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Research Policy Analysis
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The Environmental Assessment of Plans and Programmes (Wales) Regulations 2004

Ireland-Wales Co-operation Programme 2014-2020
Strategic Environmental Assessment

Welsh European Funding Office and
the Southern & Mid-Eastern Regional Assembly

ENVIRONMENT REPORT [v6]
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Environment Report

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Annexes

1 INTRODUCTION

1.1 Purpose of the Report

1.1.1 This Strategic Environmental Assessment (SEA) report has been produced by Bangor University in association with Old Bell 3 Ltd on behalf of the Welsh European Funding Office (WEFO). It relates to the Ireland-Wales Co-operation Programme (referred to in the text as the IWCP) for the funding period 2014-2020.

1.1.2 Its production has been guided by a number of SEA documents including:

- Implementation of Directive 2001/42/EC 'on the assessment of the effects of certain plans and programmes on the environment'. European Commission – Environment Directorate-General, 2003. (European Commission Guidance on the SEA Directive);
- A Practical Guide to the Strategic Environmental Assessment Directive. Office of the Deputy Prime Minister and Administrations in Scotland, Wales and Northern Ireland, September 2005;
- The Environmental Assessment of Plans and Programmes (Wales) Regulations 2004
- Implementation of SEA Directive (2001/42/EC) Guidelines for Regional and Planning Authorities November 2004. Government of Ireland.
- S.I. No. 435/2004 - European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004
- European Communities (Environmental Assessment of Certain Plans and Programmes) (Amendment) Regulations 2011, (S.I. No. 200 of 2011)
- The DoECLG Circular (PSSP 6/2011) '*Further Transposition of the EU Directive 2001/42/EC on Strategic Environmental Assessment (SEA)'*

1.1.2 The objective of the SEA Directive is

" to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes […] by ensuring that […] an environmental assessment is carried out of certain plans and

programmes which are likely to have significant effects on the environment."[1]

1.1.3 Articles 3(2)(a) and 3(4) apply the legal obligation to carry out an SEA to the Rural Development Programme. Furthermore, article 3(2)(b) of the Directive requires an environmental assessment to be undertaken for plans and programmes requiring assessment under article 6 or 7 of the Habitats Directive.[2]

1.1.4 In the case of Wales, this is reiterated in Part 2 of the 2004 regulations[3], and in Ireland's case this is stated in Article 9 of the 2004 regulations as amended[4].

1.1.5 This SEA has been carried out in conjunction with the development of the IWCP and its overall Ex-Ante Evaluation. It aims to ensure that the programme contributes positively to a high level of environmental protection, as well as supporting the goal of the Welsh Government of working towards sustainable development. It does this:

- by setting out the environmental parameters within which the IWCP will operate;
- by identifying, describing and assessing likely significant effects on the environment arising from the programme's implementation;
- by discussing mitigation where likely significant effects are identified, and where necessary recommending measures for avoidance where mitigation cannot be applied;
- by considering reasonable alternatives to the IWCP; and
- by describing appropriate approaches to monitoring, bearing in mind the high level of this SEA.

1.1.6 The purpose of this SEA is therefore is to inform the development of the IWCP prior to its adoption, and to provide an environmental context for its implementation.

1.2 SEA requirements

1.2.1 The Welsh[5] and Irish[6] regulations require that the Environmental Report contains the appropriate levels of information to enable its audiences to

[1] Article 1 of the SEA Directive 2001/42/EC of 27 June 2001

[2] Council Directive 92/43/EEC of 21 May 1992

[3] The Environmental Assessment of Plans and Programmes (Wales) Regulations 2004

[4] S.I. No. 435/2004 - European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004

understand the assessment process, and the environmental context and issues relevant to the programme. Table 1 identifies those sections within the Environmental Report that relate to the specific requirements of the regulations

Table 1: References to the SEA Regulations

Environmental Report - Information to be included	Relevant Section
1. An outline of the contents, main objectives of the plan, and of its relationship with other relevant plans and programmes.	**Section 9, page 66** **See also pp73-74**
2. The environmental characteristics of areas likely to be significantly affected.	**Sections 4-7, pp13-60**
3. Any existing environmental problems which are relevant to the plan including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC and 92/43/EEC.	**Section 8, page 61**
4. The environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan and the way those objectives and any environmental considerations have been taken into account during its preparation.	**Annex I**
5. The likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects, on issues such as: biodiversity; population; human health; fauna; flora; soil; water; air; climatic factors; material assets; cultural heritage including architectural and archaeological heritage; landscape; the interrelationship between the above factors.	**Section 11, page 79** **Annex II**
6. The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the	**Section 11.1.9, page 84**

[5] Welsh Instrument 2004 No.1656 (W.170) Regulation 12 and Schedule 2

[6] S.I. No. 435/2004 Regulation 12

environment of implementing the plan.	
7. An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken.	**Section 12, page 85**
8. A description of measures envisaged concerning monitoring in accordance with Regulation 17.	**Section 13, page 93**
9.. A non-technical summary of the information provided under paragraphs 1 to 9.	**Accompanying document**

1.3 The scope of the assessment

1.3.1 The assessment aims to consider the implications of the programme from four perspectives:

Level - The programme as presented is strategic in nature, so whilst the report acknowledges the implications of the programme for delivery on the ground, it should avoid concentrating on details that should be addressed at project level.

Spatial - Although the programme is targeted towards East and South East Ireland and West Wales, it is possible that some projects may have environmental implications beyond the defined area, not least where innovation may result in developments elsewhere. The programme may result in transboundary effects.

Thematic - The SEA Directive specifies a number of themes that need to be addressed. Although they should not be seen as inclusive or exclusive, the assessment focuses on those themes that are considered likely to be significantly impacted on by the programme. Of equal importance are the interactions between these themes.

Temporal - Although the programme has a lifetime of seven years, its consequences are likely to be long lasting. Account has been taken of long term effects, both positive and negative.

1.4 The SEA process prior to the Environmental Report

1.4.1 The regulations state[7] that the responsible authority must consult the consultation bodies when developing the assessment and its report. A

[7] Environmental Assessment of Plans and Programmes (Wales) Regulations, Part 3, section 12(5)
EC (Environmental Assessment Of Certain Plans And Programmes) Regulations 2004 Article 13

screening report was issued in April 2014 in order to determine the need for a full assessment. Following responses from the Welsh and Irish consultation bodies, a **scoping report** was issued in June 2014. This report reflects the opinions of the consultation bodies which responded (see Annex III).

1.5 Relevant EU Directives and Standards

1.5.1 Annex I provides a comprehensive list of directives and regulations, as well as UK, Irish, and Welsh policies and strategies. Although all these have some relevance to the programme and to this assessment, the 'stand out' directives include those that refer to air and water quality (freshwater and marine), to biodiversity conservation, to the management of waste (industrial, domestic and agricultural), to coast and flood management and to energy.

1.5.2 In the context of this assessment it is worth noting that projects emerging from the programme may be subject to the EIA Directive[8] which provides for a detailed assessment of the key environmental issues. Guidance has been issued in Ireland by the Department for Environment, Community and Local Government[9] and in Wales by then Welsh Office[10].

1.5.3 Agriculture and Forestry have their own statutory assessment provisions, including the Environmental Impact Assessment (Agriculture) (Wales) Regulations 2007, and the Environmental Impact Assessment (Forestry) (England and Wales) Regulations 1999. The equivalent Irish agriculture regulation is the European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011. In Ireland, two regulations relate to EIA and habitats (S.I. No. 473 of 201 and S.I. No. 584 of 2011).

1.5.4 Also worth noting is Article 6(3) of the European Directive 92/43/EEC on the 'Conservation of Natural Habitats and Wild Fauna and Flora', referred to as the 'Habitats Directive', which states:

"*Any plan or project not directly connected with, or necessary to, the management of the [European] site, but likely to have a significant effect thereon, either individually or in combination with other plans or projects,*

[8] Council Directive 85/337/EEC as amended and codified by 2011/92/EU

[9] Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (2013)

[10] Circulars 02/99 and 11/99 Environmental Impact Assessment

shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives".

1.5.5 A 'European site' includes Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). For the purposes of Habitats Regulations Assessment in Wales, the Welsh Government also expects plan making to treat all Ramsar sites, candidate SACs (cSACs) and potential SPAs (pSPAs) in the same manner as European sites when considering the implications of development plans[11].

1.5.6 The purpose of Habitats Regulations Assessment is to ensure that any plan or project, alone or in combination with other plans or projects, shall not have an adverse impact on the integrity of European sites, and that competent authorities shall agree to a plan or project after ascertaining that it will not affect the site concerned. Guidance is provided in Ireland by the Department of Environment, Heritage and Local Government (2009/2010)[12], and in Wales by Natural Resources Wales[13].

[11] Annex 6: the Appraisal of Development Plans in Wales under the provisions of the Habitats Regulations.

[12] Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities (2010)

[13] Tyldesley, D. 2011 *Assessing projects under the Habitats Directive: guidance for competent authorities.*

2 METHODOLOGY

2.1 Having laid out the structure of the IWCP (see sections 4.2.2 and 4.2.3) the Types of Action (ToA) were analysed for their environmental implications, in order to provide a basis for describing the environmental baseline and the key issues (see chapters 5 to 9).

2.3 This was followed by a trawl of material related to development plans and to shoreline, flood and river basin management plans at local or regional levels, especially where SEAs and HRAs were available on-line (see references).These, along with material on the marine environment, including previous marine-based projects, have been analysed and summarised.

2.4 A list of relevant European, national and regional legislation and policy has been reviewed to provide a context for this report (annex I).

2.5 Given the contrasting ecological, social, geographical and topographical context, and also considering the importance of the sea itself as an ecosystem, a climate controller and a resource, this report focuses on the marine environment and the two terrestrial (Wales and Ireland) environments as discrete systems, whilst recognising the interactions between them and hence the potential positive and negative synergies of proposals that may emerge from the IWCP.

2.6 Whilst the IWCP emphasises marine resources and coastal communities, it does not exclude rural environments and communities, and therefore themes related to the rural environment will need to be taken into account in scoping the report, whilst not going beyond the reach of the programme.

2.7 The baseline data is drawn exclusively on grey literature including relevant SEAs and EIAs of development plans, river basin management plans, and coast and flood management plans. Where possible, more than one source will be sought to ensure accuracy, and these will be quoted and referenced.

3 CHALLENGES

3.1 Whilst a number of the background documents are up to date, in some cases the data on which they are based may be somewhat dated, and where possible more recent sources will need to be sought.

3.3 There is some variation in environmental data presentation between Wales and Ireland, and therefore there may be some variation in the presentation of environmental baselines.

3.4 Sources of environmental data that is specific to the level of either of the two partner regions are somewhat limited. Much of the data is largely presented at a Wales or Ireland level[14] or at the level of individual districts. The environmental baseline has largely relied on aggregating up data from this lower level, which provides useful detail but is variable.

3.5 Some environmental themes, such as terrestrial biodiversity or water quality, have more detailed information than others, such as marine ecosystems. Studies of potentially important environmental themes, especially where linked to the principle of the ecosystem approach (such as the water retention capacity of woodlands, or net flows of ecosystem benefits), are still at an early stage, and therefore data is limited.

3.6 A key challenge has been to ensure that Welsh and Irish policy and regulation have been recorded accurately. Whilst Ireland is a sovereign state with its own legislature, Wales has delegated law making powers in certain spheres, including environment and land use planning. There are some contrasts between Wales and Ireland with regard to the scope of some regulations, as well as in policy matters.

3.7 Whilst understandably the programme's prescribed types of action allow for flexibility, there were some difficulties in interpreting the terms used to describe some of them (see section 11.1.4).

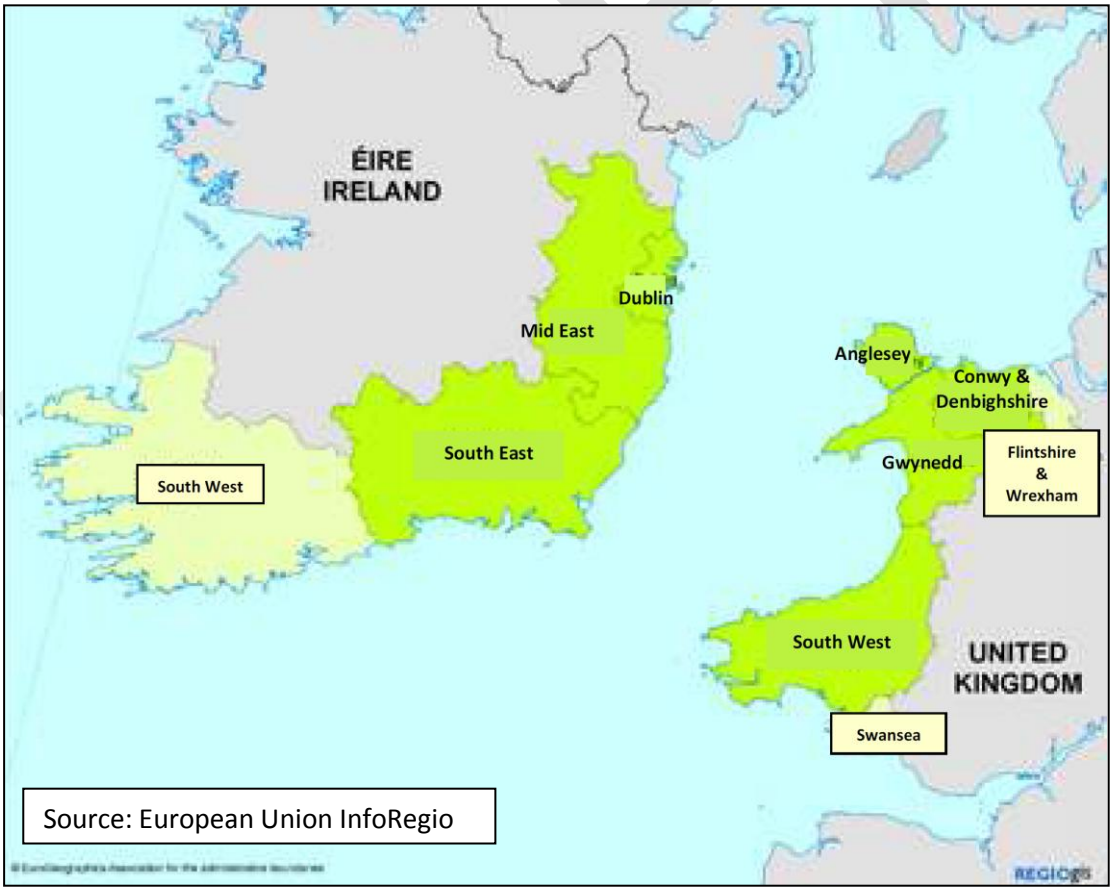
[14] For example the Ireland and the Wales State of Environment Reports 2012

4 ENVIRONMENTAL BASELINE AND ISSUES

4.1 Introduction

4.1.1 'Ireland's Environment - An Assessment' was published by the Environmental Protection Agency in 2012[15]. In Wales, the State of the Environment Statistical Bulletin (2012) provides an annual summary on a range of indicators reviewing the state of the environment in Wales, and allocates them a status based on their long term trends[16]. The results for individual indicators can be found in the 'State of Environment Report' that is published alongside the bulletin. In addition to the report, data are available via the StatsWales website[17]. These documents provide important information at a national level, as well as useful statistics and assessments of pressures and trends. They also informed the formulation of the SEA objectives in this report.

Figure 1: Map of Programme Area



[15] http://www.epa.ie/pubs/reports/indicators/00061_EPA_SoE_2012.pdf

[16] http://wales.gov.uk/topics/statistics/ theme/environment/?lang=en#

[17] https://statswales.wales.gov.uk/Catalogue/Environment-and-Countryside

4.1 General description of the area

4.1.1 The area comprises three distinct 'environmental systems' - North and West Wales; south east/mid-east Ireland; the Irish Sea. Whilst each has its own environmental characteristics, there is a clear environmental relationship between them, especially in terms of climate and marine currents. Although the prevailing winds are west to north west, there may be some effects in terms of air currents, although given the largely rural nature of both regions (apart from the obvious exception of Dublin), air pollution from industry and transport is unlikely to be a significant transboundary factor.

4.1.2 The population of Dublin is 527,612 (2011)[18], making it by far the largest centre of population. That of County Dublin, the Mid-East, South East and South West Regions is about 3,360,000[19]. In contrast, the population of the Welsh participating counties is about 1,652,900[20].

4.1.3 In terms of spatial coverage, the Welsh counties are contained within 12,321 sq km, whilst the Irish counties cover 28,666 sq km.

4.1.4 The total area of the Irish Sea is estimated at about 1000,000 sq km[21]. However, the area within the scope of this study approximates to the area defined as the South Irish Sea, namely 58,000 sq km, as described in the Irish Sea Pilot[22].

[18] http://www.dra.ie/dynamicdata/profile-of-dublin.php

[19] http://www.cso.ie/en/newsandevents/pressreleases/2013pressreleases/pressreleaseregionalqualityoflifeinireland2013/

[20] http://wales.gov.uk/statistics-and-research/?lang=en

[21] http://www.britannica.com/EBchecked/topic/294164/Irish-Sea

[22] http://jncc.defra.gov.uk/pdf/irishseapilot_all.pdf, page 26

5 TERRESTRIAL ENVIRONMENT - WALES

5.1 Introduction

5.1.1 As stated in paragraph 3.4, much of the immediately available data is based either at local (i.e. development plan and below) levels or at national level. A number of local development plan SEAs were trawled for environmental information that reflected the distinctive nature of the counties involved. Therefore, whilst much of the data is presented largely at Wales level, where possible reference is made to individual counties or to the region as a whole.

5.1.2 The Welsh Government also produces a set of Sustainable Development Indicators[23], some of which correspond to the SoE statistics. The status of some indicators may differ between the two publications (for example, ecological footprint), mainly because the Sustainable Development Indicators look at more recent trends and present progress against an agreed set of indicators from a baseline year of 2003 (or the nearest year for which data are available), whereas the State of the Environment report considers progress over a longer term (in some cases, where data permits, from the 1990s).

