs and SPAs will vary depending on the locations of the sites and types of features for which the sites are designated, with higher costs likely to be associated with surveys for offshore sites, owing to the requirement for larger vessels or the use of planes for aerial surveillance. For the purposes of this assessment, the following assumptions have been applied based on advice from JNCC and the SNCBs:

- For the harbour porpoise dSACs, it is assumed that assessment and monitoring will be conducted both through field survey and modelling:
  - Field survey: this may be conducted through either boat based survey or visual or digital aerial survey. The latter is considered to be more likely. JNCC has indicated that the costs for undertaking a digital aerial survey of the UK part of the North Sea site (including processing) would be approximately £500,000 and around £130,000 for a visual boat-based survey. The Southern North Sea dSAC area is around 50% of the total proposed area for all 8 dSACs. Scaling this up for all the dSACs would give a cost of around £1m. Assuming that the surveys were conducted on a 12 year cycle, this would give an annual average cost of approximately £80k. For sites such as the Southern North Sea and Outer Moray Firth, where some interaction with offshore renewables development may occur, it would be expected that the industry would contribute to some of the survey costs. For the purposes of the IA, it has been assumed that developers contribute 50% to the costs of these surveys, resulting in an overall reduced average annual cost to the public sector of around £40k.
  - Modelling: the impact of noisy construction and operational activities in and near the dSACs could be assessed using a modelling approach. This could be required for the Southern North Sea and Outer Moray Firth sites. JNCC has indicated that the potential cost of such a modelling exercise might be around £50k. It is likely that these costs would be shared with developers. For the purposes of this IA, it has been assumed that only 50% of these costs would be borne by the public sector with costs incurred equally in 2016 and 2017.
- For the 2 offshore extensions of existing SPA colonies, it is assumed that existing seabird colony monitoring work will be sufficient to monitor bird populations and no further monitoring is anticipated as being required;
- For the Northern Cardigan Bay SPA, it is assumed that it is monitored on a six year cycle at a cost of £126,000 per cycle, with the midpoints of each cycle assumed to be 2019, 2025 and 2031.

E.5 Managing the Impact of Geophysical Surveys Within dSACs

Public bodies undertake or commission various geophysical surveys for a number of purposes including:

- To maintain navigational safety as part of the UK Civil Hydrography Programme
- To monitor and assess seabed habitats within designated sites and wider marine areas
- In support of Government research programmes

Where public bodies are commissioning or directly undertaking certain geophysical surveys within or near dSACs, additional management measures may be required to manage levels of disturbance to harbour porpoise associated with these surveys (see Table E.2.).

Table E.2 Potential management measures for geophysical surveys

Management Measure	Scenario		
	Lower	Intermediate	Upper
Habitats Regulations Assessment (HRA) of geophysical surveys within or near site boundaries	✓	✓	✓
Enhanced mitigation measures to reduce or limit impacts of geophysical surveys within site boundaries		✓	
Limiting the number and duration of geophysical surveys within or near site boundaries			✓

E.5.1 HRA of Geophysical Surveys Within Site Boundaries

It has been assumed for the purposes of this assessment that HRA will be required for certain public sector geophysical surveys within site boundaries to assess potential impacts on dSAC conservation objectives.

JNCC and the country nature conservation agencies have indicated that the primary concern about the impacts of geophysical surveys relates to their contribution to overall levels of underwater noise. It is recognised that it would be onerous for individual surveys to prepare HRAs which each take account of potential cumulative underwater noise. It has therefore been suggested that a strategic HRA should be progressed as a joint initiative between regulators, SNCBs and industry covering all of the dSACs. This would document the location and nature of planned surveys and make a judgement on the extent to which such survey activity was consistent with achievement of dSAC conservation objectives. (The SNCBs current view is that the levels of survey activity are compatible with achievement of the site conservation objectives). An indicative cost of preparing the strategic HRA has been suggested to be around £100k, for which it is anticipated that the costs would be shared between the public sector and industry (oil and gas, offshore renewables and aggregates). This might result in a one-off cost to the public sector of around £50k. It is assumed that thereafter the strategic HRA would be maintained by the relevant regulators based on information provided by industry, but that this would represent only a marginal cost.

Assuming that a strategic HRA is in place and that this concludes that current levels of disturbance are not significant, the process for considering HRAs for public sector geophysical surveys should be fairly simple and require relatively little effort to provide the information required for HRA. For example, this might entail providing similar or slightly expanded information to that which is required in the MMO's voluntary notification form. For the purposes of this IA it has been assumed, on a conservative basis that all multibeam and sub-bottom profiler surveys will require HRA and that there will be a nominal additional cost to operators of £1k per HRA.

The potential number of geophysical surveys within each dSAC has been estimated based on the following assumptions:

- One geophysical survey is carried out within each dSAC as part of the Civil Hydrography Programme every 20 years (for the purposes of the IA, this is assumed to occur in 2025);

- Where dSACs overlap with existing marine SACs or existing or proposed MCZ/MPA, it is assumed that one geophysical survey is carried out for each SAC or MCZ/MPA every 6 years (for the purposes of the IA, these surveys are assumed to occur in 2018, 2024 and 2030); and
- One geophysical survey is carried out within each dSAC for government research purposes every 20 years (for the purposes of the IA, this is assumed to occur in 2025).

E.5.2 Enhanced Mitigation Measures to Reduce or Limit Impacts of Geophysical Surveys Within Site Boundaries

Under the intermediate scenario, additional mitigation could be required for sub-bottom profiler surveys within site boundaries. The proposed management measures could require:

- Soft start procedures (if appropriate); and
- Use of Marine Mammal Observers, following EPS protocol.

The cost of complying with these measures is considered to be minimal as few if any public sector surveys would include use of sub-bottom profilers. The cost impact is therefore assessed as being close to zero.