5.1.3 The area is predominantly rural[24] with agriculture being the dominant land use[25].The west, north and south west of the region is delineated by coastline, which varies from steep sea cliffs in parts of the Anglesey, Gwynedd, Ceredigion, and Pembrokeshire coasts, to extensive beaches and dune systems in the same areas and in Carmarthenshire. The Wales Coast Path runs through most of the counties involved in the IWCP.

5.1.4 The westward facing areas have many short fast flowing river systems determined by the proximity of extensive catchment areas and their geology. There are few extensive coastal plains on the west coast. In contrast, the rivers that flow north and south-west/south tend to be longer and their lower valleys and estuaries, flowing through softer geology, are broader with in some cases relatively significant coastal plains with arable land and more extensive settlement.

[23] http://wales.gov.uk/topics/statistics/headlines/sustaindev/120829/?lang=en

[24] For a discussion on definitions of 'rural' see Pateman, T. (2011). Rural and Urban areas: comparing lives using rural/urban classifications. Office for National Statistics.

[25] UK 2005. The Official Yearbook of the United Kingdom of Great Britain and Northern Ireland.. London: The Stationery Office. 2004. pp. 279.

5.1.5 Two of Wales' National Parks are wholly located in Gwynedd and in Pembrokeshire. At 2,130 sq km and 629 sq km respectively, Snowdonia and the Pembrokeshire Coast National Parks occupy 84 per cent and 40 per cent of their administrative counties. About 21 per cent of Gwynedd's population lives within Snowdonia National Park, and about 18 per cent of Pembrokeshire's population lives within its National Park. Internationally, these two areas are referred to as Category V protected landscapes, in contrast to the Irish national parks, which are assigned Category II, according to the management categories defined by the International Union for the Conservation of Nature and Natural Resources (IUCN) (see paragraph 6.1.3).

5.1.6 Most of the area is dominated by westerly weather systems, tending to have a higher than average rainfall and a fairly mild climate. There is a possibility that climate change will exaggerate this pattern and will exacerbate problems of coastal flooding. The warming of the Arctic may also cause an increase in weather systems arriving from a northerly direction as the jet stream shifts further south. This may result in areas previously in the 'rain shadow' of south-westerly winds no longer benefitting from such protection, with associated flood risks particularly in North Wales[26]. The proximity of rivers to constricted settlement and density of infrastructure in some coastal settlements also presents flood issues.

5.1.7 Industrial, agricultural, and forestry practices have been historically associated with watercourses, sensitive habitats, and coastal and marine environments[27]. Redundant and abandoned coal, copper, lead and iron ore mines are a source of groundwater pollution, and with increasing flood conditions, this is a problem that may be exacerbated[28]. Land has tended to be allocated largely on a 'single use' basis, to the exclusion of ecological other functions, which has resulted in a loss of those other functions. Furthermore, such allocations have tended to ignore the functions of surrounding areas of landed, with the result that some landscapes are patchworks of sometimes conflicting land uses. The

[26]http://www.climatecentral.org/news/arctic-warming-is-altering-weather-patterns-study-shows

[27]See StatsWales for example: https://statswales.wales.gov.uk/Catalogue/Environment-and-Countryside/State-of-the-Environment/Environmental-Hazards/NumberOfDaysWithModerateOrHigherPollutionLevels-by-Area-Year

[28]See for example 'Industrial and Urban Groundwater Pollution'. UK Groundwater Forum. BGS NERC 'The State of Groundwater in England and Wales. Environment Agency. (undated). cdn.environment-agency.gov.uk/geho0906bldb-e-e.pdf

adoption and promotion of the ecosystem approach is designed to address these issues.

5.1.8 The rail system in West Wales links Aberystwyth and the north west coast (via Machynlleth) to Shrewsbury, whilst the Heart of Wales line links Llanelli to Craven Arms. The West Wales line from Fishguard, Milford Haven and Pembroke Dock through Carmarthen runs to Swansea and thence to Cardiff and England. In North Wales, the main rail line from Holyhead links the region to Deeside, Chester and destinations in the North West, Midlands and South East of England.

5.1.9 The region has a significant diversity of cultural character and heritage. Gwynedd, the Isle of Anglesey, Ceredigion and Carmarthenshire are traditionally Welsh speaking areas and the language is an important aspect of everyday life. In the north and on the west coast there is a significant reliance on tourism and this is linked to the value set on its landscape and cultural heritage.

5.1.10 The distinctive character of local architecture is mainly found in traditional farm buildings and structures associated with them, and tend to reflect the historic availability of local materials. Parts of the coastline have important historic castles including two of Wales' three Cultural World Heritage Sites and religious buildings and sites. Anglesey, Gwynedd and Pembrokeshire are distinguished by their prehistoric landscapes.

5.2 Biodiversity

5.2.1 Key biodiversity features of this region of Wales include Atlantic oak woodlands; a significant coastal belt that noted for several species of seabird; and a marine SAC. The uplands and valley systems with steep, rocky sides, waterfalls, pools and temperate wet environment, are important habitats for a wide variety of lower and higher plants, invertebrates, birds, reptiles and mammals.

5.2.2 Of Wales' 92 SACs, 20 SPAs and 10 Ramsar sites, 64 SACs, 19 SPAs and 3 Ramsar sites are associated with the region. All these sites are likely to be National Nature Reserves (NNR) designated under the UK Wildlife and Countryside Act (1981 as amended). The distribution of these protected sites is variable. For example, Gwynedd and Anglesey account for 25 NNRs, covering 4891 hectares, over one-third of NNRs by number and just under one-fifth in area. Gwynedd and Anglesey also account for one third of Wales' SPAs[29].

[29] Gwynedd UDP Deposit Plan SEA 2005

5.2.3 In common with other countries in Europe, Wales missed its international biodiversity targets in 2010. Whilst not all of its 'Biodiversity Action Plan' species and habitats are European protected, these are important indicators of the state of biodiversity. In 2005, 59 per cent of Biodiversity Action Plan habitats in Wales were in declining condition. Priority habitats classed as stable or improving increased from 30per cent in 2002 to 36 per cent in 2008. Fifty-four per cent of Biodiversity Action Plan species were assessed as being in 'unfavourable condition' in 2008, but with considerable variation between species groups. For example, 80 per cent of marine mammals and birds were in favourable or recovering condition, while 80 per cent of amphibians, butterflies and fish were recorded as being in unfavourable condition.

5.2.4 Data from individual counties provides further evidence of the situation. For example, sixty per cent of the SAC features assessed in Ceredigion are in unfavourable or unfavourable-declining condition[30]. In Denbighshire of the 30 features assessed, 24 are in unfavourable and 5 in unfavourable-declining condition[31].

5.2.5 Coastal and marine habitats are under particular pressure, with the majority in stable or declining condition. Saltmarsh and coastal lagoons are reckoned to be stable, whilst cliffs, dunes and shingle show a weak decline in condition[32.] However, marine habitats themselves are mostly stable[33], and there has been a downward trend in some polluting substances in the marine environment[34].

5.2.6 However, according to the Wales chapter of the UK National Ecosystem Assessment (UK NEA 2011), about 60 per cent of marine habitats, 8 per cent of terrestrial habitats and 33 per cent of freshwater habitats have witnessed a decline, whilst 83 per cent of woodland, upland and enclosed farmland habitats have shown some improvement. About 25 per cent of wetland and coastal habitats have experienced decline. Specifically in the

[30] Ceredigion LDP SEA scoping report January 2008 page 24

[31] Denbighshire LDP HRA October 2009 Appendix 1

[32]UK NEA 2010 Chapter 20

[33]UK MMAS 2010

[34]State of the Environment Report 2012

case of SACs, 61 per cent of assessed habitat features and 67 per cent of species features are show to be in unfavourable condition[35].

5.2.7 Other indicators present a mixed picture, particularly in the case of birds, with some farmland and woodland birds showing marked declines (some species showing a 42.7 per cent decrease in range) and others (16.9 per cent) an increase in populations[36].

5.2.8 Drivers of change in Welsh Coastal Margin Habitats include:

- Changing tourism patterns and interests
- Land use demands
- Climate change
- Nitrogen deposition
- Sea-level rise

5.2.9 Invasive species, such as the signal crayfish (Pacifastacus leniusculus), the 'killer shrimp' (Dikerogammarus villosus)[37], Himalayan balsam (Impatiens glandulifera),Japanese knotweed (Polygonum cuspidatum), parrot's feather (Myriophyllum aqauaticum), floating pennywort (Hydrocotyle ranunculoides), and Water fern (Azolla filiculoides) are giving rise to concern since they threaten a number of native species, choke waterways and banks, and in some cases damage infrastructure. In coastal waters, Japanese wireweed (Sargassum muticum), New Zealand barnacle (Elminius/ Austrominius modestus) and algae such as Heterosiphonia japonica are also becoming problematic.

5.2.10 Further information on European protected habitats and species will be provided in the Habitats Regulations Assessment carried out in parallel with this Environmental Report.

5.3 Geology and soils

5.3.1 The bedrock geology of the region is almost entirely composed of volcanic and sedimentary rocks from the Ordovician or Silurian periods, although isolated examples from later periods can be seen, such as Tertiary age truncated marine erosion surface at St David's Pembrokeshire. Examples of exposed Ordovician volcanic include Rhobell Fawr in Gwynedd and Treffgarne Gorge in Pembrokeshire. Cader Idris and Snowdon are examples of volcanic activity from later in the period. Sandstones,

[35] Special Areas of Conservation in Wales. Current State of Knowledge report. September 2010

[36] *Ibid.*

[37] http://www.environment-agency.gov.uk/homeandleisure/wildlife/31350.aspx

conglomerates and mudstones from the Silurian period dominate the Welsh landscape. Fossils of the first vascular plants date from the late Silurian period. Exposures of Silurian mudstones can be found along much of the Welsh coastline from Llangrannog to Borth.

5.3.2 Further south, exposures of Carboniferous rock can be found extensively around Saundersfoot and Tenby South Pembrokeshire.

5.3.3 Whilst soil types are well understood and have been categorised[38], there are still gaps in understanding its structure and function. Most of the soils in the region are either podzolic or (in the coastal region) surface water gley soils, with small pockets of lithomorphic and brown soils.

5.3.4 Air pollution, waste, infrastructure, flood risk management and energy demand all have a direct or indirect relationship to the physical, chemical or biological quality of the soil. Soil erosion has been identified as a problem within Wales, which increases the need for soil conditioners, and reduces water retention and filtering properties of the soil. Furthermore, deposition of air pollution may contaminate soils with heavy metals, persistent organic chemicals, sulphur, nitrogen and acidification.

5.3.5 Concern also revolves around the potential impact of climate change. As the Welsh Government has put it,

'Climate change is also expected to lead to changes in soil composition. A reduction in the carbon content of soil will lead to a reduction in the capacity of the soil to absorb rainfall.[39]'

5.3.6 The link between climate change and soil is an important one, since organic soils are an important reservoir for carbon. Welsh soils are thought to contain over 500 million tonnes of carbon. If carbon is lost from organic soils, this has a serious effect on emissions of greenhouse gases.

5.3.7 The quality of agricultural land in the region is largely grade 3 (moderate) or 4/5 (poor), with several pockets of grade 2 (very good) in certain areas such as Conwy and Anglesey.

[38] Avery, B.W. (1980).Soil classification for England and Wales [Higher Categories]. Survey Technical Monograph No. 14, pp67. Harpenden, UK.

[39] Welsh Government National Strategy for Flood and Coastal Erosion Risk Management in Wales. Nov 2011:14

5.3.8 Wales lacks a plentiful supply of terrestrial sand and gravel, and therefore relies on marine dredged sources to supply a Wales-wide demand. The implication is that Wales needs either to import supplies or to intensify its dredging activity in order to meet a significant increase in infrastructural development or that the level of infrastructure proposed is unsustainable.

5.4 Landscape and Visual Amenity

5.4.1 The landscapes of Wales are remarkably varied for such a small nation. The underlying geology and the variety of land use and land cover result in a number of distinctive landscapes that can be identified at both an extensive and at a local level.

5.4.2 Forty-eight 'character areas' have been identified, each of which represents a distinctive character based on a number of landscape factors that provide a sense of place. These factors are geological, historic, habitat, cultural and visual/perceptive. Each of these areas also has its local identity, mapped and described in detail in LANDMAP, Natural Resource Wales' landscape assessment tool. Approximately 25 of these character areas fall within the scope of the IWCP.

5.4.3 Some areas, such as Snowdonia/Eryri and Pembrokeshire, are well-known for certain characteristics, and have been described, written about, appreciated and visited for centuries, and it is perhaps no surprise that each of these areas is a protected landscape. Others, such as the Dovey Valley are less widely known but are nonetheless well-known and appreciated locally. Within these larger areas, distinctive landscapes can be identified and described. The wooded valley systems of south Snowdonia contrast strongly with those of the north, on account of their glacial history, their topography, the underlying geology and hydrology and their historic land uses.

5.4.4 Pressures on the landscape of the region come from a number of sources. Development in the open countryside, including the development of infrastructure, are seen as a key threat to landscape integrity, as does tourism development on the coast. Conversion of land from one use to another, including agricultural intensification, is also seen as a threat to landscape character[40]. Paragraph 6.1.7 refers to 'single use' approaches to land management, which continues to put pressure on landscapes.

[40] See for instance Ceredigion LDP SEA consultation January 2008 page 26

5.5 Cultural assets

5.5.1 Cultural tourism is an important contributor to the Welsh economy. Some of the most important and popular historic site lie within the area in question, for example the World Heritage Edwardian castles on the north and west coasts, and the ecclesiastical site at St David's in Pembrokeshire on the south-west coast. The area also contains some of the most important archaeological sites in Wales (such as Pentre Ifan in Pembrokeshire, Bryn Celli Ddu on Anglesey, Kendrick's Cave and Letty's Filiast on the north coast at Great Orme), industrial sites (including sites associated with the slate industry at Blaenau Ffestiniog and Llanberis, and with the minerals industry at Amlwch and Parys Mountain) and networks including the historic road built by Telford with its Menai Bridge, the steam railways, and the canal system that includes the World Heritage Pontcysyllte viaduct near Llangollen.

5.5.2 The built heritage includes important seaside resorts such as Tenby, Aberystwyth and Llandudno, as well as sites such as Portmeirion with its singular architecture.

5.5.3 In all there are over 2,000 Scheduled Ancient Monuments, over 15,000 listed buildings and over 150 registered historic parks and gardens within the area covered by the Programme.

5.5.4 In both 1996 and 2003, nearly eighty per cent of scheduled ancient monuments were reported to be stable, and about ten per cent are improved or greatly improved. The region contains a rich heritage of historic buildings, including vernacular and agricultural buildings, as well as industrial, ecclesiastical and historic military structures and sites.

5.5.5 In 2007, Cadw commissioned a baseline report on listed Buildings at Risk in Wales. This brought together data from most of the local authority registers. The 2009 summary report[41] estimated that of the 29,896 listed buildings in Wales, 2,882 are 'at risk', and 5,145 are 'vulnerable', owing to the rate of decline of their fabric and character. The report indicates that North West Wales has a particularly high number of 'at risk' buildings. In some areas the threat of flooding is a concern. Also of great concern is the threat posed by rising sea levels to important sites along the coast (including responses by statutory bodies in response to the threat), as well as to intertidal sites that might become exposed and eroded as a result of increasingly violent storms.

[41] Buildings at Risk in Wales". Handley Page partnership for Cadw. (2009)

5.5.6 The number of people who speak Welsh has fallen in the past 10 years, according to the 2011 census. Despite an increase in population the number of Welsh speakers has fallen overall from 582,000 in 2001 to 562,000 in 2011 a two-percentage point drop in the proportion of Welsh speakers in the population as a whole - from 21 per cent to 19 per cent. Gwynedd and Anglesey are the only areas where over half the population now speak Welsh.

5.5.7 The local authorities with the highest percentage of Welsh speakers have not changed but Gwynedd now has 65per cent (down from 69per cent), Isle of Anglesey 57 per cent (down from 60per cent). Welsh is now a minority language in two of its traditional strongholds: Ceredigion at 43 per cent (down from 52 per cent) and in Carmarthenshire at 44 per cent (down from 50 per cent).

5.6 Air quality

5.6.1 Given the diversity of landscape and land cover, the geology, density of settlements, quality of housing, employment patterns, traffic flow and densities of traffic, the quality of the air is likely to be vary across the region.

5.6.2 Air quality relates to a number of variables, including carbon monoxide and dioxide, nitrous oxide, particulates, methane, ozone and radon. Following the decline of heavy industry, the major threat to clean air is now posed by traffic emissions. Petrol and diesel engines emit a wide variety of pollutants, principally carbon monoxide, oxides of nitrogen, volatile organic compounds and particulates, which are having an increasing impact on air quality, particularly in urban areas.

5.6.3 A few councils have declared Air Quality Management Areas (AQMA) in discrete areas where air quality consistently exceeded thresholds[42], but West Wales in general has no AQMAs[43].

5.6.4 Some parts of the region are designated as radon affected, areas, since there are locations such as parts of Conwy[44] where it is estimated that more than one per cent of homes exceed the Government Action Level for

[42] For example Llandeilo (Carmarthenshire) http://uk-air.defra.gov.uk/aqma/details?aqma_id=793; Haverfordwest and Pembroke (Pembrokeshire) http://uk-air.defra.gov.uk/aqma/details?aqma_id=938; http://uk-air.defra.gov.uk/aqma/details?aqma_id=939

[43] See Defra AQMA maps for Wales. http://uk-air.defra.gov.uk/aqma/

[44] Conwy LDP SEA 2011

radon. In parts of north Pembrokeshire, Anglesey and Gwynedd, the number of homes exceeding the action level may be as high as 30per cent[45]. This will need to be considered in the design of new buildings, and particularly homes.

5.7 Climate factors

5.7.1 Climate change relates to several of the baseline discussed here, including flood risk, water resources, air quality and biodiversity. Carbon dioxide (CO_2) is the main contributor to greenhouse gas emissions in Wales. According the Wales State of the Environment Report (2012), it was estimated that in 2010 the energy industries accounted for 41 per cent of total CO_2 emissions; manufacturing and construction industries accounted for 24 per cent; transport accounted for 15 per cent, and the remainder came from domestic, agricultural and waste emissions.

5.7.2 UK climate impact projections quoted in the National Ecosystem Assessment suggest that average annual natural river flows could reduce by 10–15 per cent in Wales by 2050, and natural summer river flows could reduce by 50 per cent or more, with implications for flood hazard regulation and water supply.

5.8 Water - resource and quality

5.8.1 Generally, there has been a downward trend in water leakage, from 249 megalitres per day in 200-02, to 202 megalitres per day in 2010-11. However, this represents 23.5 per cent of total water supplied (WG SoE Report 2012; UK NEA 2011).

5.8.2 Overall, average per capita consumption in Wales has remained fairly stable: having risen from 148 litres/day in 2001 to 152 litres/day in 2008-09, in 2010-11 it was 149 litres/day. Where households were metered, consumption was significantly less.

5.8.3 Not all of the water abstracted in Wales is for home consumption, as there are considerable transfers to English regions. According to the (then) Environment Agency (2010), abstractions in Wales were 40 per cent greater in 2007 than in 1995. The major reasons for abstraction related to electricity supply and represented 75 per cent of total Welsh

[45] Indicative Atlas of Radon in England and Wales. Miles JCH et al Health Protection Agency Didcot and British Geological Survey Nottingham. 2007

abstractions – although it needs to be recognised that most of the water abstracted for this purpose is returned directly to the environment.

5.8.4 Bathing waters have achieved a high level of compliance with EC standards since 2002. For five of the last ten years, compliance has been 100 per cent. It is not clear to what extent this success has been weather related since heavy rainfall in summer results in sewage discharges to the sea that may exceed the EC standards. An increase of climate change-induced extreme weather events may result in increases in the likelihood of exceedance incidents.

5.8.5 For chemical quality, the percentage of river length of good quality has been consistently high at about 95per cent. However, ecological and biological water quality indicates some areas of concern.

5.8.6 Whilst 67 per cent of coastal waters have been assessed as being of 'good' or 'high' ecological quality, this implies that 33 per cent (i.e. one third of the coastal zone) is *not* of good ecological quality. The picture for overall river length of good biological quality is positive at approximately 87 per cent. However, the ecological status for specific water body types is mixed: 36 per cent of transitional water bodies, 34 per cent of rivers, 56 per cent of canals and 21 per cent of lakes assessed were given 'good' or 'high' ecological status in 2011.

5.8.7 In 2002, Environment Agency Wales identified 1,300 mine sites where discharges to water are known to occur (EAW 2002). This continues to be a significant source of pollution, accounting in 2012 for 130 or ten per cent of water bodies failing to meet WFD standards[46]. Other major sources of WFD failures in water bodies are:

- agricultural pollution (155 failing water bodies)
- artificial barriers to fish migration (150 failing water bodies)
- impoundments (reservoirs) and regulated flows (101 failing water bodies)
- sewage discharges (82 failing water bodies).

5.8.8 Freshwater ecosystems in Wales are subject to a variety of human pressures including pollution, sedimentation, extractive fisheries, invasive/non-native species, and over abstraction. Trends such as

[46]Living Waters for Wales, Fifth Water Framework Directive Newsletter, Spring 2012, Environment Agency Wales

population growth, combined with climate-related trends, may significantly impact on the availability of good quality water.

5.9 Flood Risk

5.9.1 According to the Wales NEA (2011), it is estimated that one in six properties in Wales (600,000 people in 357,000 properties, of which 150,000 are residential) is at risk of flooding. The 2004 Foresight Future Flooding Report[47] estimated that economic risk from flood damage to properties and contents would rise from £70 million in 2004 to £1,235 million in the 2080's in the most likely scenario.

5.9.2 Of Wales' 2,740 km of coastline, about 28 per cent has some form of artificial defence works. The erosion of natural flood defences, such as dunes and wetlands, increases the susceptibility of Welsh coasts to risk.

5.9.3 Flooding may emanate from a range of sources, including surface water runoff, groundwater flooding, and pluvial flooding. Changes in land use and hard surfacing of land for road schemes and for urban development, as well as inappropriate development location, are key factors, and will be exacerbated by climate induced changes in weather patterns that may entail increases in storm events.

5.9.4 The effects of flood events are not purely economic. They also include impacts on human health and safety, the disruption of key services, and the loss of important biodiversity.

5.10 Energy generation and consumption

5.10.1 The Wales SoE 2012 stated that in 2008, gas accounted for 60 per cent of public sector energy use[48], electricity accounted for 36 per cent, whilst oil and coal combined accounted for 4per cent of public sector energy use.

5.10.2 'A Low Carbon Revolution' - the Welsh Government's Energy Policy Statement (2010) provides some general information about energy consumption in Wales (p9):

[47]Foresight Programme (UK Government), (2004). Foresight Future Flooding www.foresight.gov.uk/OurWork/CompletedProjects/Flood/index.asp

[48]See http://wales.gov.uk/docs/statistics/2012/120725stateofenvironment12en.pdf. Indicator 25b According to National Assembly for Wales Research Paper: Renewable Energy in Wales in Figures (August 2013) gas is currently the main fuel for electricity generation in Wales, accounting for 39 per cent of the electricity generated in 2011

'Currently, in the UK the average person's daily energy consumption (excluding energy related to food and imported goods) is around 125 kilowatt hours per day per person (kWh/d/p).

Of this 125 kWh/d/p, after taking into account conversion losses, we use a third for heating, a third for transport and a third for electrical power. The average electrical power consumption per person per day in Wales is approximately 22 kWh/d/p, (slightly higher than the UK average of 18 kWh/d/p. To put this into context this is equivalent to every person in Wales leaving twenty-two 40-watt light bulbs on for 24 hours every day.'

5.10.3 Wylfa nuclear power station is sited on the Anglesey coast, and was built in 1963. Following the closure of Trawsfynydd power station in 1991, Wylfa is the only such station in Wales. One of its two reactors ceased to operate in 2012, with the second reactor due to retire in 2015 although it is planned to re-commence generation in the mid-2020's.

5.10.4 In 2011 renewable energy contributed 7.9 per cent of electricity generated in Wales, of which wind energy accounted for 68 per cent of installed capacity[49]. It should be noted that installed capacity is not the same as generation, the former being the maximum that a generator can produce under optimal condition, whereas the latter refers to the amount of electricity actually generated over a period of time.

5.10.5 As of June 2013 there were 90 operational renewable projects in Wales, and a further 72 have been approved. Two offshore wind farms (Rhyl Flats and North Hoyle) and one onshore wind farm (Cefn Croes) currently have the greatest installed capacity. A large (299 MW) biomass plant has been approved in Anglesey at the Wylfa site, and a large (84 MW) onshore wind farm has been given permission at Brechfa Forest in Carmarthenshire. Also of note is the potential onshore wind farm at Nant y Moch, Ceredigion which has an installed capacity of 140 to 176 MW.

5.10.6 Renewable projects with an installed capacity less than 5 MW are eligible for feed-in-tariffs from the UK Government. As of July 2013, over 28,000 projects with a combined installed capacity of about 93 MW (the equivalent of Rhyl Flats offshore wind farm) are receiving feed-in tariffs. About 97 per cent of these projects are domestic installations and 97 per cent of these are solar photovoltaic.

[49] National Assembly for Wales Research Paper: Renewable Energy in Wales in Figures (August 2013)

5.11 Waste management

5.11.1 The SoE Report's latest findings on waste management (July 2012) are summarised below:

- The total amount of household waste produced per person in Wales has fallen to 467kg in 2010/11
- In 2005-06, the estimated amount of construction and demolition waste produced in Wales was 12.2 million tonnes
- 191,000 tonnes of waste was produced by the public sector in Wales in 2007, of which 46 per cent was recycled off-site or re-used off site; 41 per cent of public sector waste was landfilled in 2007
- The percentage of local authority municipal waste (excluding abandoned vehicles) reused, recycled or composted in Wales increased to 45 per cent
- The percentage of industrial and commercial waste recycled, composted or re-used in Wales decreased from 64 per cent in 2002/03 to 49 per cent in 2007
- 39 per cent of industrial and commercial waste was sent to landfill in 2007 (3.6 million tonnes), increasing from 28 per cent in 2002/03.
- 51 per cent of municipal waste (excluding abandoned vehicles) was sent to landfill in 2010/11 - a decrease from 93 per cent in 2000/01
- 338 companies are Green Dragon certified in 2012; 21 companies achieved the highest rating (Level 5), an increase from 17 in 2011

5.11.2 The trend in the amount of municipal waste reused, recycled or composted is upward. The picture is less clear in regard to industrial and commercial waste, since 2009 has been taken as the baseline and more recent figures are unavailable.

5.12 Human health and wellbeing

5.12.1 The population of the region varies considerably across its constituent administrations. The population of Carmarthenshire (184,000, is more than the combined size of its adjoining county of Ceredigion (75,300) and Denbighshire in the north (93,900), as a result of the concentration of its urban and post industrial areas. The populations of Gwynedd (121,500) and Pembrokeshire (122,600) are similar, with that of Conwy not significantly less at 115,300. However, the most populous area is Swansea, with a population of 685,051.

5.12.2 In terms of population density, that of Swansea is by far the greatest at 633 people per sq km, whilst that of Flintshire is 339 people per sq km and that of Wrexham 268. Gwynedd occupies 2,548 sq.km, giving it a

population density of 47 people per sq.km. The density of Denbighshire is 111 people per sq km, and that of Conwy 102 people per sq km. The population density of Anglesey is 98 people per sq km, whilst that of Carmarthenshire is 77 people per sq km. The least dense county is Ceredigion with 43 people per sq km. The average population density for Wales is 140 people per sq km.

5.12.3 The Welsh Government's Sustainable Development Scheme 'One Wales: One Planet (May 2009) defines 'wellbeing' (p19) as:

'...a positive physical, social and mental state; it is not just the absence of pain, discomfort and incapacity. It requires that basic needs are met, that individuals have a sense of purpose, that they feel able to achieve important personal goals and participate in society. It is enhanced by conditions that include supportive personal relationships, strong and inclusive communities, good health, financial and personal security, rewarding employment and a healthy and attractive environment.'

5.12.4 The State of the Environment Report (July 2012) sets outcomes for health and well-being and provides detailed information on progress, based on sets of indicators. Its main findings on the condition of health and well being in Wales are summarised here:

- In 2009/10, 50.3 per cent of respondents found it very easy to access parks or open space and a further 35.6 per cent found access fairly easy, a decrease from 89.9 per cent in 2005 to 85.9 per cent in 2009/10.

- 20 per cent of adults reported currently being treated for high blood pressure, 14 per cent for a respiratory illness, 12 per cent for arthritis, 11 per cent for a mental illness, 9per cent for a heart condition, and 7 per cent for diabetes.

- 29 per cent of adults reported being physically active on five or more days in the past week.

- 57 per cent of adults were classified as overweight or obese, including 22 per cent obese. 35 er cent of children were classified as overweight or obese, including 19 per cent obese.

- In 1997, 78.2 per cent of people travelled to work by car. In 2011, this had risen to 80.7 per cent (an increase of 2.5 percentage points). In 1997, 11.2 per cent of people walked to work. In 2011 this had fallen to 10.3 per cent, a fall of 0.9 of a percentage point.

- Over the same period the proportion of people using public transport had fallen from 8.8 per cent to 7.5 per cent (a fall of 1.3 percentage

points), and those travelling by bicycle had fallen from 1.9 per cent to 1.4 per cent (a fall of 0.5 of a percentage point).

- Having peaked at just over 5,200 per 100,000 self reported illnesses made worse by work in 2005/6, the figure currently stands at just under 4,000 per 100,000. There were 5,863 reported injuries to employees in 2011, a 4.4 per cent decrease from the previous year.

It is worth noting that these statistics apply to the whole of Wales, and therefore include urban populations in the south whose experience are likely to differ significantly from those of the counties within the IWCP.

5.12.5 Of more significance is the 19 per cent out-migration of younger people from the rural and coastal areas, and an in-migration of older people[50]. Whilst the proportion of people in Gwynedd considering themselves to be in good health is higher than the Welsh average, cancer rates are above the Welsh average.

5.12.6 The Welsh Index of Multiple Deprivation (WIMD) has shown that the majority of small areas in Gwynedd are less deprived than the average for Wales. However, there are pockets of relative deprivation within the authority, most notable in terms of housing and access to services, mainly owing to rural remoteness.

5.12.7 In contrast, a lower proportion of people in Carmarthenshire consider themselves to be in good health than the Welsh average, and a higher proportion live with a long term illness than the national average. Rates of obesity are also above the national average.

5.12.8 A number of reports[51] allude to an increasing disconnect between young people and the natural environment, linked to a fear of strangers and of other hidden dangers. Whilst this is not an appropriate forum for detailed discussion of this issue, there are indications that demonstrate that contact with the outdoors and with nature brings with it a number of mental and physical health benefits, and conversely such a disconnect should raise concerns about the future health of young people.

5.13 Travel

5.13.1 There has been little change in the main modes of travel to work since 1997 in both Wales and the UK. In 2011 the situation was as follows:

[50] As noted for example in Gwynedd's LDP SEA (July 2011) page 15.

[51] For example England Marketing (2009) Childhood and Nature; Report to Natural England; Children and Nature Network (2010) Children's Contact with the Outdoors and Nature; Greater London Authority (2011) Sowing the Seeds – reconnecting London's children with nature

- 81 per cent of the population travelled to work by car, van, minibus or works van
- 12 per cent by walking or cycling and
- 8 per cent used other modes of transport in Wales.
- Almost as many children travel to school by car (33.6 per cent) as by walking (36.4 per cent)
- the numbers travelling to school by bus or coach have reduced since 2002/3, with 23.9 per cent travelling in this way[52]
- bus passenger numbers have fallen from about 118 million in 2009/10 to 113 million in 2010/11
- rail passenger numbers (for journeys either beginning or ending in Wales) have increased from some 25 million 2008/09 to 27 million in 2010/11
- CO_2 emissions from road transport have steadily increased since 1990, and depending on the forecasting method used, look set to continue to grow. Emissions of other pollutants such as Nitrogen Oxides (NOx) and particulates (PM10) are 58 per cent and 44 per cent lower

'One Wales - Connecting the Nation -
The Wales Transport Strategy April 2008

5.13.2 There is a high reliance on the road network in the region. Rail based travel is relatively limited, though connections to the Midlands, to Merseyside and to London provide a means of reaching the coast without resort to a car. However, bus services within the region are somewhat limited**.** It is worth noting that according to the 2001 census, about 20 per cent of households in some areas (for example Ceredigion) did not own a vehicle.

5.13.3 The area is popular with walkers and cyclists, and generates a significant income to the region. The Wales coast path runs along the region's coast, and has potential to increase tourism, especially along the coasts of less well-known counties such as Ceredigion. The region is generally well furnished with cycle routes, both local and national, although standards vary considerably across the region.

[52] SoE Report 2012

6 TERRESTRIAL ENVIRONMENT - IRELAND

6.1 Introduction

6.1.1 As noted in paragraph 5.1.1, 'Ireland's Environment - An Assessment' (EPA 2012) provides useful statistics at a national level, and has informed the SEA objectives and indicators used in this assessment.

6.1.2 In contrast to the west of Wales, the Irish regional partner contains the nation's capital. The Greater Dublin Area (GDA) includes the Dublin Regional Authority and Counties Meath, Kildare and Wicklow. Together with the South-East Region counties of Carlow, North and South Tipperary, Waterford, Kilkenny and Wexford, and those of the South-West (Cork and Kerry) the region in question is 28,666 sq km in size (approximately 34 per cent of the nation). The population of the GDA is about 1.6 million, which constitutes 40 per cent of the nation's population, whilst that of the South-East region is 460,838, and that of the South-West 621,130.

6.1.2 Agriculture is the largest use of land cover in the region and contains around half of Ireland's tillage farmland. Trends in agriculture have seen a change from traditional tillage crops grown in the past, such as sugar beet, to bio-fuel crops such as Oilseed Rape, Willow and Miscanthus.

6.1.3 The Wicklow Mountains National Park occupies the whole of the centre of County Wicklow, and stretch into Counties Carlow, Wexford and Dublin. It is worth noting that this area (one of six in Ireland) is assigned Category II in IUCN's global list of management types, putting it on a par with areas such as Yellowstone National Park in the USA, or the Serengeti in Africa. In management terms this requires a stricter 'preservationist' approach to landscape management than that applied to, say, Snowdonia or the Pembrokeshire Coast in Wales[53] (see paragraph 6.1.5).

6.1.4 Ireland's climate can be summarised as mild, moist and changeable with abundant rainfall and a lack of temperature extremes, with generally warm summers and mild winters. The influence of the North Atlantic Current also ensures the coastline of Ireland remains ice-free throughout the winter.

6.1.5 Unlike Wales, Irish railways are currently in state ownership. The network extends from Dublin to link with cities northwards to Belfast and Derry,

[53] For a full explanation of the six IUCN protected area management categories see http://www.iucn.org/about/work/programmes/gpap_home/gpap_quality/gpap_pacategories/

westwards to Sligo, Galway and Limerick, and south to Wexford. Ireland has one of the largest freight rail systems in Europe.

6.1.6 An electric train, the Dublin Area Rapid Transit (DART) has operated out of Dublin to link with its coastal suburbs since 1984.

6.1.7 In 2005 the Irish Government launched Transport 21, a plan envisaging the investment of €34 billion in transport infrastructure from 2006 until 2015. Several road projects were progressed but the economic crisis that began in 2008-09 prevented its full implementation, including the development of a Dublin Metro system. A new transport policy has been developed to cover the period 2009-2020[54].

6.1.8 As with Wales, Ireland has a rich cultural heritage. Although the Irish language is strongly associated with the west of Ireland, the Central Statistics Office reports that Dublin and its suburbs contain the largest actual number of daily Irish speakers, although the lowest percentage of any county[55]. Tourism is a major economic factor, linked to the landscape and cultural heritage of the region.