E.5.3 Limiting the Number and Duration of Geophysical Surveys Within or Near Site Boundaries

Based on JNCC and country nature conservation agency advice, it has been assumed that there may be a requirement to limit the number and duration of geophysical surveys within a site, subject to the provisions of Article 6 of the Habitats Directive. However, such requirements will be site specific and in the absence of detailed information on site activity and thresholds, it is not possible to quantify the potential impacts.

E.6 Compliance and Enforcement

Where management measures are necessary to support the achievement of conservation objectives for individual features within SACs and SPAs, some level of compliance and enforcement activity will be required. For licensable activities, this is likely to primarily entail scrutiny of monitoring returns provided by operators in fulfilment of conditions in their licences and in most cases is likely to impose only a minimal administrative burden on regulators. For example, in relation to finfish aquaculture in Scottish waters, the requirement to adhere to best practice in net tensioning for anti-predator nets to avoid entanglement of harbour porpoise could be checked as part of SEPA's existing inspection programme.

For unlicensed activity, some additional site based monitoring/surveillance could be required. Where management measures regulate fishing gear types, some additional area-based inspection/surveillance activity may also be required. For the purposes of this IA, it has been assumed that potential additional inspection/surveillance requirements for SACs and SPAs can be delivered through existing aerial and sea going assets as part of normal enforcement operations and that they will not therefore lead to any significant increase in existing costs.

E.7 Promoting Public Understanding

Once designated, a level of promotion of the SACs and SPAs and their management plans may be undertaken. This may take a variety of forms including provision of information via the internet. The costs associated with these activities are generally considered to be part of normal corporate activity for the SNCBs and for the purposes of this assessment it has therefore been assumed that no additional costs will be incurred.

E.8 Regulatory and Advisory Costs Associated with Licensing Decisions

E.8.1 New Developments

Where licensed development is proposed in the vicinity of features protected within or adjacent to SACs or SPAs, competent authorities may be required to carry out a Habitats Regulations Assessment (HRA) to assess the potential impacts of the development on those features as part of their overall determination of the application.

Where this is the case, developers must provide the information necessary for the assessment which necessarily entails additional review effort by regulators and their advisors. Based on information contained in the draft Regulatory Impact Assessment for the Scottish Marine Bill, the cost to regulators of reviewing developer submissions was estimated to be approximately 10% of the cost to the developer of preparing those submissions (RPA & ABPmer, 2009). Additional regulatory and advisory costs associated with reviewing developer submissions for the purposes of enabling HRAs are therefore assumed to be 10% of the costs identified for preparing HRAs presented in the relevant sector assessments.

The main areas identified where additional HRA costs may be incurred include:

- Planning applications for new or extended finfish aquaculture installations (local authorities, particularly Western Isles, Argyll & Bute, Highland, Orkney Islands and Shetland Councils);
- Oil and gas licences and permits for new oil & gas surveys or decommissioning activities using explosives (DECC); and
- Planning Act consents or marine licences for new development activity (ports and harbours, offshore renewables) (Planning Inspectorate; MMO, Marine Scotland, Welsh Government, DoE).

The cost impacts identified above will fall on the lead regulators for the relevant licensing regimes but also on the SNCBs.

In addition it is assumed that regulators and conservation advisors will contribute to the preparation of a strategic HRA for noisy activities within and around dSACs. It has been estimated that the costs of preparing a strategic HRA will be approximately £100k, shared equally between the public sector and industry. Within industry, for the purposes of this assessment, it has been assumed that the costs will

be shared across offshore renewables (£20k), oil and gas (£20k) and aggregates (£10k). These costs have been included within the relevant sectoral costs in section 3.2.

E.8.2 Existing Developments

Under the Habitats Regulations, competent authorities are required to review existing consents when new SACs or SPAs are designated where the fulfilment of those consents would be likely to have a significant effect on the new SAC or SPA, noting that such review does not affect anything already done under a consent. Based on the conclusions of the review the competent authority must affirm, modify or revoke the consent Many existing consented activities are compatible with the achievement of SAC and SPA site conservation objectives and will not require detailed review.

The number of projects for which review of consent is identified as being required has been estimated for each relevant sector, based on the methods described within Appendices B and C. The main sectors where review of consents is likely to be required are finfish aquaculture and offshore renewables. It is also noted that there are 3 consented port developments located between 26 to 50km from the Southern North Sea dSAC. However, it is unlikely that these developments will give rise to any significant effects on harbour porpoise within the dSAC and it is considered unlikely that any Review of Consents would be required.

It has been assumed that the cost of undertaking the Review of Consents will be £2,000 per consent for offshore renewables and £200 per consent for finfish aquaculture and that the reviews will be undertaken in 2016. The costs will fall on the lead regulators and the SNCBs.

E.9 Costs to The Crown Estate

If some offshore renewables developments do not proceed, leasing revenues to The Crown Estate could be reduced. An estimate of the potential cost impact has been made based on information provided by The Crown Estate.

Appendix F

Draft Reporting Template for Sites

F. Draft Reporting Template for Sites

[Site Name (site 3-letter code)] **Site Area (km²): [ ]**

Site Summary

Table 1. Summary of Proposed Protected Features, Data Confidence and Conservation Objectives				**[Site Code]**
Proposed Protected Features				
[Description features that would be protected e.g. harbour porpoise, all qualifying marine birds] [Brief site description to be taken form the SADs]				
Summary of Confidence in Presence, Extent and Condition of Proposed Protected Features and Conservation Objectives				
Proposed Protected Feature	**Feature Presence**	**Estimated Abundance of Feature (no/km²)**	**Confidence in Estimated Abundance of Feature**	**Confidence in Feature Condition**
Biodiversity Features				
e.g. Harbour porpoise				
References:				

Summary of Costs and Benefits

Table 2a. Site-Specific Economic Costs on Human Activities Arising from the Designation and Management of the Site (Over 2015 to 2034 Inclusive) [Site Code]			
Human Activity	**Cost Impact on Activity**		
	Lower Estimate (£k)	**Intermediate Estimate (£k)**	**Upper Estimate (£k)**
Quantified Economic Costs (Discounted)			
e.g. Aquaculture			
Total Quantified Economic Costs			
Non-Quantified Economic Costs			
[Identify non-quantified costs here]	Describe costs e.g. loss of confidence to invest	Describe costs	Describe costs
Note: For detailed information on economic cost impacts on activities, see Table 4.			