6.2 Biodiversity

6.2.1 Irish Natural Heritage Areas (NHAs) are designated under the Wildlife (Amendment) Act 2000, and are the equivalent of Sites of Special Scientific Interest in the UK. As well as those sites that have been designated, about 630 proposed sites (pNHAs) were published in 1995 on a non-statutory basis, but have not been confirmed. These sites are of significance for wildlife and habitats. The pNHAs cover approximately 65,000 Ha and it is expected that designation will proceed on a phased basis over the coming years[56].

6.2.2 There are 133 pNHAs, 3 NHAs, 42 SACs, 14 SPAs and 5 Nature Reserves in the South-East Region. A number of wetland species protected under European legislation include Freshwater Pearl Mussel and White-Clawed Crayfish, both of which are in decline.

[54] 'Smarter Travel'. A Sustainable Transport Future. A New Transport Policy for Ireland 2009-2020.

[55] Central Statistics Office http://www.cso.ie/en/newsandevents/pressreleases/2012pressreleases/pressreleasecensus2011profile9whatweknow/

[56] http://www.npws.ie/protectedsites/naturalheritageareasnha/

6.2.3 Assessments of the condition status of European protected sites and species have found that 7 per cent of the habitats were in good condition, with 46 per cent inadequate and 47 per cent in poor condition. There was a particular concern about habitats associated with water. In terms of species, about fifty per cent were reckoned to be in good conservation status, while ten per cent were in poor condition[57].

6.2.4 Most of the SACs and SPAs are linked to rivers, estuaries and coasts, with some critically important over-wintering sites at Dungarven and Wexford harbours, both Ramsar sites important for Light Bellied Brent Goose and Blacktailed Godwit. Other important coastal sites include South Dublin Bay and Tolka Estuary in County Dublin; Tramore, Backstrand and Blackwater Estuary in Waterford.

6.2.5 As well as these estuarine and coastal sites, a number of upland areas are recognised for their high ecological value. These include the Glendoo Mountains, Ballyman Glen and Kiltiernan in County Dublin; and the Wicklow Uplands.

6.2.6 A number of rivers have been designated as habitats for important European species such as otter, river and brook lamprey, salmon, trout and char. These include the Barrow and Nore, Middle Shannon, Blackwater and Suir.

6.2.7 The 2008 National Park and Wildlife Service (NPWS) Native Woodlands Survey[58] details the cover of native woodland. The percentage cover of native woodland is highest in Waterford with 6,990 Ha, representing 3.8 per cent of the county's land cover. Kilkenny has 2.15 per cent of the county under native woodland, Wexford 1.78 per cent and Tipperary (North and South) 1.73 per cent. Carlow has the least amount of native woodlands with 690 ha. or 0.77per cent of total land area.

6.2.8 A number of issues are identified in the SEAs of various county plans, including afforestation, nutrient run-off, bankside development, erosion and silting, changes in grassland management, and invasive species.

6.2.9 As stated above, more detail on European protected habitats and species will be provided in the Habitats Regulations Assessment carried out in parallel with this Environmental Report.

[57] http://www.npws.ie/publications/article17assessments/article172013assessmentdocuments/Article_17_Web_report_habitats_v1.pdf

[58] http://www.npws.ie/media/npws/publications/reports/media,6688,en.pdf

6.3 Geology and soils

6.3.1 The Irish Geological Heritage Programme is established to identify and select the best national sites for Natural Heritage Area designation, to represent the country's geology. It is also identifying many sites of local geological heritage importance, which are classed as County Geological Sites (CGS) and included in County Development Plans, although these will not receive the statutory protection of NHA sites. There are currently over 200 geological heritage sites listed in the South-East Region.

6.3.2 One of Ireland's two UNESCO designated Geoparks - the Copper Coast is located in County Waterford between Fenor and Stradbally. It was designated in 2001 in recognition of its outstanding volcanic geology and copper mining heritage. The aims of the geopark are to develop awareness and understanding of geology and local heritage, as well as developing geo-tourism and sustainable economic activity in this rural area.

6.3.3 A number of geological types are represented, running in a south-west to north-east belt[59]. County Wexford is dominated by Cambrian and Ordovician rocks, with pre-Cambrian metamorphic and Lower Carboniferous limestone. Wicklow is dominated by Ordovician rocks, with granites Cambrian shales, and Silurian series also prominent. Lower Carboniferous limestone occurs throughout much of central County Dublin, whilst Silurian mudstones, shales and sediments occur widely in County Meath. Much of County Waterford lies on a bed of Devonian sandstones and conglomerates, whilst the area around Waterford itself is dominated by Silurian sediments and Ordovician volcanic rocks. Lower Carboniferous and Silurian rocks are prominent in much of County Tipperary, whilst Kilkenny is bedded on Lower and Upper Carboniferous limestone, coal and shales, typified by the Castlecomer Plateau, with Ordovician rocks to the east of the county. Lower Carboniferous and Silurian rocks typify the bedrock of County Kildare.

6.3.4 Unsurprisingly, slate and coal workings have a long association in Kilkenny, the last pit closing in 1979. Shales and clays are still worked in the county for the making of bricks. Coal has been mined in east County Tipperary until 1973, and slate was worked at Portroe between the 1820's and the 1950's. Silver has also been worked over a long period until the 1990's.

[59] http://geoschol.com/ireland.html

6.3.5 County Wexford contains a number of kettle holes and pingos, notable geological features associated with the retreat of the last ice age. A number of fossils associated with carboniferous limestones can be seen around Hook lighthouse. Crinoidal fossils can also be found in County Kildare. Also of interest are the warm springs associated with County Kildare.

6.3.6 County Wicklow has a long association with lead, copper and gold mining, mainly around Glendalough and Glendasan. Lead was also mined around Clontarf and Killiney in County Dublin.

6.3.7 It is worth pointing out that a number of important buildings in Dublin have been built of locally mined and quarried rocks, including for example Leinster granite quarried in Wicklow. These include the General Post Office, the Government Buildings, the Four Courts and the Department of the Taoiseach.

6.3.8 The dominant soils of the region are acid brown earths, grey-brown podzols, and surface water gleys, with alluvial soils occurring along floodplains of rivers and estuaries. The uplands are largely overlain with blanket peat. Much of the soils are therefore nutrient poor and poorly drained.

6.3.9 A number of pressures are evident. Climate change is likely to result in coastal erosion, which will impact on a number of designated local and national geological sites. Other pressures include infrastructure development.

6.4 Landscape & Visual Amenity

6.4.1 The region comprises a diverse and rich landscape including forestry, bogs, mountains and river valleys, dramatic coastlines with cliffs and estuaries, historic townscapes as well as extensive areas of hedged agricultural land, which makes up about 23 per cent of the GDA. Around half of Ireland's tillage land occurs in the South-East Region. Much of the crop is oil seed rape. A significant proportion of the wooded landscape is planted coniferous forest. Wetlands are a significant landscape type, covering about 9.6 per cent of the GDA.

6.4.2 Meath consists of rich pasture in an undulating topography, centring on the historic Boyne River Valley. In contrast, Wicklow's landscape is noted for its river valleys and wooded mountains.

6.4.3 The Wicklow Mountains dominate the southern part of the GDA. As mentioned above, the Wicklow Mountains national park was designated in 1991 on account of the area's exceptional landscape qualities. The park currently occupies some 200 sq km. In the South-East region, upland areas include the Blackstairs, Comeragh, Knockmealdown, Slievenamon and Galtee Mountain Ranges.

6.4.4 The main rivers in the GDA are the Boyne, Liffey and Avoca, each having a unique system with protected landscapes and views, based on distinctive traditional land use patterns. The South-East region is defined by five river corridors, the Blackwater, Nore, Barrow, Suir and Slaney.

6.4.5 The coastline is 611kilometres in length, and includes a number of internationally designated bays, lagoons, estuaries, Dúne systems and islands, as well as marine areas. The coastline is understandably an important tourist attraction.

6.4.6 The local authorities are responsible for designating areas as Areas of High Amenity, Areas of Outstanding Natural Beauty and Protected Views, which are identified in local development plans and protected through plan policies. According to the GDA planning guidelines however, specific landscape features within the GDA counties are often not listed within these plans[60].

6.4.7 Although landscape character assessment is used to assess the distinctive character of discrete landscape areas, as well as sensitivity to development and other pressures as well as supporting capacity studies, it is not used consistently nor is it used at a regional level[61].

6.4.8 There are a number of highly distinctive local landscapes, such as the Curragh in Kildare, the largest area of unenclosed farmland in the country; the coastal earthen banks in County Waterford, a distinctive feature of the landscape with impressive seasonal colour of Thrift and Sea Pink in early summer; or Waterford's Comeragh Mountains with their dramatic glaciated hollows and lakes and the limestone-floored valley of the Blackwater, which runs eastward until it turns south and cuts through a number of sandstone ridges forming a steep sided valley that was at one termed the 'the Irish Rhine'.

[60] Regional Planning Guidelines for the Greater Dublin Area 2010-2022. Volume II. paragraph 3.11.1 http://www.rpg.ie/documents/RPGPrintA4-SinglePages.pdf

[61] South East Regional Authority. Regional Planning Guidance 2010-2022. Environmental Report and Habitats Directive Assessment paragraph 4.7

6.4.9 There are a number of issues related to landscape in the region. These include inappropriate development, by virtue of siting, scale or design; infrastructure development such as road upgrades, telecommunications masts, wind farms and power lines; coastal tourism development; and forestry. Recreational development is seen as problematic in Tipperary, along with overgrazing and the effect of dispersed non-agricultural development in rural areas. In Wexford there are issues with coastal tourism development and with sand extraction. A particular concern is the cumulative effect resulting from the impact of many relatively minor developments.

6.5 Cultural assets

6.5.1 The region abounds with historic and cultural assets. For instance, the South-East region contains over 15,000 Recorded Monuments protected under the National Monuments Act 1930-2004. Archaeological inventories appear to be available only for counties Carlow, Waterford and Wexford in the South-East.

6.5.2 Significant sites include the Rock of Cashel in County Tipperary, Woodstown Viking Settlement on the River Suir, Kells Priory; the monastic settlement at Glendalough in County Wicklow; the historic landscape of the Boyne Valley, including the Battle of the Boyne site and Newgrange and Knowth Neolithic monuments. The archaeological landscape of the Boyne has been designated a UNESCO cultural World Heritage Site, and contains Europe's largest and most important concentration of megalithic art.

6.5.3 Walled towns such as Waterford, Kilkenny and Wexford, as well as settlements such as Dungarven, are important historic sites, as of course is Georgian Dublin. Parts of many of the towns and cities in the region contain groups of buildings which make an important contribution to the streetscape. These significant built settings have been designated Architectural Conservation Areas (ACAs). Thirty-seven such designations exist in the South-East region.

6.5.4 Other important examples of architectural heritage include many large country houses and their associated demesne landscapes, ecclesiastical sites and sites of industrial and vernacular heritage. Each local authority in the region maintains a record of protected structures for buildings of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest.

6.5.5 Some important gardens are located in the region, including the horticultural collection at Mount Congreve in County Waterford; Altamont, County Carlow; Woodstock, County Kilkenny and the J.F. Kennedy Arboretum in County Wexford.

6.5.6 The region's coast provides interest in underwater and inter-tidal archaeology. Wexford, for example, has sixty-two recorded wrecks. Other maritime and industrial interest includes Rosslare Harbour, Kilmore and Slade/Hook head Portlaw Industrial Village centred around Mayfield House and the mining history of the Copper Coast.

6.5.7 Historic trees are of some importance in the region. For example, County Waterford has recorded over 270 trees which are remarkable for their height, diameter, age or historical associations. The majority of notable trees in the county are located in demesne landscapes such as Curraghmore Estate, Gurteen le Poer and Cappoquin.

6.5.8 A key issue is development pressure on the settings of important heritage structures, which results in visual impact and may also damage hitherto undiscovered archaeological sites in proximity to such structures. As well as these more obvious threats, economic factors may reduce the capacity of the authorities to maintain the historic fabric to an appropriate standard, and may reduce the capacity to provide easy access to visitors. A particular concern is the lack of maintenance of historic graveyards, noted in both Dungarven and Kilkenny.

6.6 Air quality

6.6.1 Air quality is subject to a number of EU legislation, such as the Air Quality Framework Directive (96/62/EC), which established standards and thresholds for sulphur dioxide, nitrogen dioxide, particulate matter, lead, benzine and carbon monoxide. A further directive (the CAFÉ Directive (2008/50/EC)), has amalgamated the various thresholds and standards into a single document, and has also set a target value for PM2.5. This latter directive has yet to be transposed into Irish law.

6.6.2 Although there are no significant air quality concerns, localised levels of atmospheric pollution derive from traffic associated with urban centres. Carlow town, for example, has been rated poor for air quality in the past because of high levels of PM10[62]. Counties Kildare, Kilkenny, Waterford and Wexford each report concerns over traffic-borne pollutants.

[62] Carlow County Development Plan June 2009, paragraph 3.5

6.6.3 Concentrations of ozone are higher in rural areas than is urban areas due to the absence of the nitric oxide in rural areas as an ozone scavenger[63].

6.6.4 Radon gas can be a significant concern in some areas. For example, it has been found in about 6 per cent of housing in the Greater Dublin area[64], and Waterford recognises that this may be an under-reported phenomenon[65].

6.6.5 Dust and odours are likely to be associated with waste and water treatment facilities, although the EC Waste Water Treatment(Prevention of Odours and Noise) Regulations 2005 (S.I. 787 of 2005) require that wastewater treatment plants are designed, constructed and maintained as to avoid causing nuisance through odours and noise.

6.6.6 These facilities, along with the general monitoring of air quality standards, is carried out by the Environmental Protection Agency (EPA).

6.6.7 Concerns tend to focus around greenhouse gas emissions and climate change, as explained in the following section. It should be noted that a significant emitter of greenhouse gases is the agricultural sector, which is reckoned to emit 27.7 per cent of the total[66].

6.7 Climate factors

6.7.1 The climate conditions for the region are dominated by the Atlantic Ocean and its air and marine currents[67]. Generally there are no extremes of temperature that might normally be experienced by countries at a similar latitude, since the warm North Atlantic Drift has a strong influence on sea and air temperatures. The region is sheltered from the strongest Atlantic conditions, but can also experience cooler conditions in the winter.

6.7.2 Since the region experiences different air masses the weather can be highly variable, with polar winds occasionally returning in a north-easterly

[63] For a discussion on the relationship between oxides of nitrogen, nitric oxide, nitrogen dioxide and ozone, see 'Analysis of variations in ozone and ozone precursors (unattributed). June 2003 http://www.arb.ca.gov/research/weekendeffect/arb-final/wee_tsd_ch2_2.pdf

[64] See Dún Laoghaire-Rathdown County Development Plan 2010-2016 SEA, paragraph 3.3.2

[65] Waterford County Development Plan SEA Report February 2011, paragraph 4.5.1

[66] EPA (2008) Ireland's Emissions of Greenhouse Gases for the period 1990-2006 Wexford: EPAhttp://www.climatechange.ie/pdf/epa/ghg_provisional_20061.pdf

[67] See Metéireann http://www.met.ie/climate-ireland/climate-of-ireland.asp

direction along the south and east coasts. Rainfall and strong winds are common in winter, although European anticyclones in winter can extend to Ireland giving extensive periods of dry cold conditions. February to June are normally periods that experience least rainfall.

6.7.3 Spring conditions can be highly variable, depending on the temperature of the sea and the prevailing air currents. Rises in temperature may be slow, though afternoon temperatures can reach summer values even in March under certain climatic conditions. When spring anticyclones prevail, night temperatures can be cold, with air frosts not uncommon into May. During the summer, warm moist Atlantic air often results in periods of rainfall with thunderstorms not uncommon, with fog increasing, especially in coastal areas as the summer progresses into autumn. Occasional very severe storms can be locally damaging in the late autumn. In the winter, snow may be disruptive but generally lasts no more than a few days, although recently snow has been known to lie for up to twelve days. However, given that sea temperatures in winter can be warmer than land temperatures, coastal conditions are invariably rainy with snow inland. It is worth noting that the upland areas of the Mid-East region have experienced the deepest snows in Ireland in the last 50 years, according to records taken at Casement aerodrome west of Dublin[68].

6.7.4 This general sequence may change from year to year, with certain events missing entirely in any year.

6.7.5 Climate change is an issue of concern, especially in the coastal communities of the region. It has been calculated (IPCC 2007) that Ireland's mean temperature has increased by about 0.7°C over the last 100 years, and the rate of increase has been higher in the last couple of decades[69]. Temperatures are predicted to rise by 1.25-1.5°C by 2040 compared to 1961 to 2000. Rainfall is expected to increase in winter by about 15 per cent and summer projections range from no change to a 20per cent decrease in precipitation.

6.7.6 A range of climate related impacts are predicted. These include higher risks of flooding (due to both increases in winter precipitation and to sudden torrential downpours), coupled with generally lower levels of summer river flows in the Slaney, the Barrow and Suir catchments, resulting in disrupted water supplies. Other concerns include increasing coastal erosion in Waterford and Wexford (whose soft areas of coastline

[68] http://www.met.ie/climate-ireland/SnowfallAnal.pdf page 2/appendix 2

[69] See Greater Dublin Area (GDA) Regional Planning Guidelines Volume 2, paragraph 3.9.1 page 48

are reckoned to erode at the average rate of one metre per annum[70]),and the potential of effects from sea level rise in DúnLaoghaire. Of particular concern is the effect of climate change on the overwintering grounds of important European birds, as well as disruption to spawning grounds. Forestry and agriculture is also likely to experience change in practices, with a potential to grow new species normally associated with the Continent.

6.7.6 Under the Kyoto Protocol, the EU has agreed to reduce its GHG emissions by an overall 8 per cent below 1990 by the year 2012. Ireland's target in the EU "burden sharing" agreement is to limit increases to 13 per cent above 1990 levels by 2008-2012. For the period beyond 2012, the EU Council of Ministers has committed to achieving at least a 20 per cent reduction of greenhouse gas emissions by 2020 compared to 1990 levels.