Table 2b. Site-Specific Public Sector Costs Arising from the Designation and Management of the Site (Over 2015 to 2034 Inclusive) [Site Code]			
Description	**Public Sector Costs**		
	Lower Estimate (£k)	**Intermediate Estimate (£k)**	**Upper Estimate (£k)**
Quantified Public Sector Costs (Discounted)			
Preparation of Marine Management Schemes			
Preparation of Statutory Instruments			
Development of voluntary measures			
Site monitoring			
Compliance and enforcement			
Promotion of public understanding			
Regulatory and advisory costs associated with licensing decisions			
Total Quantified Public Sector Costs			
Non-Quantified Public Sector Costs			
[Identify non-quantified costs here]	Describe costs	Describe costs	Describe costs

Table 2c. Summary of Social Impacts Arising from the Designation and Management of the Site (Over 2015 to 2034 Inclusive) [Site Code]										
Key Areas of Social Impact	Description	Scale of Expected Impact across Scenarios, Average (Mean no. of Jobs Affected)	Distributional Analysis							
			Location			Fishing Groups Predominantly Affected		Social Groups Affected		
			Region	Port	Rural/ Urban/ Island	Gear Types Most Affected	Vessels Most Affected	Crofters	Ethnic Minorities	With Disability or Long Term Sick
e.g. Employment with consequent impacts on: Health, Crime, Environment, and Culture and Heritage	e.g. Commercial Fisheries									
Note: For detailed information on social impacts by sector, see Table 7a. For more detailed information on distribution of social impacts by sector see Tables 7b and 7c.										

Table 2d. Environmental Impacts Arising from the Designation and Management of the Site (Over 2015 to 2034 Inclusive) [Site Code]		
Impact	Description	
Ecosystem Services Impact (Moderate and High Impacts)	**Relevance**	**Scale of Benefits**
e.g. Food provisioning		
Other Impacts		
[Identify other impacts here e.g. contribution to ecologically-coherent network; activities that would benefit, regulatory certainty]	Describe impacts	
Note: For detailed information on ecosystem services impacts, see Table 9. For detailed information on other impacts, see Tables 4 and 5 (activities experiencing impacts) and Table 8 (contribution to ecologically-coherent network).		

Human Activity Summaries

Human Activities that Would Be Impacted by Designation of the Site

Table 3a. e.g. Aquaculture (Finfish)			**[Site Code]**
[Summary description of activity and risks to features]			
Economic Costs on the Activity of Designation of the Site			
	Lower Estimate	**Intermediate Estimate**	**Upper Estimate**
Assumptions for cost impacts	▪ [Summary description of management measures, additional costs (licensing, monitoring) inc. feature extent to which applied]	▪ [Summary description of management measures, additional costs (licensing, monitoring) inc. feature extent to which applied]	▪ [Summary description of management measures, additional costs (licensing, monitoring) inc. feature extent to which applied]
Description of one-off costs	▪ [Description and unit value, year in which incurred]	▪	▪
Description of recurring costs	▪ [Description and unit value, periodicity of recurrence]	▪	▪
Description of non-quantified costs	▪ [Description]	▪	▪
Quantified Costs on the Activity of Designation of the Site			
Total costs (2015–2034)	[Value]		
Average annual costs	[Value]		
Present value of total costs (2015–2034)	[Value]		
Economic Impacts			
Total change in GVA (2015–2034)	[Value]		
Average annual change to GVA	[Value]		
Present value of total change in GVA (2015–2034)	[Value]		
Direct and Indirect reduction in employment	[full time equivalent jobs]		
Total costs = Sum of one-off costs and recurring costs for the site summed over the 20 year period. Average annual costs = Total costs divided by the total number of years under analysis (i.e. 20). Present value of total costs = Total costs discounted to their current value, using a discount rate of 3.5%. Total change in GVA (2015–2034) = The change in direct GVA in the sector for the site summed over the 20 year period. Average annual change to GVA = Total change in direct GVA in the sector for the site divided by the total number of years under analysis (i.e. 20). Present value of total change in GVA (2015–2034) = Total change in direct GVA in the sector for the site discounted to current value, using a discount rate of 3.5%. Direct and Indirect reduction in Employment = The average (mean) reduction in direct employment in the sector plus the indirect reduction in employment on the sector's suppliers.			

Human Activities that Would Benefit from Designation of the Site

Table 4. Human Activities that Would Benefit from Designation of the Site				[Site Code]
Activity	**Description**	**Lower Estimate**	**Intermediate Estimate**	**Upper Estimate**
List activities that would benefit from designation, or note 'None'.	Description of activity..	Text summary of benefits	Summarise benefits	Summarise benefits

Human Activities that Would be Unaffected by Designation of the Site

Table 5. Human Activities that are Present but Which Would be Unaffected by Designation of the Site	[Site Code]
Activity	**Description**
List activities that are unaffected, or note 'None'	Describe why the activity is unaffected (e.g. does not occur within MPA or buffer, and not expected to occur in future; or overlaps, but feature not sensitive, no management measures or additional costs anticipated under any scenario)

Social and Distributional Analysis of Impacts from Designation of the Site

Table 6a. Social Impacts					[Site Code]
Sector	**Potential Economic Impacts**	**Economic Costs and GVA, (PV)**	**Area of Social Impact Affected**	**Mitigation**	**Significance of Social Impact**

Impacts: +++/---: significant effect; ++/--: possible effects; +/-: minimal effect, if any; 0 – no noticeable effect expected.
* These estimates assume zero displacement of fishing activity and hence are likely to overestimate the costs.

Table 6b. Distribution of Social Impacts – Location, Age and Gender								[Site Code]
Sector/Impact	**Location**			**Age**			**Gender**	
	Region	**Ports***	**Rural, Urban, Coastal or Island**	**Children**	**Working Age**	**Pensionable Age**	**Male**	**Female**

Impacts: +++/---: significant effect; ++/--: possible effects; +/-: minimal effect, if any; 0 – no noticeable effect expected.
* Based on value of landings by home port affected under intermediate scenario.

Table 6c. Distribution of Social Impacts – Fishing Groups, Income Groups and Social Groups								[Site Code]
Sector/Impact	**Fishing Groups**		**Income Groups**			**Social groups**		
	Vessel Category <15m >15m	**Gear Types**	**10% Most Deprived**	**Middle 80%**	**10% Most Affluent**	**Crofters**	**Ethnic Minorities**	**With Disability or Long-Term Sick**

Impacts: +++/---: significant effect; ++/--: possible effects; +/-: minimal effect, if any; 0 – no noticeable effect expected.
* Based on costs to gear types/sectors and vessel categories affected under the intermediate scenario.

Anticipated Impacts to Ecosystem Services

Table 7. Summary of Ecosystem Service Impacts Arising from Designation of the Site								[Site Code]
Services	**Relevance to Site**	**Baseline Level**	**Estimated Impacts of Designation**			**Value Weighting**	**Scale of Benefits**	**Confidence**
			Lower	**Intermediate**	**Upper**			
Fish for human consumption								
Fish for non-human consumption								
Gas and climate regulation								
Natural hazard protection								
Regulation of pollution								
Non-use value of natural environment								
Recreation								
Research and Education								
Total value of changes in ecosystem services								

Appendix G

Site Assessment Documents for dSACs and dSPAs

(Document Provided Separately)

G. Site Assessment Documents for dSACs and dSPAs

See Sep document

Appendix H

Social and Distributional Analysis

H. Social and Distributional Analysis

H.1 Fishing (Combined Analysis for New dSACs and dSPAs)

H.1.1 Introduction

The designation of the entire suite of dSACs and dSPAs is estimated to present a risk of the following impacts under the upper scenario:

- Reduce average annual GVA (direct and indirect) by £0.13m to £42.0m (intermediate to upper scenarios); and
- Reduce the average (mean) number of jobs (direct and indirect) by between 0.2 and 73 FTEs (intermediate to upper scenarios).

These are worst-case estimates based on the assumption that all economic activity is lost rather than being displaced to alternative fishing grounds. Since it is likely that some displacement of effort would occur, the economic costs are likely to be lower than those estimated. This may, however, be partly offset by other economic and social costs associated with displacement such as increased fuel costs and a loss of social cohesion among fleets.

In addition to the impact on the commercial fisheries sector, reductions in the quantity of seafish landed locally at UK landing ports, would reduce the supply of locally-landed catch to fish processing facilities and the hotel/restaurant, retail and wholesale trades. The distributional analysis therefore considers how the impacts on both sectors (commercial fisheries and fish processing) are likely to be distributed across different areas of the UK and specific groups of people, and assesses the likely significance of these impacts.

The distributional analysis presented in this appendix considers the distribution of the potential economic (and hence social) costs of designating the entire suite of dSACs and dSPAs. A distributional analysis has also been conducted for each relevant individual dSAC and dSPA and is presented in Tables 6b and c of the Site Assessment Reports in Appendix G.

H.1.2 Distributional Analysis: Summary of Key Results

Six different aspects are assessed qualitatively as part of the distributional analysis:

- Location;
- Age groups;
- Gender groups;
- Fishing groups;
- Income group; and
- Social groups.

The key results of the distributional analysis for the commercial fishing and fish processing sectors are summarised in Tables H.1 and H.2 below.

Table H.1 Combined new dSAC and dSPA proposals - Distribution of Impacts for commercial fisheries and fish processors (assuming zero displacement of fishing activity): location, age, gender

Sector/Impact	Location			Age			Gender	
	Reductions in Value of Landings/Job Losses, by Region	Port (s)	Rural, Urban, Coastal or Island	Children	Working Age	Pensionable Age	Male	Female
Commercial Fisheries Reduction in landed value, GVA and employment		It is not possible to associate the jobs impacts with specific ports For under-10m vessels, ports in close proximity to the sites would be most likely to be affected.	Risk to rural & urban coastal, and Island	Risk of xx Potentially significant negative effect at individual level if parent loses job/ becomes unemployed	Risk of xxx	Risk of xx Potential negative effect at individual/ family level if retirees own affected vessels or live in households affected by unemployment	Risk of xxx Potential significant negative effect at individual/family level	Risk of xx Potentially significant negative effect at individual/family level if member of household loses job/ becomes unemployed.
Fish Processors Reduction in local landings at landing ports spread around UK coast	Risk of x Total affected landings value of £0.01m (intermediate) to £4.6m (annual average), mainly shellfish (53%) and demersal fish (43%)	Risk of x	Risk to rural and urban coastal, and Island	Risk of x	Risk of x	0	Risk of x 60% of processors male	Risk of x 40% of processors female

Impacts:
xxx Significant negative effect;
xx Possible negative effects;
x Minimal negative effect, if any;
0 No noticeable effect expected.