6.7.7 The Irish Government has produced a National Climate Change Strategy. Various policy statements set out the Government's Energy Policy Framework 2007-2020 to deliver a sustainable energy future for Ireland. County Climate Change Strategies have been prepared or are underway for all counties in the region.

6.7.8 Since the region contains the most urbanised and industrialised area in Ireland, namely the Greater Dublin Area, a significant proportion of reduction targets will have to be met by the region. Under the current economic conditions this may be challenging.

6.8 Water - resource and quality

6.8.1 The Water Framework Directive (WFD) was brought into Irish law by the European Communities (Water Policy) Regulations, 2003. A key purpose of the directive is to ensure that all waters achieve good quality status by 2015, through the preparation and implementation of a River Basin Management Plan for each River Basin District. The South-East Regional Authority is covered in the main by the South Eastern River Basin District and the South Western River Basin District. A small area to the northwest of South Tipperary is covered by the Shannon River Basin District involving tributaries of the Mulkear River, Dead River, Gauteen River and Popes River. In order to satisfy the objectives of the WFD all water bodies in the region must achieve good chemical and ecological status, and groundwaters must achieve good quantitative status as well, which means

[70] See Draft Wexford County Development Plan 2013-2019. Volume 8 Strategic Environmental Assessment. June 2012. page 120

that they have to be capable of sustaining the flows of waters that they feed into.

6.8.2 In pursuit of the WFD objectives, the Environmental Protection Agency (EPA) has complied Registers of Protected Areas (RPA), requiring special protection to protect the surface or ground water, or to conserve habitats and species that directly depend on those waters. Five categories of protected area are represented:

- Waters used for abstracting drinking water
- Areas designed to protect economically significant aquatic species
- Recreational waters
- Nutrient sensitive areas
- Areas designated for the protection of habitats and/or species

Examples of such protected areas include: Loughlinstown River at DúnLaoghaire, on the RPA for drinking water; the Barrow and part of the River Liffey in County KIldare, listed on the RPA for Nutrient Sensitive Rivers; Lough Derg in County Tipperary, listed on the RPA for Recreational Waters, Nutrient Sensitive Lakes and Estuaries; and the rivers Slaney, Vartry and Dargle in County Wicklow, on the RPA for Water Dependent Species and Habitats.

6.8.3 Groundwaters include several important aquifers in the South-East, including the volcanic rocks in Counties Waterford and Wexford and the limestones underlying the lowland areas. As is the case with the GDA, groundwater status has been found to be generally good with more than 90 per cent achieving good chemical and quantitative status. This falls short of the necessary 100 per cent target for 2015.

6.8.4 The region lacks any lakes of substantial size. The largest lake in the South-East region is Knockaderry Reservoir in County Waterford at less than 30 Ha in size. The WFD reporting threshold for lakes not in protected areas is 50 Ha, therefore although there are no lakes over the threshold, there are twelve lakes in protected areas within the South-East River Basin District. In the GDA, there are about 500 natural standing waters, the majority being small. Only twenty lakes exceed 10 Ha in size.

6.8.5 The longest river in the GDA is the Boyne (2,390 km). The other main rivers include the Liffey and its tributaries of the Tolka and Dodder, Slaney, Barrow, Avoca, Vartry, Nanny and Delvin Rivers. The GDA lies mainly within the scope of the Eastern River Basin District. It also has a small portion contained with the South Eastern River Basin District along

the Kildare and Wicklow borders, and smaller portions of the Shannon International River Basin District and Neagh-Bann International River Basin Districts in Meath. In the South-East, the Suir, Barrow and Nore river system is the second largest in Ireland (after the Shannon) with a combined catchment area of over 9,000 km^2. The Backwater is a major river system that flows into Youghai Harbour, and is within the catchment covered by the South Western River Basin District, whilst the Slaney runs into Wexford Harbour.

6.8.6 According to EPA information from the River Basin District Reports the river water quality in the region is in the majority of moderate quality status (<50%) with high and good quality accounting for approximately one third of the rivers in the region. Nearly two thirds of lakes in the region are considered as of moderate quality, with nearly twenty per cent of lakes considered to be poor quality. The transitional waters of the region, comprising of estuaries and coastal lagoons are in the majority (<75%) of moderate quality whereas nearly two thirds of coastal water achieve high status for their water quality.

6.8.7 Some water bodies have been manipulated to optimise water storage, flood defences, navigation, or land drainage. These 'heavily modified water bodies' (HMWBs) include the Rivers Dodder, Liffey and Vartry, whose flows are regulated through reservoirs, and also the Poulaphouca Reservoir, Dublin Port on the Liffey and Tolka Estuaries, and the channel of the Avoca Estuary at Arklow Port. In the South-East region.

6.8.8 There are thirteen transitional waterbodies in the region, including the major estuaries of the Boyne, Broadmeadow, Tolka, Liffey, Dargle, Vartry and Avoca, and eight coastal waterbodies. These estuaries and coastal areas in the majority are afforded protection for their ecological status.

6.8.9 There is no universally accepted definition of the scope of a coastal zone, although it is estimated that the coastal zone of the GDA is more than 300 km^2. It has been suggested that 200 metres above/200 metres below mean sea level might be appropriate, though this is likely to vary according to the main ecological processes entailed in any coastal zones, including its geology and topography. Within the region's coastal zone there are approximately twenty five shellfish areas including those North County Dublin and off the Wicklow Coast north of Arklow. Other designated shellfish areas occur within Wexford Harbour and Waterford Harbour. A number of other designated shellfish areas occur at Dungarven Bay in County Waterford; Rostellan, Bantry Bay, Ballymacoda

Bay and Cork Great Island Channel in County Cork; and Kenmare, Velantia Harbour and Tralee Bay in County Kerry[71].

6.8.10 The waters around Ireland support a rich marine diversity. Whilst the inshore and offshore seas are generally unpolluted, a number of estuaries in the south east coast, such as the Slaney and the Blackwater, give rise to concerns, and have been classed as eutrophic. Whilst the bacteriological levels of shellfish in shellfish growing waters is reasonably good, it is likely that additional measures will be required to prevent further deterioration in certain areas. Rivers such as the Brickey raise concerns. This river discharges to Dúngarvan Harbour. Its upper reaches are drained and canalised and it is classed as eutrophic, with abundant weeds and of mediocre quality. Levels of PCBs, dioxins and other contaminants in fish and shellfish are low.

6.8.11 From the most recent EPA report on water bathing quality[72] rated the waters of Waterford, Wicklow, and Wexford as 'excellent' overall, with some concern for Counsellors' Strand and Dúnmore, Silver Strand, Morriscastle and Rosslare Strand. The waters for Dublin were rated good with some concerns for Merrion Strand. However, Ardmore was only 'sufficient' in quality, whilst Dúncannon was rated 'poor'. Sandymount Strand in Dublin was rated as being of 'sufficient' bathing quality.

6.8.12 A range of issues present themselves to this theme. Proposals to develop the port facilities associated with Dublin Port will entail land reclamation and dredging, which will have an impact on the bed of transitional and coastal waters in the area. Other pressures may include increased seaborne traffic, communication cables and renewables infrastructure associated especially with wind farms. It has been estimated that 10 per cent of the GDA's shoreline has been modified by infrastructure[73]. Physical modification to water courses, especially through undergrounding, will have a significant impact on biodiversity, and also on ecosystem function and services, by increasing flow rates. Wastewater discharges, runoff from agriculture, leachate from landfills and

[71] http://www.sfpa.ie/SeafoodSafety/Shellfish/ClassifiedAreas.aspx. A number of these sites were identified and designated following a European Court of Justice ruling in 2007. (Case C67/02 *Commission v Ireland* [2003] ECR 1-9019 (breach of Art 5)
'Government agrees on new protection of Shellfish Waters'.
http://www.dcenr.gov.ie/Press+Releases/2007/Government+agrees+on+new+protection+of+Irish+shellfish+waters.htm

[72] Environmental Protection Agency 'The Quality of Bathing Water In Ireland 2013'. page 9

[73] Greater Dublin Area Regional Planning guidelines 2010-2022. Volume II Appendices and Background Papers. page 39.

contaminated sites and nutrient input from forestry can all have detrimental effects on water quality resulting in subsequent impacts to biodiversity. A major concern centres around the availability of water. Dún Laoghaire obtains 98 per cent of its water from Dublin City, and is urgently seeking new sources by 2015.

6.9 Flood risk

6.9.1 The Office of Public Works (OPW) and the local authorities are developing Catchment Flood Risk Assessment and Management Plans (CFRAMP) for all of the catchments across the country, although many are still at an early stage.

6.9.2 Both the GDA and South-East Region have had a history of flooding, whether through coastal storms, through sudden and overwhelming downpours, or through pulses of water coursing through river systems unable to cope with volumes of water resulting from upland runoff after storm events. Some settlements suffer from all three effects. In the GDA, Arklow town has suffered from flooding, most recently in 2010, 2013 and 2014.

6.9.3 The South-East Region contains a number of settlements that are vulnerable to flooding. The River Suir is the second longest river in Ireland, with a width of 25-35 metres in its middle sections. It has overflowed its banks on a number of occasions, resulting in flooding to extensive areas of agricultural land in the Suir Valley. Floods in the towns of Clonmel and Carrick-on-Suir 2000 caused extensive damage to properties, with over two hundred properties seriously damaged with a further 60 properties affected. Clonmel has recently (February 2014) experienced further flooding incidents, though both it and Carrick were able to withstand the effects of flooding on this latter occasion. Overall, 23 settlements are identified as being of priority concerning the Suir catchment, including Tipperary and Waterford[74]

6.9.4 The 140 km River Nore rises in County Tipperary and flows through County Laois and County Kilkenny and into the River Barrow. A comprehensive flood defence scheme providing defence against a 100-year flood risk from the Nore was completed for Kilkenny City in 2006 to address the long standing problems of flooding. As with other parts of the south-east region, County Kilkenny was badly hit by flooding in August 2008.

[74] See OPW Suir Catchment Flood Risk Assessment and Management Study http://www.waterfordcoco.ie/ga/seirbhisi/seirbhisiuisce/foilseachain/Suir_Info_Leaf_V4.0.pdf

6.9.5 Whilst the Suir is the longest river, the River Barrow has the second longest main river channel in the country. Towns on the River Barrow subject to flooding include Carlow which experienced substantial flooding in August 2008 with parts of the town under almost 2 metres of flood water. Flood Relief schemes are proposed as part of the Carlow Water Services Investment Programme and includes the Carlow Town Flood Relief Scheme (€14million) - to provide a flood defence system for Carlow Town.

6.9.6 The River Slaney rises in the Wicklow Mountains before flowing west and then south through counties Wicklow, Carlow and Wexford, before entering the sea at Wexford Harbour. Towns on the Slaney include Tullow, Bunclody, Enniscorthy and Wexford. The town of Enniscorthy has suffered extreme flooding for a number of years, most recently in 2010 and 2013. A major event in November 2000 resulted in severe flooding and damage, significantly affecting approximately 110 properties. Carlow similarly suffered extensive flooding in 2008.

6.9.6 As well as causing significant damage to property at a cost of millions of euros, is a serious health hazard, especially where water enters untreated sewage systems and floods into settlements. Erosion is particularly problematic, since it can cause silt to build up in systems downstream, and can severely affect spawning and feeding grounds for fish, mammals and birds as well as critically important crustaceans in river systems. Flooded fields themselves can affect feeding and nesting for important species, and can influence the nutrient content of the soil.

6.10 Material assets

6.10.1 In the context of this report, 'material assets' refers to the region's infrastructure, although it will also include references to forestry and quarrying. Infrastructure includes the road and rail network; harbour and port facilities; airports; energy, telecommunications and waste facilities; water supply and treatment; and coastal and flood defences.

6.10.2 There is an extensive network of roads throughout the region, including motorways, national roads and secondary roads. The network radiates out from Dublin, connecting to Waterford by the M9 motorway, a distance of 166 km, and to Wexford on the M11, a distance of 134 km. As in other parts of Europe, reliance on the car in rural areas has increased as the use of local public transport, walking and cycling has declined. The loss of rural services has exacerbated the situation.

6.10.3 The rail system is still owned by the state, since Ireland called for a derogation from EU Directive 91/440 that has allowed open access to operators other than the owners of the line. Rail links, like the roads, radiate from Dublin. The GDA retains about 500 km of rail infrastructure, although only about 300 km is in use. Rail services between Rosslare and Waterford closed in 2010. County Wexford is actively supporting campaigns to re-open the service, and is keen to facilitate the re-opening of the New Ross to Waterford line for passengers and freight. The council states that it will encourage the development of the necessary infrastructure, including a rail cargo depot at Rosslare Harbour[75].

6.10.4 There are three airports within the region: Dublin Airport in Fingal; Casement Aerodrome at Baldonnel; and the South-East Regional Airport near Waterford City. In 2013, Dublin Airport handled 20.2 million passengers[76], making it the busiest airport in Ireland. Additional runway and terminal capacity is being developed. In 2011 80,000 passengers passed through Waterford Airport, and it has been reported that a 150m extension of the runway would be funded by the Department of Transport of up to €400,000.

6.10.5 The three main ports in the GDA are Drogheda, Dublin and Dún Laoghaire, with Dublin and Dún Laoghaire operating as international ferry ports. The Dublin to Holyhead (Wales) route was the most important route in terms of tonnage received, accounting for 7.9 per cent of all tonnes received[77]. In 2012 the port of Dublin received 6,624 vessels and 140,394,000 tonnes of freight. There are plans to expand the port facility. Waterford and Dún Laoghaire have both witnessed significant reductions in vessel arrivals and in freight since 2007. In the case of the former, vessel numbers have reduced from 831 to 370, and freight tonnage has reduced from 3,654,000 to 1,728,000. In the case of Dún Laoghaire, the vessel numbers have come down from 624 in 2007 to 172 in 2012, with tonnage reducing from 12,254 to 3,378.

6.10.6 As well as these important ports, there are three other commercial ports at Rosslare, New Ross, and Bellview, Waterford Estuary. A local ferry runs between Ballyhack and Passage. There are also marinas at Courtown, Wexford, Kilmore Quay, Waterford and Carrick-on-Suir. There are a number of fishing ports in the region, including Balbriggan, Skerries,

[75] Draft County Wexford Development Plan June 2012. Volume 8 Strategic Environmental Assessment page 131

[76] "Passenger numbers at Dublin Airport increase by 6%" RTE News. 7 May 2014

[77] http://www.cso.ie/en/media/csoie/releasespublications/documents/transport/2012/spt_2012.pdf

Howth, Dún Laoghaire, Wicklowand Arklow (which also has some minor commercial activity) in the GDA, and Helvick, Dúnmore East, Dúncannon, Kilmore Quay, Wexford and Courtown in the South-East region.

6.10.7 There are a number of navigable water systems in the region including both canals and portions of the Boyne and Liffey Rivers.

6.10.8 Although the region has the most well developed telecommunications network, broadband coverage outside Dublin is 95%, which may impact on communities in remote rural areas. County Carlow for example has highlighted the need for an upgrade in broadband facilities.

6.10.9 There are a number of both fossil fuel and hydro power generation plants in the region. Fossil fuel-based stations include Dublin Bay, Edenberry, Great Huntstown, North Wall and Poolbeg. There are hydro schemes at Bennetsbridge and Inch Mills, County Kilkenny, Castlegrace and Holy Cross, County Tiperrary, Celbridge and Leixlip, County Kildare, and Poulaphuca, Golden Falls and Turlough HIll in County Wicklow, and Milford in County Carlow.

6.10.10 In 2012 the consumption of coal in Ireland increased by 17.3 per cent (mainly through generation). Peat use increased overall by 5.4 per cent. The use of peat for generation increased by 16 per cent, with an increase of domestic use by 10.5 per cent.

6.10.11 Counties Wexford and Tipperary provide the majority of wind generated energy. Wind farms are sited at Ballywater, Richfield, Carnsore, Castledockrell and Cronelea in County Wexford, and at Ballinlough/Ikerrin, Ballinveny, Carrigh, Lisheen, Mienveel I and II), Skehanagh, Glenough, and Garracummer in County Tipperary. Beallough is located in County Waterford, Cronelea Upper in County Wicklow, and Greeoge in County Carlow. Ballymartin wind farm is in County Kilkenny. Their combined capacity is about 286MW. Two large offshore stations have been proposed in theregion: Dublin Array off the Dublin coast will have a capacity of 364MW, whilst that of Codling off the coast of County Wicklow will be 1100MW, with 220 turbines, making it by far the largest wind farm in the country and one of the largest in Europe.

6.10.12 In 2012, renewables accounted for 11.4 per cent of the energy inputs to generate electricity with wind contributing 7.5 per cent of total inputs. Wind generation fell by 8.4 per cent in 2012 following a 57 per cent increase in 2011.

6.10.13 Over the period 1990 to 2012 primary energy per capita increased by 6.5 per cent to 34 MWh while energy-related CO2emissions per capita fell by 6 per cent to 8.2 tonnes. This reflects the switch from the use of solid fuels to oil, gas and renewable energy[78].

6.10.14 There are forty nine landfill sites in total in the region, some of which are closed or inactive, and a number of which are unlined, resulting in gas emissions and leachate. There are currently no hazardous waste landfills in the region. Although work is currently underway to address issues related to unlined sites, meeting the targets of the Landfill Directive are likely to prove challenging.

6.10.15 The supply of water is considered in section 7.8. There are about 156 wastewater treatment plants in the region, the majority of which discharge directly into river systems, though some discharge into lakes, transitional and coastal waters. Many rural dwellings are not connected to public sewage systems. For example, North Tipperary reports that the 2006 census showed that out of 22,866 houses 10,877 (47.5 per cent) houses were connected to the public sewer and 10,990 (48 per cent) were connected to individual septic tanks. Poorly functioning septic tanks have the potential to place pressure on surface and groundwaters.