Table H.2 Combined dSAC and dSPA proposals - Distribution of Impacts for commercial fisheries and fish processors (assuming zero displacement of fishing activity): Fishing groups, income groups and social groups

Sector/Impact	Fishing Groups % is of Total landings Affected		Income Group			Social Groups		
	Affected Landings by Vessel Length (<10m, >10m)	Affected Landing by Gear Types/ Vessel Category and Species	10% Most Deprived	Middle 80%	10% Most Affluent	Crofters	Ethnic Minorities	With Disability or Long-Term Sick
Commercial fisheries Reduction in landed value, GVA and employment	Upper scenario: under-10m (33%) over-10m (67%)	Upper scenario: Under 10m drift and fixed nets (27%) Over-10m demersal trawl/seine (35%) Over-10m dredge (20%) Shellfish (53%) Demersal fish (43%) Pelagic fish (5%)	Risk of xx Possible negative impact on 10% most deprived	Risk of xx Possible negative impact on middle income group	Risk of x Information only available on average incomes, not the distribution of income. Not clear, therefore, whether this group will be affected	0	No breakdown of fisherman employment by social group	No employment data but unlikely to be employed in fisheries
Fish Processors Reduction in local landings at landing ports		Risk to processing units that cannot offset reductions in local landings with imported fish: xx	Risk of x	Risk of x	0	0	No breakdown of fish processing employment data available by social group	No breakdown of fish processing employment data available by social group

Impacts:

xxx	Significant negative effect;
xx	Possible negative effects;
x	Minimal negative effect, if any;
0	No noticeable effect expected

H.1.3 Commercial Fishing Distribution Analysis

H.1.3.1 Distribution of Economic Costs (Assuming Zero Displacement of Fishing Activity)

Distribution of Economic Costs by Location

Significant impacts are only present as a risk under the upper scenario, in which they derive from sites that are widely distributed across the UK. Information on home port and port of landing was not available for the analysis therefore it was not possible to link the affected catches to specific ports. Therefore, no further distributional effects in determining the significance levels of social impacts are considered in this analysis. Due to the more restricted operating range of the under-10m vessels, impacts on this sector are likely to be felt in fishing ports close to each affected site. The distributional impacts data analysis for the sites is presented in Tables 6b and c of the Site Reports in Appendix G.

Distribution of Economic Costs - Age and Gender

Under the assumption that all affected activity is lost, designation has the potential to put approximately 73 FTE jobs at risk in the commercial fishing sector and its upstream supply chain, for the upper scenario. This could generate significant economic and social costs for the individuals concerned and for their families.

In reality, some displacement of fishing activity is likely to occur and hence the impacts on employment are likely to be lower than those estimated. However, the multiple and overlapping designations in some areas mean that there could be significant combined impacts on the commercial fishing sector from dSACs and dSPAs together with existing European Marine Sites, designated MCZs, recommended MCZs, and Nature Conservation MPAs, pMPAs and dSPAs in Scotland. This could result in some fishing activities becoming unviable, with associated social impacts.

Distribution of Economic Costs - Fishing Groups (Vessel Category)

The risks under the upper scenario are mainly to the following gear types and vessel lengths: over-10m demersal trawls; under-10m drift and fixed nets; and over-10m dredges.

These impacts mainly arise from the designations of:

- For over-10m demersal trawls, North Channel and Outer Solway, Outer Moray Firth, Southern North Sea and Southern Sea of Hebrides dSAC;
- For under-10m drift and fixed nets, Southern North Sea, Bristol Channel Approaches and West Wales Marine dSACs; and
- For over-10m dredges, West Wales Marine and North Anglesey Marine dSACs, and to a lesser extent North Channel and Outer Solway, Outer Moray Firth, Southern North Sea and Southern Sea of Hebrides dSACs.

Distribution of Economic Costs - Income Group

While the gross wages and salaries of fisherman are, on average, above those earned by the lowest-paid 10%, it is likely that there will considerable variation in gross earnings across fleets. It is possible

therefore, that designation of the possible dSACs and dSPAs could impact on income groups falling into lowest paid 10% and the middle 80% of workers.

Distribution of Economic Costs by Social Group - Crofters, Ethnic Minorities and Long-Term Sick

It is considered unlikely that significant numbers of crofters, or people with disabilities or the long-term sick would be employed in fisheries and hence the proposals are not anticipated to have any noticeable effects on this social group.

H.1.4 Fish Processing Industry: Distributional Analysis

H.1.4.1 Background on Sector

The fish processing industry is a significant employer in some parts of the UK, providing 19,511 full-time equivalent (FTE) jobs in 2014. 333 of the 403 fish processing units in the UK were for sea fish, supporting 14,305 FTE jobs. The processing industry is mainly concentrated in the Humberside and Grampian regions, which together accounted for 38% of sea fish processing units and 52% of FTEs in 2014 (Image B.3.4). The processing units tend to be larger than average in these regions. Other regions may not account for a large proportion of UK processing capacity, but in more remote regions where other economic opportunities are limited, the contribution of the processing industry to local employment can be substantial.

The sector processes the UK's £1.3bn of annual landings (House of Commons Library, 2015), as well as imported fish.

Under the upper scenario there is a risk that management measures will restrict commercial fishing activity, and have the potential to reduce the quantity of fish and shellfish landed at ports and hence reduce the supply of locally-landed catch to fish processing facilities and the hotel/restaurant, retail and wholesale trades. Further reductions in landings, therefore, would impact on the fish processing industry. The significance of the economic impact will depend upon various factors, including:

- The extent to which the landings of different species are affected (i.e. pelagic, demersal shellfish) and the dependency of different processing units on these species;
- The distribution of affected landings across landing ports/regions and the dependency of landing ports on the affected landings; and
- The dependency of fish processing units in these regions/ports on processing locally landed catch and their ability to offset reductions in local landings with imported fish.

The target species most affected by the proposed management measures under the upper scenario are shellfish (53% by value) and demersal fish (47%). Only 5% of affected landings by value relate to pelagic species. Processing facilities that rely on local supply of demersal fish and shellfish may be significantly affected by the proposals under the upper scenario.