6.10.16 There are some 58 km of coastal defences in the South-East Region, consisting of seawalls, embankments and rock barriers, mainly located in transitional waters and on the coasts of Counties Wexford and Waterford. In the GDA, these are mainly located around Dublin Port, Drogheda, Arklow and the coast between Greystones and Wicklow.

6.10.17 Other material assets include the extractive industries and forestry. There are a number of pits, quarries and one lead and zinc mine at Galmoy, County Kilkenny. Wexford has 114 quarries [79]Disused mines are found extensively in the region, for example at Gortdrum, Castlecomer and Ballingarry. Tipperary has extensive reserves of sand and gravel which are worked at many locations. The amount of afforestation differs significantly across the region. At twenty one per cent, County Wicklow has the highest percentage of forest cover in the region, whilst County Tipperary has the highest overall amount of cover. In contrast, County Meath has the least percentage at 3.2 percent of land covered by planted timber.

[78] Energy in Ireland. Key Statistics 2013

[79]Draft County Wexford Development Plan. Volume 8 Strategic Environmental Assessment. page 99

6.10.18 There is a wide range of issues related to material assets. A key factor is the increase in population, which causes stresses in land availability and building materials, as well as waste facilities, travel and energy consumption. The expansion of port and airport facilities may raise concerns about energy consumption and increased emissions. Whilst the increase in renewables is welcome as a means of addressing climate change, there may be impacts on landscape character, on biodiversity, and on geology and hydrology, as well as the risk of desiccating peat, itself resulting in carbon emissions. The promotion of rail transport for freight and passengers may alleviate some of the pressures on roads, but a number of schemes are in process, which may alleviate problems with localised air pollution but will nonetheless require land take, and may have a detrimental effect on biodiversity.

6.10.19 Climate change is likely to threaten the coastline and river systems. In some places, constructing further seawalls may not prove to be the best solution, and some managed retreat may be inevitable, along with using natural systems of flood control such as SUDS and conversion of marginal farmland. There are concerns of the effects of afforestation on water quality and on dependent species. Of significant concern is the issue of waste capacity. Counties such as Tipperary consider landfill to be a critical issue, and highlights a problem with illegal dumping. Counties Wicklow, Wexford and Waterford all report concerns with wastewater management including the leaching of raw sewage into soils and watercourses.

6.11 Human health and wellbeing

6.11.1 The East and Southern Regions have seen significant growth in population. The GDA has witnessed a growth of nearly half a million people since 1991, and currently stands at 1,801,040 (2011 census), whilst that of the South East Region stands at 460,838 (2006 census figure). The latter region is largely rural, with an overall rural to urban balance of 56.5 per cent to 43.5 per cent. County Wexford has seen a 10.3 per cent growth rate between the 2006 and the 2011 census, whilst Wicklow has seen similar growths in population.

6.11.2 A significant factor is that where rural populations have expanded the housing built to meet their needs may not have been connected to mains sewage systems, which may have an impact on groundwater. Pressure to provide potable water has grown in some areas, as has the challenge of processing waste. The growth in population has also resulted in demands for energy, food and goods, which has led to increases in transportation. Congestion is also likely to be an issue in some urban areas, resulting in

raised levels of atmospheric pollution and noise. Where employment opportunities are not located in places that have witnessed population growth, this will result in increases in commuting, which if not met by sustainable transport systems, is likely to increase traffic pollution.

7 MARINE ENVIRONMENT

7.1 Introduction

7.1.1 The south Irish Sea is a relatively small Regional Sea, about 58,000 sq km (23,000 sq miles) in area. It has the shape of a fairly shallow basin, reaching a depth of about 100 metres in a number of places, with a deeper channel, exceeding 100 metres, running north-south between St George's Channel to the south and Malin Shelf in the north, in the Western part of the Irish Sea, and attaining a depth of 315 metres in Beauforts Dyke.

7.1.2 Water enters the Irish Sea from the Atlantic Ocean through the St George's and North Channels; the two branches meeting to form a standing wave and weak currents to the south-west of the Isle of Man. In marine biogeography, the area is known as the Atlantic Boreal Province, although the southernmost regions of the Irish Sea is also at a transition point for the Lusitanic Subtropical Province, which may therefore host species more common in the Bay of Biscay and off the coast of Spain.

7.1.3 The bed is covered extensively with gravel sediments, sands and muds, with areas of exposed till in St George's Channel, and areas of exposed bedrock occur in the North Channel. Although it differs in detail, the Irish Sea, in terms of depth and substrate type, is similar to adjacent seas overlying the continental shelf, such as the eastern Celtic Sea, the English Channel and the North Sea. It is shallower and warmer than the seas to the south and west of Ireland, and west of the Hebrides[80].

7.2 Biodiversity

7.2.1 The Irish Sea is host to a wide range of resident and passage species, including various cetaceans and other marine mammals, sharks, fish, birds, molluscs and crustacea, as well important habitats including reefs, kelp beds and seagrass. This section will provide an overview of marine biodiversity, which is described in more detail in the accompanying Appropriate Assessment.

7.2.2 The Biomôr Project (1995) was a Wales-Ireland Interregional project that set out to describe the benthic biodiversity of the southern Irish Sea. The project was able to identify some 1030 species, dominated by

[80] Data drawn from the Irish Sea Pilot Project

polychaete[81] worms, crustacea and molluscs. There was considerable abundance in the samples taken, reaching 17,348 individuals per square metre. The western portion of the central Irish Sea, St George's Channel and close inshore around Pembrokeshire and off North Wales and Anglesey presented the highest biodiversity index, which included abundance and diversity, i.e. the evenness of species represented as well as their abundance.

7.2.3 A number of marine habitats can be identified under the EU Habitats Directive, including sandbanks which are slightly covered by seawater at all times; large shallow inlets and bays; Reefs; Mud habitats in deep water; and submerged or partially submerged sea caves. Each of these presents its own distinctive communities. Some of these habitats and their associated species are considered highly sensitive to a range of pressures. The SEA of the Offshore Renewable Energy Development Plan (October 2010) identified a number of habitats and communities considered to be sensitive:

- beds of seagrass *Zostera marina*
- beds of maerl forming calcareous algae including *Lithothamnion corallioides, Phymatolithon calcareum*
- communities of the polychaetes *Lanice conchilega* (Sand Mason) , *Sabella pavonina* (Peacock Worm) and the reef forming *Serpula vermicularis* (Tube Worm)
- reefs of the Native Oyster *Ostrea edulis*
- reefs of the bivalve mollusc *Limaria hians* (Gaping File Shell)
- communities of *Scolanthus callimorphus* (Burrowing Worm Anemone)
- beds of the tubicolous anemone *Pachycerianthus multiplicatus* (Fireworks Anemone)
- communities of *Virgularia mirabilis* and other Sea Pen species
- beds of *Neopentadactyla mixta* and other burrowing sea cucumbers
- communities of the anemone *Edwardsia delapiae*

7.2.4 Pelagic fish species are shoaling fish mainly found swimming in the water column as opposed to near the seabed. Important pelagic fish species include mackerel, herring, horse mackerel, bluefin tuna, albacore tuna, boarfish, blue whiting and basking sharks.

7.2.5 Twenty-eight species of marine mammal are known to have frequented Irish waters, of which seventeen are whales, six are dolphin, and two are seals. Walrus is also recorded. These have mainly been recorded through

[81] Often referred to a bristle worms. Lugworms, sandworms and clam worms are common representatives of the 100,000 species described.

strandings. Grey seals are commonly seen, and harbour porpoise, bottlenose dolphin, minke and long finned pilot whales are frequent. Fin whale and Risso's dolphin are frequent off the south and east coasts of Ireland. A key mammal in inshore waters is the otter, which is widespread with an estimated population of between ten and twenty thousand individuals.

7.2.6 Leatherback and loggerhead turtles are a migratory species known to occur around the Irish and Welsh coasts in the summer and early autumn, in pursuit of a key source of food, jellyfish. Numbers are low, perhaps 400 in around the entire coast of Ireland in the summer.

7.2.7 At least 45 species of seabird have been recorded during at-sea surveys in Irish waters, including IUCN Red-listed species such as Sooty Shearwater, Balearic Shearwater, and common scoter. Other important species include Manx Shearwater, Great Black-Backed Gull, Gannet, Sandwich Tern and Puffin.

7.3 Geology and sediments[82]

7.3.1 The sea obviously imposes limitations on using normal analytical techniques. Analysis is therefore based on sea-bed grab sampling, combined with cores and dredge samples.

7.3.2 It is possible to classify the geology according to three main groups, based on age and geological processes:

- Solid or bedrock geology formed during the Proterozoic eon, some 2500 million years ago, or older, up to the relatively young Pliocene, 2.6 million years ago.
- Rocks that date from about 2.6 million to 10,000 years - drift or superficial geology deposited since the start of the Quaternary period, resting on the bedrock
- Sediments formed from the erosion and restructuring of either the bedrock or the superficial rock, deposits from estuaries or newly formed material from shells.

7.3.3 Devonian to Carboniferous rocks, dating from 419 million to 299 million years ago, are the main bedrock. There are also areas containing variable layers of sedimentary rocks, dating from the Upper Palaeozoic

[82] Much of this information is drawn from 'Strategic Environmental Assessment (SEA) of the Offshore Renewable Energy Development Plan (OREDP) in the Republic of Ireland. Environmental Report Volume 2: Main Report. October 2010. page 123. AECOM Ltd for the Sustainable Energy Authority of Ireland

541 million to 252 million years old, as well as igneous rocks of variable ages.

7.3.4 As stated in the introduction the bed of the Irish Sea is covered with seafloor sediment ranging from 3 to 60 metres in thickness, comprising sands, gravels and muds. The sediment is reworked and redistributed by wave action and tidal currents. Such currents include river channels that extend into inactive submarine river valleys ('palaeovalleys') filled or buried by younger sediment. These are seen extending from the Blackwater, Barrow and Suir rivers.

7.3.5 Generally, sediments in the central Irish Sea are muddy and sandy, becoming more gravelly towards the south. The northern part of the Irish Sea comprises an extensive area of very fine sediments, the Dundalk Mud Belt, where fine material results from very low currents. Sand, shell fragments and gravel substrate predominate within the Celtic Sea. Large areas of bedrock also occur, generally in the vicinity of headlands where the seafloor is swept clear by wind-wave and tidal current action.

7.3.6 Although geological data is patchy, the UK Joint Nature Conservation Committee has, since 1977, set out to identify and describe the most important geological sites in Britain. Its Geological Conservation Review (GCR) has extended below the low water mark in Wales and a number of sites are listed, including Morfa Harlech, Porth Neigwl and Morfa Dyffryn in Gwynedd; Ynyslas in Ceredigion; and the South Pembrokeshire cliffs.

7.3.7 The Irish Sea Pilot Project identified further important sites, including the Sarnau, Cardigan Bay; Southern Irish Sea Linear Troughs and Incisions; Muddy Hollow Holocene Deposits, and Cold Seeps Muddy Hollow, Tremadoc Bay; Morfa Dynlle; Gallows Point Hollow, Menai Strait; Large Mega-ripples, north of Holyhead; Hard Rock geology, north west of Holyhead; Irish Sea Cold Seeps; Pingo, north west Ynys Mon; Tidal Scour Cauldrons, west of Ynys Mon; Periglacial Polygonal Patterned Ground, north of Ynys Mon; 18 Gravel Reefs within Cardigan Bay; 2 Gravel Ridge/Patches, north of Ynys Mon; Inactive Tidal Sand Ridges, west of South Wales peninsula; Linear Sand Streaks on Smooth Gravel Beds, St George's Channel; and Giant Sand Waves, within Cardigan Bay[83].

[83] JNCC Irish Sea Pilot Project (2004) www.jncc.gov.uk/irishseapilot

7.4 Archaeology

7.4.1 There are two key areas of interest: artefacts and remains of settlement by ancient humans in and around the Irish Sea; and more recent remains from maritime shipping history, such as wreck sites. The former is inevitably somewhat speculative, and the evidence difficult to trace.

7.4.2 During the last million years Britain was connected to by dry land to Europe for far longer than it has since been separated, and the Irish Sea was also dry or blocked by ice during much of this time[84]. Evidence of human occupation close to the Welsh coast suggests that sites of similar age might be found offshore. Human artefacts may therefore have been deposited in the Irish Sea at any time that glacial activity elsewhere allowed for its floor to be exposed. However, the significant scouring of the bed, and the thickness of sediment subsequently make the survival of sites unlikely and their discovery, even if possible, highly problematic.

As DTI (2005) puts it (page 21 paragraph 2.15):

Archaeological materials may be covered by metres of sediments which protect them indefinitely, or eroded by ice or rivers, eroded and scattered by surf action or by bottom action of storm waves in shallow water, eroded by tidal currents, chemically altered, or disturbed by trawling, dredging, entrenching, or drilling. if an archaeological deposit is buried under 5-10m of mud or sand it will not be discovered, except in very unusual circumstances.

7.4.3 During the Mesolithic period (about 10,000 years ago), it is likely that communities were fishing and hunting along the coastline, clearing marginal woodland for fire and shelter. Given the rising sea levels, sites that were once located several miles inland are now on the coastal fringe and also submerged offshore. The presence of drowned forests and submerged peat in Wales (for example along the Cambrian coast at Ynyslas) confirms an erstwhile terrestrial landscape here.

7.4.4 The most likely sites for any evidence of early human occupation and activity are:

- Palaeovalleys - submarine 'fossilised' river valleys and estuaries
- Banks or ridges which have or may have layers of peat
- Valleys, depressions, or basins with wetland or marsh deposits
- Creeks, mudflats and peat deposits
- 'Fossil' archipelagos which would have been low lying islands

[84] This section is drawn from DTI (2005) The scope of Strategic Environmental Assessment of Irish Sea Area SEA6 in regard to prehistoric archaeological remains. March 2005

- Caves and rock shelters, submerged rocky shores that are parts of archipelagos
- Sediments deposited in rocky gullies and depressions
- 'Fossil' coastal sites associated with historic shorelines accessible to marine mammals[85]

7.4.5 Remains of more recent artefacts such as ships and aircraft are less problematic, partly because they are recorded in history even where their location is not precisely known, and partly because of their relative visibility. In the light of the previous paragraphs, it is interesting to note that the Irish Sea was historically narrower for a considerable period of its history, and navigating across the channel would have entailed a shorter crossing, so it is not surprising that the maritime history of the Irish Sea is extensive.

7.4.6 Craft dating from the Bronze Age have been found elsewhere in Britain, which points to the possibility of the remains of such craft in the Irish Sea. Roman maritime finds have been discovered at Aberdaron, and there is evidence of Roman presence, if not occupation, in the Rivers Liffey and Boyne. Subsequently, finds from the Viking through the Norman and into the Medieval period have been made.

7.4.7 By the eighteenth century, wrecks were recorded on Admiralty charts, one of which for example led to the find of a Genoese wreck in Cardigan Bay carrying blocks of Carrera marble. The number of wrecks discovered has increased since the improvement of diving apparatus in the 1970's. Seven sites are now protected under the UK Protection of Wrecks Act 1974 and two under the UK Protection of Military Remains Act 1986 in UK Sea Area 6. There are also seven known U-Boat wrecks from the Second World War in the Irish Sea[86].

7.4.8 It should be noted that the wrecks which have been recorded are only a proportion of those lost in recent centuries. Only certain types of losses and wrecks would have been recorded. It is reasonable to assume, for example, that existing records seriously under-represent losses of smaller vessels such as coasting craft and fishing boats. As an indication of the wealth of maritime archaeology in the Irish Sea, 459 wrecks are known from the Sarn Badrig reef on the Cambrian coast north of Aberystwyth.

[85] *Ibid.*

[86] http://uboat.net/maps/irish_sea.htm

7.4.9 Two infrastructure developments within the spatial area of the proposed IWCP have led to archaeological investigations, of which one is of note: the Dublin Bay sewerage pipeline development in 2001. The substantial remains of a Seventeenth century wooden vessel were found during trenching operations. The vessel had not been previously identified in geophysical surveys prior to the commencement of development, owing to the depth of covering sand.

7.5 Human activity - seaborne traffic, energy and fisheries

7.5.1 About 100 million tonnes of imports and exports passed through Irish Sea ports in 2002. Milford Haven handled 34.5 million tonnes. Eighty per cent by volume of Ireland's exports and imports pass through its ports and trade is continuing to rise. The UK remains Ireland's most important trading partner, accounting for just over thirty one per cent of imports and twenty one per cent of exports. The main ferry routes between Wales and Ireland saw 662,000 passengers pass between Fishguard and Rosslare; 1,354,000 between Holyhead and Dublin; 1, 017,000 between Holyhead and Dún Laoghaire; and 287,000 between Pembroke and Rosslare[87]. According to UK Government statistics for 2013[88], the Irish Republic remained the second most popular destination for international short sea passengers. The number of passengers travelling to the Irish Republic remained stable at 2.7 million.

7.5.2 Fisheries landings in Wales in 2012 were worth £19.8 million, of which £7.5 million was derived from scallops. Demersal fishing is of a smaller scale, with megrim and monk fish each netting about £1.5 million[89]. The Welsh fleet consists of 440 vessels under ten metres, and thirty nine vessels over ten metres. The Irish fleet, in comparison, is 2239 vessels[90]. About 450 vessels are over ten metres in length[91]. It is difficult to estimate the value of fish specific to the programme area, since it is contained within ICES sea areas VIIa (partly), VIIg and VIIj (partly)[92]. Eurostat

[87] Transport Statistics Bulletin, National Statistics Office

[88] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/283678/Sea_Passenger_Statistics_2013.pdf

[89] http://www.marinemanagement.org.uk/fisheries/statistics/annual.htm

[90] http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tag00116&plugin=1

[91] *ibid.*

[92] ICES VIIa includes Northern Ireland, South West Scotland and north west England; area VIIj includes part of Western Ireland.

figures can be found for catches and for landings, but these do not correspond to the defined co-operation programme area. In the Irish fishing area as a whole, 275,917 tonnes of fish were caught in 2012, whilst in the UK the figure was 626,487 tonnes[93]. Statistics for landings relate to fish landed in a country regardless of the vessel making the landings. In Ireland 180, 970 tonnes of fish were landed in 2011, whilst in the UK the figure is 437,762. In terms of the value of landed fish, the figure for Ireland was €261.2 million in 2011, and for the UK €806.3 million[94]. However, these figures are of limited value in presenting a picture of the situation of the fishing industry in the region relative to the rest of Ireland and the UK in general.