In particular, processing facilities that rely on supply of demersal fish from the Bristol Channel Approaches dSAC and the Southern North Sea dSAC could be significantly affected (demersal fish from these sites account for 12% and 26% respectively of the total value of landings affected across the

proposed sites). Due to the size of the Southern North Sea dSAC, these impacts would be distributed across a range of ports, reducing the impact on any one individual port, but could still be significant in some areas.

Processing facilities in Wales that rely on supply of shellfish from Bristol Channel Approaches, West Wales Marine and North Anglesey Marine dSACs could be significantly affected (shellfish from these sites account for 10% and 6% respectively of the total value of landings affected across proposed sites). In Scotland, shellfish processing facilities that rely on shellfish from Southern Sea of Hebrides (10%), North Channel and Outer Solway (9%), Outer Moray Firth (7%) and North Minch (5%) dSACs could also be affected (values in brackets are the value of shellfish landings affected in those sites as a percentage of the total value of landings affected across all proposed sites).

H.1.4.2 Other Distribution of Economic Costs

Insufficient information is available to assess the distribution of impacts across age and gender of employees, minority social groups or regions/ ports. However, the risk of significant effects on fish processing overall is relatively small (as around 0.15% of UK landings would be affected, any impact would be localised), although where landings affected represent a significant proportion of local landings, and the processing industry relies on local landings for a large proportion of their inputs, impacts could be greater. Impacts are only present under the upper scenario, and spread across the UK, so a detailed analysis is not regarded as necessary.

H.2 Marine Energy Sector - Renewable Generation by Wind and Tidal Stream (Combined Distributional Analysis for dSACs)

H.2.1 Introduction

The designation of the three dSPAs is not anticipated to give rise to significant economic impacts associated with potential management measures for the offshore renewables sector. The suite of dSACs is not estimated to give rise to significant economic impacts associated with potential management measures for the offshore renewables sector under the lower or intermediate scenarios. Under the upper scenario, there is potential for economic impacts to arise as a result of management measures on the offshore renewables sector (Tables H.3 and H.4)

These are worst-case estimates based on the assumption that all economic activity is lost rather than being displaced to alternative generation sites. However, the scale of the projects potentially affected is such that this displacement may not be possible.

Under the upper scenario the impact on the offshore wind and tidal stream energy generation sectors would be very significant, but it is recognised that this scenario is very unlikely. In both cases there could be strategic impacts on the sectors that could have significant social impacts. The distributional analysis presented in this appendix considers the distribution of the potential economic (and hence social) costs of designating the entire suite of dSACs. A distributional analysis has also been conducted for each relevant individual dSAC and is presented in Tables 6b and c of the Site Reports in Appendix G.

Table H.3 Potential impacts to GVA and employment for offshore wind sub-sector (dSAC)

GVA £'000 (Direct, indirect and induced) (Present value over assessment period (2015 – 2034) at 2015 prices) and employment (undiscounted) impacts			
Location	**Lower Estimate**	**Intermediate Estimate**	**Upper Estimate**
Southern North Sea			
GVA:			
▪ Construction	0	0	1,035
▪ Operation	0	0	888
▪ Total	0	0	1,924
Employment (average):			
▪ Construction (2017 – 2021)	0	0	5,353
▪ Operation (2020 – 2034)	0	0	730
Outer Moray Firth			
GVA:			
▪ Construction	0	0	454
▪ Operation	0	0	400
▪ Total	0	0	854
Employment (average):			
▪ Construction (2016 – 2023)	0	0	1,470
▪ Operation (2020 – 2034)	0	0	326

Table H.4 Potential impacts to GVA and employment for tidal stream sub-sector (dSAC)

GVA £m (Direct, indirect and induced) (Present value over assessment period (2015 – 2034) at 2015 prices) and employment (undiscounted) impacts			
Location	**Lower Estimate**	**Intermediate Estimate**	**Upper Estimate**
North Channel and Outer Solway			
GVA:			
▪ Construction	0	0	34
▪ Operation	0	0	12
▪ Total	0	0	46
Employment (average):			
▪ Construction (2018 – 2019)) (average number of jobs p.a. during construction period)	0	0	525
▪ Operation (2020 – 2034)) (average number of jobs p.a. during operation)	0	0	25
North Anglesey Marine / Gogledd Môn Forol			
GVA:			
▪ Construction	0	0	24
▪ Operation	0	0	9
▪ Total	0	0	32
Employment (average):			
▪ Construction (2016 – 2019)) (average number of jobs p.a. during construction period)	0	0	175
▪ Operation (2018 – 2034)) (average number of jobs p.a. during operation)	0	0	16
West Wales Marine / Gorllewin Cymru Forol			
GVA:			
▪ Construction	0	0	13
▪ Operation	0	0	5
▪ Total	0	0	19

GVA £m (Direct, indirect and induced) (Present value over assessment period (2015 – 2034) at 2015 prices) and employment (undiscounted) impacts			
Location	**Lower Estimate**	**Intermediate Estimate**	**Upper Estimate**
Employment (average): ▪ Construction (2016 – 2017)) (average number of jobs p.a. during construction period) ▪ Operation (2017 – 2034)) (average number of jobs p.a. during operation)	0 0	0 0	196 9

H.2.2 Marine Energy Sector - Renewable Generation by Wind and Tidal Stream - Distributional Analysis: Summary of Key Results

Six different aspects are assessed as part of the distributional analysis:

- Location;
- Age groups;
- Gender groups;
- Income group; and
- Social groups.

The key results of the distributional analysis for the marine renewable energy sectors are summarised in Table H.5 below. For some aspects, the distribution of costs (e.g. across different Scottish regions and ports) has been assessed quantitatively. For others (i.e. age and gender), the analysis indicates whether designation of the possible MPAs and dSPAs is likely to impact on these groups, and, if so, whether the impact is anticipated to be minimal, negative, or significantly negative.

Table H.5 Combined new dSAC and dSPA proposals - Distribution of Impacts for energy generation (renewable): location, age, gender

Sector/Impact	Location			Age			Gender	
	Reductions in Value of Landings/Job Losses, by Region	Port (s)	Rural, Urban, Coastal or Island	Children	Working Age	Pensionable Age	Male	Female
Marine Energy – Renewable Generation by wind and tidal stream	Distributed across Eastern England, Southwest and Northwest Scotland, and West Wales. Upper scenario - potential loss of 11,211 short-term jobs during construction and 502 long-term jobs associated with operation.	Wind sector job impacts could be experienced anywhere along the East Coast, although main construction facilities likely to be in Humber at Hull and Killingholme. O&M facilities could use many of the smaller East coast ports as well. Construction could take place from Nigg/ Cromarty/ Ardersier with O&M also provided by smaller ports. For tidal stream, impacts could occur at Mull of Galloway (see HIE MRIP Report), Anglesey (Holyhead) or St Davids (Pembroke/Milford Haven).	Impacts concentrated in coastal areas	xxx Potentially significant negative effect at individual level if parent loses job/ becomes unemployed	xxx	xx Potential negative effect at individual/ family level if retirees live in households affected by unemployment	xxx Potential significant negative effect at individual/family level	xxx Potential significant negative effect at individual/family level
Supply chain to sector, particularly during construction phase.			Impacts concentrated in coastal areas	xxx Potentially significant negative effect at individual level if parent loses job/ becomes unemployed	xxx	xx Potential negative effect at individual/family level if retirees live in households affected by unemployment	xxx Potential significant negative effect at individual/family level	xxx Potential significant negative effect at individual/family level

Impacts:

xxx	Significant negative effect;
xx	Possible negative effects;
x	Minimal negative effect, if any;
0	No noticeable effect expected.

H.2.3 Marine Energy Sector - Renewable Generation by Wind and Tidal Stream - Distribution Analysis

H.2.3.1 Distribution of Economic Costs by Location

For offshore wind, the main impact is associated with Southern North Sea dSAC with lesser impact on outer Moray Firth dSAC. Depending on which developments might be affected by SNS dSAC, job impacts could be experienced anywhere along the East Coast, although main construction facilities likely to be in Humber at Hull and Killingholme. O&M facilities could use many of the smaller East coast ports as well. For Outer Moray Firth, construction could take place from Nigg/ Cromarty/ Ardersier with O&M also provided by smaller ports (See Scottish Enterprise NRIP report).

For tidal stream, impacts could occur at Mull of Galloway (see HIE MRIP Report), Anglesey (Holyhead) or St David's (Pembroke/Milford Haven).

Although the scale of potentially affected activity cannot be allocated to specific ports, the magnitude of impacts mean that there are likely to be major impacts on ports in the affected areas of the UK.

H.2.3.2 Distribution of Economic Costs - Age and Gender

Under the assumption that all affected activity is lost, the management measures under the upper scenario would have the potential to put thousands of FTE jobs at risk in the energy generation sector and its supply chain. This could generate significant economic and social costs for the individuals and communities and regions concerned and have social consequences for all age groups, beyond those directly or indirectly employed in the sectors' activities. However, this scenario is considered to be very unlikely.

H.2.3.3 Distribution of Economic Costs - Income Group

The scale of potential employment impacts and nature of the construction supply chain mean they are likely to influence job opportunities in all income sectors. Those in highest income brackets are more likely to relatively less well represented amongst the affected individuals, and be mobile with respect to job opportunities, and therefore may be slightly less significantly affected. However, this scenario is considered to be very unlikely.

H.2.3.4 Other Distribution of Economic Costs by Social Group - Ethnic Minorities and Long-Term Sick

The scale of potential employment impacts and nature of the construction supply chain mean they are likely to influence job opportunities and social outcomes in many if not all minority social groups in the communities impacted. These include ethnic minorities, and those with disabilities and the long term sick. However, this scenario is considered to be very unlikely.

H.2.3.5 Other Strategic Socio-Economic Costs

The scale of potential employment impacts means that, particularly under the upper scenario, there is a risk of a reduction in confidence in marine renewable energy investment. This could impact the strength of the UK supply chain for the sector, making future investments more expensive for the UK to undertake. It could result in a greater reliance on imports in future, making it less likely to result in economic benefits in the UK. However, this scenario is considered to be very unlikely.

Appendix I

Marine Wildlife Tourism in the UK

I. Marine Wildlife Tourism in the UK

I.1 Introduction

Nature-based tourism is a significant industry in the UK; for example, in Scotland, the direct economic impact of nature-based tourism is £1.4 billion per year, supporting 39,000 jobs (full-time equivalent) nearly 40% of all tourism spending[25]. Part of this is Scotland's marine wildlife tourism offer, including its position as one of the top-10 whale watching locations internationally (IFAW, 2009). UK national parks (10 in England, 3 in Wales, and 2 in Scotland) are estimated to have 71 million visitors per year, with an annual spend of approximately £5,350 million[26]. It can be argued that through designation, the marine tourism experience in the UK can be enhanced through the protection of key features to SAC and SPA sites. This increases the reliability of the quality (i.e. makes more secure) of the UK marine-nature tourism offer, and potentially enhances it. Both these factors could increase the potential economic impact of marine wildlife tourism. It may also be a supporting factor in the quality of experience in other (not predominantly wildlife-based) types of marine recreation (e.g. sailing).

As is outlined in Section 3.5.3.1, recreation activities take place in a number of the proposed sites, indicating the important linkage between designation and tourism activities in the marine environment.

I.2 Marine Wildlife Tourism in Proposed Sites

A number of studies have attempted to elicit economic values for recreation in the marine environment; a selection of these values is outlined in Table I.1 below. These values represent use values of marine species and habitats (per year), non-use values of marine protection (one-off values), and relevant marine tourism statistics.