7.5.3 Dunmore East, Kilmore Quay, Houth, Wexford, Waterford, Dungarven, Rosslare and Wicklow are key fishing ports in the South-East Region. In terms of employment, there are about 1000 full time and 400 part time fishermen in Wales. There are no figures for ancillary workers. In contrast, it is estimated that fishing provides 11,000 jobs in Ireland, and is worth €713 million to the Irish economy[95]. Ireland's fishing effort is concentrated in the Atlantic, which is clearly relatively lucrative, as indicated by the important South-West ports of Castletownbere, Dingle, Union Hall, Ringaskiddy, Kinsale, Cobh and Baltimore.

7.5.4 Coastal and marine tourism is an important activity. According to the Irish Sea Pilot Project

'...a reasonable estimate of the annual economic contribution of the principal marine sectors would be in the order of £6 billion (€9 billion) for the Irish Sea as a whole…the tourism and leisure sector probably contributes the most of all the marine sectors to the regional economy. Statistics which are available indicate a contribution to the regional economy in the order of £2.5 billion (€3.6 billion) per annum, with between 100,000-200,000 people directly employed in the sector. The value of seaside tourism to Wales in 2001 is estimated at £0.9 billion (€1.3 billion).'[96]

[93] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=fish_ca_main&lang=en

[94] Eurostat pocket book 2013. Agriculture, forestry and fishery statistics. ISSN 1977-2262

[95] http://www.agriculture.gov.ie/publications/2011/annualreviewandoutlookforagriculturefisheriesandfood20102011/fisheries/overview/

[96] Vincent, M.A., Atkins, S.M., Lumb, C.M., Golding, N., Lieberknecht, L.M. and Webster, M. (2004). *Marine nature conservation and sustainable development - the Irish Sea Pilot.* Report to Defra by the Joint Nature Conservation Committee, Peterborough. page 27

Although somewhat dated, the figures highlight both the level of activity and the value of this to the economy of both partners.

7.5.5 The fishing industry depends on good water conditions, the maintenance of good habitat conditions for spawning and as nursery areas, and the maintenance of plankton productivity and of a complex trophic structure. By its very nature and scale, fishing has an impact on target stocks, on non-target stocks of fish and on other species through their incidental catch in fishing gear. It can also affect marine food webs. In the Irish Sea, several fish stocks are close to or below safe biological limits and some skate and ray species are threatened. Certain gears, in particular beam trawls and scallop dredges, have impacts on the seabed due to physical disturbance. Such disturbance is widespread in the northern Irish Sea.

7.5.6 Oil, gas and wind energy have all been established and are subject to further exploration and development in the Irish Sea. The number of wind farm projects is expected to increase over the next fifteen years, and it is likely that shale gas exploration will also be undertaken. Of the five wind farms in existence, only one falls within the geographical scope of this study - Arklow Bank, off the Wicklow coast. Oil and gas exploration has been actively pursued off the south coast of Ireland. There is currently a licence to explore off the Dublin coast at Dalkey. Whilst production is not dependent on the marine environment as such, there are a number of environmental issues relating to the exploration and commercial production of these fuels.

7.5.7 Although the region has considerable potential for tidal and wave energy generation, none has yet been realised at this time.

7.6 Marine landscape

7.6.1 A key output of the ISPP was the development of a marine landscape concept. Three main groups of marine landscapes were identified:

i. **Coastal (physiographic) marine landscapes** such as rias and estuaries where the seabed and water body are closely interlinked. In this group, both the seabed and the overlying water are included within the marine landscape;

ii. **Seabed marine landscapes** which occur away from the coast, i.e. the seabed of open sea areas. In this group, the marine landscapes comprise the seabed and water at the substrate/water interface;

iii. **Water column marine landscapes** of open sea areas, such as mixed and stratified water bodies and frontal systems. In this group, the marine

landscapes comprise the water column above the substrate/water interface.

Within these three groups, eighteen coastal and seabed marine landscape types were identified for the Irish Sea, according to criteria that included depth, substratum, current, and physiographical characteristics:

7.6.2 An important aspect of the analysis was to assess the extent of any correlation between the landscape characterisation and the biota present at each landscape. The conclusion was that '*…in general the relation between marine landscapes and biological communities is very strong, but locally there can be considerable variation and complexity.*

8 ISSUES AND INTERACTIONS

8.1 The European Commission is set to publish a Seventh Environmental Action Programme, which will address a number of issues, including:

- the rapidly changing external conditions and the **increasingly interlinked nature of environmental, economic and social challenges**
- **increased growth in the demand for natural resources and the impacts this has on the environment**
- the enlargement of the EU and the increased diversity of national characteristics and circumstances
- **pressure on ecosystems, biodiversity loss, waste generation and air quality in urban areas**
- the uneven implementation of environmental law across Europe.

The issues highlighted have a clear resonance with this report, and reflect some of the concerns expressed below.

8.2 Each of the 'environments' described in sections 6 to 8 has its own environmental priorities and challenges. In Wales, **development, agricultural intensification, erosion, pollution** and **loss of carbon** are all potential challenges, with potential impacts on human health, food productivity, biodiversity, ecosystem functions and the economy. **Halting biodiversity loss** is a major concern.

8.3 In Ireland, two primary areas where unsatisfactory conditions are prominent and extensive are **eutrophication** and other **water pollution** and the **unsatisfactory conservation status of natural habitats** and species. **Remediation of contaminated land** is also an important issue[97]. A number of dwellings in rural areas on both sides of the Irish Sea rely on septic tanks, some of which are in poor condition and pose a threat to soils and groundwater. This is highlighted in a number of Irish local plans.

8.4 **Fragmentation** through development, and the **conversion of land** from one use to another, as well as **intensification**, are seen as some of the underlying causes. **Erosion and silting**, as well as **nutrient loading**, have a particular negative effect on the quality of rivers and their chemistry and biodiversity. Furthermore, major land-use changes can significantly impact the **quality of the marine** (**particularly coastal**)

[97] South-East Regional Authority Regional Planning Guidelines 2010-2022. Environmental Report and Habitats Directive Assessment page 28

environment (e.g. sedimentation, hydrographic change, impacts on benthic eco-system, etc).

8.5 In both regions, protected European areas and species are under pressure from the activities of other sectors**. Invasive species** are on the increase, a situation likely to be exacerbated by climate change. In some areas, invasive species are seen as a particular threat[98].

8.6 For Ireland and for Wales, the issue of **population growth** with its attendant **demands on natural resources**, is a common theme. An **increase in traffic** will increase the likelihood of **local and regional air pollution**, as well as contributing greenhouse gases. For both regions, **climate change** will increase the likelihood of devastating storm conditions, and **sea level rise**poses a threat to the coastal communities on both sides of the Irish Sea. **Increasing tourism development** along the coasts is likely to add to pressures unless managed.

8.7 The threats from human activities to marine geological and geomorphological features derive from significant **dredging** and **dumping** activities and from **engineering works**. For most of these, effective present day controls exist but are not applied directly for Earth heritage conservation purposes because important sites have not been identified. In Wales, Cadw is aware of the significance of drowned landscapes and is particularly concerned about the possible impact of **offshore development**. Cable-laying for connection from offshore wind turbines to the inshore infrastructure are likely to cross sensitive areas where buried Mesolithic littoral settlements might be expected.

8.8 Threats to marine biodiversity are also of concern. These include **by-catch**, the incidental entanglement in nets of marine mammals such as small cetaceans and seals. The EU's By-catch Regulation 812/2004 requires monitoring of cetacean by-catch in pelagic trawl fisheries. **Overfishing** will potentially impact negatively on marine mammals directly through reducing the biomass of fish available, and indirectly by causing changes in the marine ecosystem. **Climate change** will result in changes to structures and distribution of marine species, and the increased possibility of disease. Warm water species may increase, as cold water species move northwards. Rising sea levels may alter the locations of haul out sites for seals, or reduce their availability. **Pollution** poses a threat to marine ecosystems. PCBs and toxic algal blooms are known to be associated with disease and neurological dysfunction in marine

[98] Wexford County Development Plan 2013-2019. Volume 8: Strategic Environmental Assessment June 2012

mammals[99]. The integrity of designated shellfish waters is critical to maintaining sustainable livelihoods, in enabling local consumption and in minimising processing costs. Shellfish also act as a nutrient sink thus contributing to water quality improvement.

8.9 **Plastics** are an increasing threat to marine mammals, which ingest particles, become entangled in plastic objects or choke on them. **Noise** is of increasing concern in the marine environment, especially with the development of offshore energy rigs and wind farms, as well as an increase in marine transport and leisure craft. Studies have shown a sensitivity of marine mammals to construction and operational noise[100]. Finally, the threat of **invasive species** from seaborne traffic should not be overlooked, especially in the context of cross-border marine tourism.

8.10 Effects are broadly of five types. They may be **spatial,** for example air or sea borne pollutants and invasive species may be carried across great distances, so that the effects are felt internationally. In the case of the IWCP, the prevailing winds are south-west to north-east, as are the sea currents, so that polluting effects of this sort are likely to be felt in the Isle of Man and north into Scotland. Agricultural pollutants will have a diversity of negative effects downstream, affecting the environments of coastal communities. The case of small protected areas is of particular concern, since efforts to conserve and enhance their conservation status are likely to be challenged by activities taking place surrounding or well upstream from the site.

8.11 Interactions may also have a **temporal** dimension, in that effects may not be felt for a considerable time. Climate change is an example, whereby the effects of Victorian industrialisation have only become apparent in recent decades. On a smaller scale, the ingestion of pollutants by communities of plants or animals may take time to have an effect, but may result in a catastrophic breakdown as thresholds are exceeded. This is of particular concern, since problems may not be apparent until a critical,

[99]Jepson, P.D., Bennett, P.M., Deaville, R., Allchin, C.R., Baker, J.L., Law, R.J. 2005. Relationships between polychlorinated biphenyls and heath status in harbour porpoises (*Phocoena phocoena*) stranded in the United Kingdom. Environmental Toxicology and Chemistry 24:238-248

[100]Madsen, P.T., Wahlberg, M., Tougaard, J., Lucke, K. and Tyack, P. 2006. Wind turbine underwater noise and marine mammals: implications of current knowledge and data needs. Marine Ecology Progress Series 309:279-295; Carstensen, J., Henriksen, O.D. and Teilmann, J. 2006. Impacts of harbour porpoises from offshore wind farms construction: acoustic monitoring of echolocation activity using porpoise detectors (T-PODs). Marine Ecology Progress Series 321:295-308; Koschinski, S., Culik, B.M., Henriksen, O.D., Tregenza, N., Ellis, G., Jansen, C. and Kathe, G. 2003. Behavioural reactions of free-ranging porpoises and seals to the noise of a simulated 2 MW windpower generator. MarineEcology Progress Series 265:263-273

and probably unknown, threshold is surpassed. The build-up of toxins in underground watercourses are another area of concern.

8.12 Interactions are also **sectoral**. The activities of, say, the agriculture sector will have a profound impact on the capacity of the water sector to deliver clean water to communities. For its part, the water sector will impact on other interests by its abstraction policies, and by its take of land for reservoirs. Both activities will diminish biodiversity, and will also impact on the availability of land for agriculture or for development. Tourism is an important economic driver in Wales and in Ireland, but it makes significant demands on natural resources, that may become unsustainable. There may also be impacts on social and cultural interests, as places and cultures become commodified, and as the availability of housing stock diminishes for local people. A major element factor in tourism in both areas is seafood. This sector relies on high water quality in order to meet appropriate standards.

8.13 Such interactions are **thematic** - air quality is a public health issue, but it is also a factor in climate change. These are environmental issues, but they are also social and economic. Flood and coastal protection schemes have in some cases impacted on biodiversity[101]. A significant number of houses in some areas are connected to septic tanks[102]. Septic tank failures could result in groundwater pollution, which is a public health hazard and may impact on biodiversity. Landscape is linked both to historic and cultural assets and to biodiversity.

8.14 **Synergistic** effects relate to the interactions of any of the above effects, in that any one activity may, by itself, not have a significant effect, but that taken together the effect may be profound, both positive and negative. This may derive within a single sector, such as energy or housing whereby a discrete, relatively few number of rigs, masts or dwellings may not have a significant visual or landscape impact, but with increases in infrastructure the landscape and biodiversity will be impacted on. Synergistic effects may also occur as a result of the combination of interventions across sectors and interests. Thus the loss of farmland birds may be attributed to a number of factors, of which agricultural practices may not be the only one. Cumulatively, such synergistic effects may result in the exceedance of thresholds and may have significant

[101] See for instance Kilkenny City and Environs Development Plan SEA 2008 page 5

[102] For example, in North Tipperary in 2006 more houses were connected to septic tanks (10,990) than to public sewers (10, 877). See North Tipperary County Development Plan 2010-2016 Strategic Environmental Assessment NTS page 13

results. Conversely a range of mutually supporting activities may have significant positive effects.

8.15 The clear conclusion is that projects assessed through the IWCP will need to be considered not only for their immediate environmental and other effects, but on a broader consideration of spatial and temporal basis, and for their effects across other sectors and themes. The ecosystem approach should be adopted in assessing any project or proposal that emerges[103]

[103] The ecosystem approach is underpinned by a number of principles. These can be summarised as:

- promoting cross sectoral approaches to decision making
- ensuring inclusivity by consulting appropriately
- respecting environmental limits in terms of ecosystem functioning
- taking decisions at appropriate spatial and temporal scales
- incorporating the full value of ecosystem services in decision making

For a fuller discussion of the ecosystem approach see '**Securing a Healthy Natural Environment - an action plan for embedding an ecosystems approach**'
http://archive.defra.gov.uk/environment/policy/natural-environ/documents/eco-actionplan.pdf

9 THE IRELAND-WALES CO-OPERATION PROGRAMME[104]

9.1 Introduction and context

9.1.1 The Ireland-Wales (IW) Co-operation Programme covers an area of about 41,000km^2, with a population of approximately 4.5 million people. The area comprises Dublin, Mid-East & South-East, and South-West regions in Ireland and the Isle of Anglesey, Gwynedd, Conwy, Denbighshire, Ceredigion, Pembrokeshire, Carmarthenshire, Swansea, Flintshire and Wrexham in Wales. Due to changes in local government structures in Ireland, North Tipperary County Council and South Tipperary County Council will merge which may result in the whole county being included within South East Ireland region and therefore becoming part of the Programme area. Seventy per cent of the population of the programme area is based in Ireland, and thirty per cent in Wales; the population difference is largely due to the inclusion of the Dublin region where over half of the Irish population of the programme area lives.

9.1.2 The overall strategy of the EU, the Europe 2020 strategy, is about delivering smart, sustainable and inclusive growth. The Europe 2020 strategy aims for social and economic cohesion through effective investments in eleven thematic objectives (TOs), of which three (TO1, TO5 and TO6) have been selected for the programme.

9.1.3 A critical element is Horizon 2020, the EU's Framework Programme for research and innovation. This consists of three pillars, namely 'excellent science', 'industrial leadership' and 'societal challenges'. The specific societal challenges most relevant for the IW programme are:

- food security
- sustainable agriculture and forestry
- marine and maritime and inland water research
- the Bio economy
- Climate action, environment, resource efficiency and raw materials;
- Europe in a changing world - inclusive, innovative and reflective societies.

9.1.4 The 'Maritime strategy for the Atlantic Area' (adopted in 2011) and the subsequent 'Action Plan for a Maritime Strategy for the Atlantic Area' (published in May 2013) are both significant for the IW cooperation programme given the prominence of the Irish Sea within the programme area. The Action Plan considers responses to the challenges of delivering growth, reducing the carbon footprint, sustainable use of the sea's natural

[104] Correct on 17th July 2014.

resources, responding effectively to threats and emergencies and implementing an "ecosystem" management approach in Atlantic waters. It contains four overarching priorities:

- Promote entrepreneurship and innovation;
- Protect, secure and enhance the marine and coastal environment;
- Improve accessibility and connectivity;
- Create a socially inclusive and sustainable model of regional development.