The Kenter *et al*. (2013) data is discussed in the main report. Parsons *et al*. (2003a) looked specifically at the impacts of cetacean tourism in West Scotland. The areas covered in the study included the west coast of mainland Scotland, Kintyre Peninsula in the south, to Cape Wrath in the north, and the offshore islands of the Inner Hebrides, and the Western Isles. The values of this study are therefore particularly relevant to the proposed SACs that fall in these areas, including the Southern Sea of Hebrides, and North Minch. Surveys for the study were conducted with individuals involved with whale watching, such as tourists on whale-watching trips, boat operators, visitor centre managers, local residents, and general tourists in the area. The survey found that in 2000, approximately 242,000 cetacean-related tourists visited West Scotland. Table I.1 includes further values from this study, indicating the high revenue values associated with cetacean-related tourism in the west of Scotland.

25 http://www.snh.gov.uk/docs/B720765.pdf accessed 27/3/15

26 http://www.nationalparks.gov.uk/learningabout/whatisanationalpark/factsandFigures accessed 16/6/2015

Table I.1 Selected values related to marine tourism

Region	Category	Value	Study
Recreational users use-values or marine species and habitats (non-market values)			
UK	Angler WTP for specimen fish per annum	£23.58	Kenter *et al*. (2013)
UK	Angler WTP for rocky seafloor with tide swept channels per annum	£25.14	Kenter *et al*. (2013)
UK	Angler WTP for each additional protected species per annum	£0.30	Kenter *et al*. (2013)
UK	Angler WTP for shipwrecks per annum	£8.87	Kenter *et al*. (2013)
UK	Diver WTP for rocky habitats and wrecks per annum	£18.98	Kenter *et al*. (2013)
UK	Diver WTP for large fish per annum	£7.64	Kenter *et al*. (2013)
UK	Diver WTP for bird colonies per annum	£7.02	Kenter *et al*. (2013)
UK	Diver WTP for octopus per annum	£13.42	Kenter *et al*. (2013)
UK	Diver WTP for seals per annum	£15.97	Kenter *et al*. (2013)
UK	Diver WTP for the presence of protected species per annum	£0.44 per species	Kenter *et al*. (2013)
Users non-use values of marine site protection (non-market values)			
UK	Angler amount WTP to give one-off donation for protection of the dive/angling site presented to respondent and its natural features in the future against risk of harm and degradation	£10.28	Kenter *et al*. (2013)
UK	Diver amount WTP to give one-off donation for protection of the dive/angling site presented to respondent and its natural features in the future against risk of harm and degradation	£11.13	Kenter *et al*. (2013)
Marine tourism statistics			
Scotland	Number of cetacean related tourists (in 2000)	242,000	Parsons *et al*. (2003a)
Scotland	Creation of jobs from cetacean related-tourism (in 2000)	59 full-time, 1 part-time	Parsons *et al*. (2003a)
Scotland	Direct economic income from cetacean-related tourism (per annum)	£1.77 million	Parsons *et al*. (2003a)
Scotland	Tourist expenditure in rural West Scotland solely due to the presence of whales (i.e. additional tourism income for the region in 2000)	£5.1 million	Parsons *et al*. (2003a)
Scotland	Total gross income generated (directly and indirectly) by cetacean-related tourism in rural West Scotland in 2000	£7.8 million	Parsons *et al*. (2003a)
Scotland	Number of whale watchers in 2008 (Scotland ranked #10 in the world, based on number of whale watchers)	223,941	IFAW (2009)
Wales	The value of wildlife - based activity to the Welsh economy was investigated in 2007 and the final report, Wildlife Economy Wales	total output of £1.9 billion direct output value of £1,426 million	(CCW 2007)
Wales	Wales marine and coastal environment	£1.5 billion (direct contribution to GDP)	National Trust (2006)
Wales	Total expenditure in case study areas in the Pembrokeshire Coast National Park	Total expenditure of around £60m per annum	MPC *et al* (2013)
Wales	Tourism brings to the Pembrokeshire seabird islands of Skomer and Skokholm	Around £330,000 of visitor expenditure per year	Wildlife Trust Wales

Referring to the numbers derived specifically for Scotland, Parsons *et al*. (2003a) estimated that the direct economic income from cetacean-related tourism in Scotland is approximately £1.77 million per annum, with £7.8 million of total gross income generated by cetacean-related tourism in rural West Scotland. More recently, Dolphin watching on the east coast of Scotland has been estimated to generate £4 million for the local economy each year[27]. As the feature of the proposed SACs is harbour porpoise, it must be noted that the species are small and relatively inconspicuous, and therefore are less usually a subject for marine wildlife tourism compared to other cetaceans. Thus, the values estimated in Parsons *et al*. (2003a) are considered to be an overestimate for the proposed SACs.

Dickie *et al*. (2006) also provide data on the number of visitors to various bird watching sites, highlighting the important role of key features in attracting tourism. The Isle of Mull, a site which is of relevance to the Sea of Hebrides SAC site, receives approximately 350,000 visitors per year, and it is estimated that about £1.4 - £1.6 million each year is generated by visitors due to the presence of white-tailed eagles.

Sea angling is another important visitor activity in the UK. As is described in the main report, marine sea angling is linked to the quality of the marine environment. This is a direct link through the availability of fish, and indirectly through the quality of the experience at locations where it is undertaken. A Defra funded Sea Angling Survey found that in 2012, approximately 1.08 million people in Great Britain went sea angling; this is comprised of 884,000 from England, 125,000 from Scotland, and 76,000 from Wales (Armstrong *et al*., 2013). They further estimated that angler spend in 2012 was £1.23 billion, which equates to £831m in direct spending (Armstrong *et al*., 2013). Additionally, a study by Riddington *et al*. (2014) estimated that 150,000 people in Scotland go sea angling, with a visitor expenditure of £141 million every year.

[27] http://www.snh.gov.uk/docs/B720765.pdf accessed 27/3/15

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