9.2 Overview of the programme strategy

9.2.1 The programme will focus on eco-innovation particularly in the context of the Irish Sea, and the effective and efficient use of this natural resource. In doing so, it is anticipated that the programme will contribute to protecting the environment, reducing emissions and preventing biodiversity loss. It is recognised that *'...it is necessary to take action to address the impacts of climate change and in so doing also contribute to the protection of the environment and the prevention of biodiversity loss*[105]*.'*

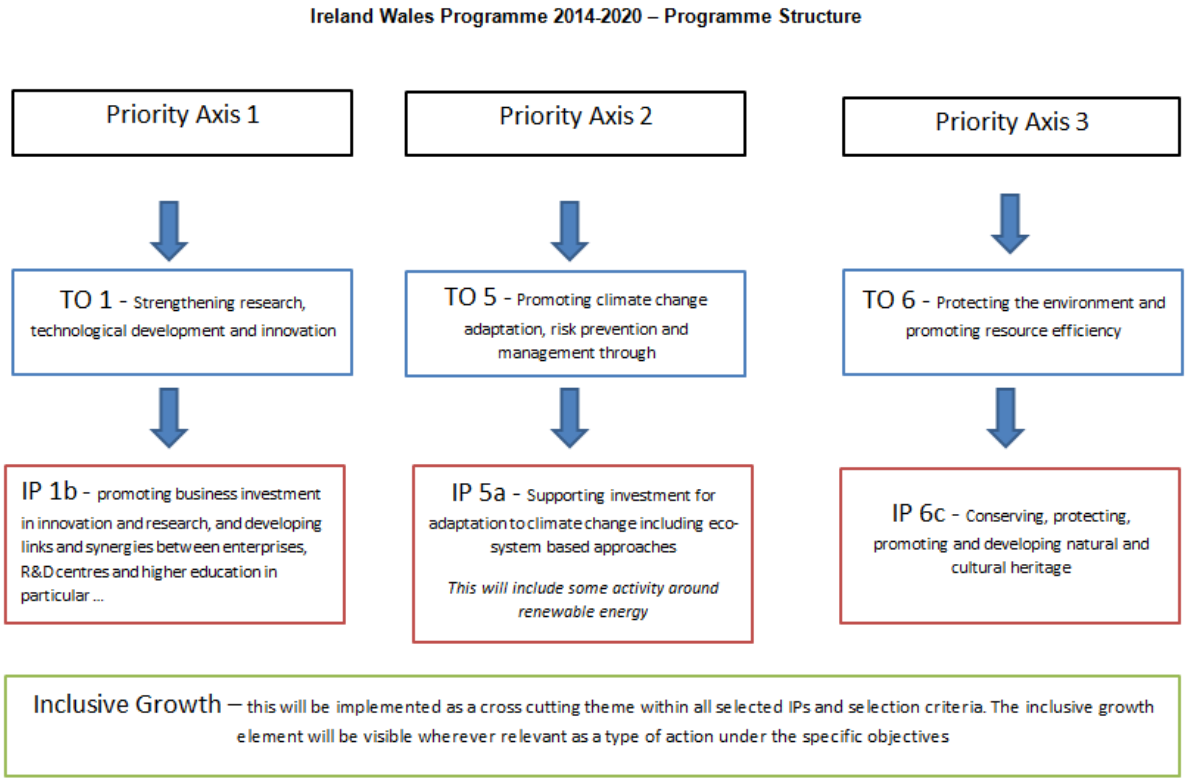
9.2.2 Approved projects will therefore'...*include real solutions for the adaptation of the programme area to climate change and the reduction of its vulnerability to the impacts of climate change.*[106]'

9.2.3 The strategy of the programme is based on the three Priority Axes, underpinned by the selected Thematic Objectives (TOs) referred to above. Each of these axes and TOs is supported by an investment priority (IP). The overall structure of the programme can be presented thus:

[105] Draft Ireland-Wales Co-operation Programme OP version 5. 06 June 2014

[106] *Ibid.*

Figure 2: Programme Structure



9.2.4 In order to provide further detail, each axis is driven forward by a Specific Objective and by types of action (ToA):

Table 2: Priority Axes – Thematic and Specific Objectives

PRIORITY AXIS	THEMATIC OBJECTIVE	SPECIFIC OBJECTIVE
Axis 1 Innovation	TO 1 Strengthening research, technological development and innovation	*To increase cross-border innovation in line with shared priorities of the smart specialisation strategies*
Axis 2 Climate change adaptation	TO 5 Promoting climate change adaptation, risk prevention and management	*To increase knowledge and awareness of Climate Change adaptation for the Irish sea and coastal communities*
Axis 3 Cultural and natural resources	TO 6 Protecting the environment and promoting resource efficiency	*To sustainably realise the potential of natural and cultural assets in increasing visitor numbers across the Programme area*

9.2.5 Table 3 summarises the types of action that will be supported by the programme. Note that the types of action are numbered for the purposes of this assessment only.

Table 3: Priority Axes and Types of Action

PRIORITY AXIS	THEMATIC OBJECTIVE
Cross-border Innovation	**Strengthening research, technological development and innovation**
	TYPES OF ACTION
	1. Bringing together organisations who would not usually work together (e.g. cross and multi-sector working, bringing together HEIs and research institutes with SMEs and other public private and third sector partners) to stimulate cross-border collaboration and the development of fresh ideas and concepts; 2. Support businesses to undertake innovation in line with the shared priorities of the smart specialisation strategies and improve innovation supply chains between businesses and with academia; 3. Piloting of initiatives to test innovative products, processes or services in areas with commercial potential including cross-border research and pilot projects to demonstrate practical application and transferability to business and wider communities; 4. Support the development of prototypes, pilot schemes, demonstrations and working models; 5. Cross-border demonstration, testing, commercialisation and marketing of new products, services, processes and systems relating to the shared priorities of the Smart Specialisation Strategies; 6. Creation of cross-border innovation clusters or networks such as creating a platform for HEI , third sector, businesses and public sector agencies to collaborate and co-ordinate their activities on a cross-border basis to meet the needs of the Programme area – for example a portal based on the Irish Sea; 7. Joint cross-border design of innovative solutions which could include piloting, testing or finding ways to overcome barriers to innovation particularly those faced by SMEs and those faced by underrepresented groups e.g. disabled people; 8. Operations which develop the concept of the citizen scientist (i.e. community involvement) working innovatively with HEIs and other

	research organisations. 9. Flexible support for innovation which targets developing innovative business ideas to underrepresented groups e.g. disabled people. 10. Transferable models to assist internationalisation of SMEs and trade developed using cross-border partnerships.

PRIORITY AXIS	THEMATIC OBJECTIVE
Adaptation of the Irish sea and Coastal Communities to climate change	**Promoting climate change adaptation, risk prevention and management**
	TYPES OF ACTION
	1. Providing mechanisms and platforms for the sharing of knowledge about risks and opportunities from climate change between stakeholders in Ireland and Wales. These could include web portals, workshops/seminars etc.; 2. Jointly commissioned research where there are clear gaps in the evidence based on shared climate change impacts on the Irish Sea and coastal communities; 3. Developing assessment tools which assess the impact, risk and vulnerability of the programme area to climate change, and which can increase the knowledge basis and support the decision making processes of public sector bodies and the general public; 4. Transferring knowledge, expertise and best practice on adaptation measures between the two regions of the Programme area. These could include how to' guides, best practice databases, workshops/seminars/conferences, web portals; 5. Marine and coastal land environment improvement, including practical management methods (e.g. Marine Spatial Planning) working with local stakeholders and involving communities; 6. Sustainable management/protection of ecosystems and biodiversity habitats and species in coastal waters and related research work into integrated water and flood risk management in river catchment areas; 7. Stimulating awareness amongst the communities of the Programme area to influence behavioural change, knowledge awareness and best practice with regard to climate change

	adaptation including though web portals containing examples of good practice, newsletters and annual reports, seminars, conferences and good practice guides.

PRIORITY AXIS	THEMATIC OBJECTIVE
Natural and Cultural Heritage and Resources	**Protecting the environment and promoting resource efficiency**
	TYPES OF ACTION
	1. Cross-border promotion of business opportunities which take full advantage of the sustainable management of natural and cultural resources, such as niche tourist attractions, including coastal and cultural attractions and maritime heritage sites – including cross-border marketing approaches; and the implementation of cross-border events and communication measures to increase interest; 2. Cross-border maritime tourism development –such as support for tourism at sea – including developing and testing best practice models; 3. Development of entrepreneurial activity, SMEs and micro-enterprises active in the natural heritage and sustainable resource management, tourist, creative and cultural heritage sectors (particularly utilising existing strengths in these sectors); 4. Enhancing the environment – particularly the coastal and marine environment – to make the area a more attractive place to visit. This may include activities such as maintaining the blue flag status of beaches. This may also include engaging communities in the conservation of their natural and cultural heritage – including creating capacity within communities to engage and share best practice and ideas in innovative community, environmental and economic development; support for the development and promotion of joint environmental enhancement activities; and cross-border partnerships between research stakeholders and the community; 5. Community regeneration through sustainable development and job creation based on cultural and natural heritage tourism – particularly focused on coastal and rural communities and where common problems are faced or opportunities are available on both sides of the Irish Sea; 6. Using traditional, cultural and creative strengths to improve an area and make it a more attractive place to visit – including the

	sharing of expertise and developing projects based on joint strengths; 7. Sharing expertise on a cross-border basis to make the area a more attractive place to visit – including the development of knowledge transfer clusters.

10 ENVIRONMENTAL OBJECTIVES

10.1.1 Whilst there is no requirement under the SEA Directive to produce environmental objectives or indicators as part of the SEA process, their use is promoted as an appropriate tool for identifying and assessing the potential environmental effects, both positive and negative, of a programme.

10.1.2 The objectives were selected as a result of a wide-ranging literature review, largely based on state of environment reports, assessments of previous Operational Programmes, sustainable development policies and strategies, environmental action plans and agency or NGO advice. These include (not exhaustive):

- European Commission Core Indicators[107]
- EU 6th Environmental Action Plan & Sustainable Development Strategy[108]
- Wales Environment Strategy[109]
- Wales National Ecosystem Assessment[110]
- Sustainable Development Indicators for Wales[111]
- Ireland's Environmental Assessment[112]
- Irish Sea Pilot[113]
- PISCES LIFE+ project[114]

[107]European Commission. Programming period 2014-2020. Monitoring and evaluation of European cohesion policy - European Regional Development Fund and Cohesion Fund. Concepts and Recommendations. Guidance document. November 2011. (http://ec.europa.eu/regional_policy/information/evaluations/guidance_en.cfm#1)

[108]Decision No 1600/2002/EC of the European Parliament and the Council laying down the sixth community environmental action programme. July 2002.(http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:242:0001:0015:EN:PDF)Summary and explanation. (http://europa.eu/legislation _summaries/ agriculture/ environment/l28027_en.htm)

[109]WAG Cardiff. Environment Strategy Action Plan October 2008. (http://wales. gov.uk/ desh/publications/enviroprotect/environmentstrategy/environmentactionplan/esap0811e.pdf;jsessionid=7D4C112D25E2CF42B4AD153E9C57CDA0?lang=en)

[110]National Ecosystems Assessment (2011): Chapter 20: Status and Changes in the UK's Ecosystems and their Services to Society: Wales. World Conservation Monitoring Centre Cambridge.

[111] Welsh Government (2012): Sustainable Development Indicators. WG Cardiff

[112] Ireland's Environment – an Assessment 2012 (Environmental Protection Agency, Wexford, 2012

[113] Lumb et al (2004): Irish Sea Pilot - Developing Marine Nature Conservation Objectives for the Irish Sea. JNCC

[114] A guide to implementing the ecosystem approach through the Marine Strategy Framework Directive. WWF-UK in partnership with WWF-Spain, Environment Council, Ireland Coastal and Marine Research Centre, France SeaWeb (2012)

- Ireland-Wales Operational Programme 2007-2013[115]

10.1.3 As well as these, a range of sectoral and thematic documents were analysed. The following is an indicative list of the kinds of documents reviewed, and is not exhaustive: Ireland Offshore Renewable Energy Development Plan (OREDP) SEA[116]; the scope of SEA of Irish Sea Area 6 in regard to prehistoric remains[117]; Southern and Eastern Regional Assembly Operational Programme[118]; Energy in Ireland[119]; Ireland Bathing Water Quality Report[120]; Wales Tourism Strategy[121]; Wales Coastal Flood Erosion Strategy[122]; Wales Climate Change Strategy[123]; Woodland for Wales[124]; Farming Food and Countryside[125]; Western Wales River Basin District Management Plan SEA[126]; Ireland Seafood Operational Programme[127]; and The Irish Government's 'National Climate Change Adaptation Framework' (2012)[128].

[115] CCI number: 2007CB163PO062

[116] AECOM Environment: Strategic Environmental Assessment (SEA) of the Offshore Renewable Energy Development Plan (OREDP) in the Republic of Ireland (October 2010)

[117] The scope of Strategic Environmental Assessment of Irish Sea Area SEA6 in regard to prehistoric archaeological remains. DTI 2005

[118] Southern and Eastern Regional Assembly. Regional Operational Programme 2007-2013

[119] Sustainable Energy Authority of Ireland (SEAI) (2013): Energy in Ireland - Key Statistics

[120] Environmental Protection Agency (2013): The Quality of Bathing Water

[121] Welsh Government (2013): Partnership for Growth. The Welsh Government Strategy for Tourism 2013-2020. EG Cardiff

[122] Welsh Government (2011): National Strategy for Flood and Coastal Erosion Risk Management. WG Cardiff

[123] Welsh Assembly Government (2010): Climate Change Strategy for Wales. WAG Cardiff

[124] Welsh Assembly Government (2009): Woodlands for Wales. The Welsh Assembly Government's Strategy for Woodlands and Trees. WAG Cardiff

[125] Welsh Assembly Government (2009): Farming, Food and Countryside - Building a Secure Future. WAG Cardiff

[126] Natural Resources Wales (2013): Water for Life and Livelihoods. Western Wales River Basin Management Plan. Strategic Environmental Assessment.

[127] Ireland (Modified) Seafood Development Operational Programme 2007-2013 (April 2013)Ref. Ares(2013)1230089 - 21/05/2013

[128] DECLG (2012): Building Resilience to Climate Change. Dublin. (December 2012) http://www.environ.ie/en/Publications/Environment/ClimateChange/FileDownLoad,32076,en.pdf

10.1.4 Each of the constituent authorities' various biodiversity action plans and SEAs linked to spatial plans were likewise reviewed in developing objectives (see references).

10.1.5 The literature review resulted in the development of 53 key objectives. In order to reflect the high level of the IWCP, these were then aggregated into the 17 objectives against which the programme was assessed (see table 4). Although some of them are somewhat generic in nature, most of the key objectives were retained as sub-objectives in order to inform thinking about potential effects.

Table 4: SEA Themes, Objectives and Sub-objectives

	Objective	Sub-objective
Protect and enhance natural and cultural heritage	**A** Protect places, landscapes and buildings of historic, cultural and archaeological value	Deliver conservation programmes for monuments in state care, alongside the designation of further heritage assets
	B Protect and enhance landscapes, seascapes, townscapes and the countryside	Improve the quality of the local built environment
		Develop an integrated approach to eco-system health
		Improve management of common land
		Protect and enhance access to the coastline and countryside
		Avoid significant alteration to urban landscape character
	C Protect and enhance biodiversity	Protect internationally, nationally and locally designated nature conservation sites
		Protect Biodiversity Action Plan (BAP) habitats and species, increase area of habitat

	Objective	Sub-objective
Protect and conserve natural resources	**D** Protect and improve the region's water quality	Monitor and regulate known and emerging environmental hazards
		Protect and enhance the quality of groundwater, rivers, lakes, and coastal waters
		Comply with 'good' status under the Water Framework Directive (WFD)
		Protect and enhance salmonid and other fisheries
		Avoid physical disturbance to the water and water edge environment
		Reduce diffuse pollution from agriculture, acid precipitation and other sources

	E Protect the water resource and ensure its sustainable use	Maintain levels of abstraction and recharge within the carrying capacity of the region
		Maintain and enhance ground and surface water physical, ecological and chemical quality
		Monitor use and discharge rates

	Objective	**Sub-objective**
Protect and conserve natural resources	**F** Guard against land contamination, encourage reuse of existing buildings and of previously developed land of low ecological quality	Use planning policy to identify suitable previously developed land
		Use planning policy to encourage the re-use of existing buildings
		Monitor and regulate known and emerging environmental hazards. Maintain and update contaminated land data and strategies
	G Minimise the requirement for energy generation, promote efficient energy use and increase the use of energy from renewable resources	Generate up to twice as much renewable electricity annually by 2025 as is generated today
		Introduce higher energy conservation standards in constructing new housing
	H Minimise waste, and increase re-use, recycling and recovery rates	Restrict biodegradable materials going to landfill
		Re-use materials from existing buildings
	I Minimise the need to travel; provide alternatives to car use	Optimise opportunities to work locally
		Promote sustainable transport
		Protect and enhance public transport systems
		Legislate to place a duty to provide cycle routes in key areas

	Objective	**Sub-objective**
Maintain and improve the human environment	**J** Limit and adapt to climate change	Reduce emissions of greenhouse gases
		Provide measures to enable adaptation to climate change
		Ensure infrastructure and material assets are resilient to potential increases in extreme weather events (such as storms, floods and heat waves, as well as extreme cold weather).
		Ensure that communities are resilient to changes in weather patterns by protecting resources and by promoting awareness of the need to adapt to extreme weather events
		Build in flexibility to enable the modification of assets in the future without incurring excessive cost.
		Work to ensure we have a sustainable food and fisheries industry
		Protect and manage soil

		Reduce the risk of flooding
		Complete flood and coastal risk plans

	Objective	Sub-objective
Maintain and improve the human environment	**K** Protect and improve air quality	Minimise the use of processes that produce toxic air pollutants, and incorporate extensive safety and capture processes for those that occur
	L Improve physical and mental health and reduce health inequalities	Minimise environmental nuisance such as fly-tipping, littering, dog fouling, graffiti, noise pollution, and light pollution
		Promote the provision of opportunities for disadvantaged communities.
		Monitor and regulate known and emerging environmental hazards
		Protect and enhance existing greenspace
	M Improve public access to land	Improve opportunities to access green space
		Ensure that disadvantaged communities have opportunities to access greenspace and open countryside and to benefit from such access

	Objective	Sub-objective
Protect the marine environment	**N** Protect seabed features so that they can support the processes, habitats and species characteristic of the marine landscapes.	Protect coastal processes from ecologically-significant change due to human activity, and reverse such change where practicable
		Protect seabed habitats from ecologically - significant change due to human activity, and reverse such change where practicable.
		Protect biogenic structures from ecologically-significant change due to human activity, and reverse such change where practicable.
	O Protect water column features so that they can support the characteristic processes, habitats and species	Protect the water column features from ecologically-significant change due to human activity, and reverse such change where practicable.
	P Protect the water quality of the component water column features so they can support the processes, habitats and species characteristic of the water column and associated seabed habitats.	Maintain or recover water quality to within defined standards which aim to prevent 'undesirable disturbance' caused by eutrophication.
		Ensure that environmental standards are not exceeded.
		Maintain noise and vibration levels below precautionary standards aimed at protecting vulnerable marine species from disturbance
		Reduce input of litter to the marine environment to below levels aimed at protecting vulnerable marine habitats and species
	Q Maintain biota quality	Ensure standards for contaminants in biota are not exceeded

11 ASSESSMENT OF THE PROGRAMME

11.1. This section reviews the types of action and summarises key environmental implications. Its purpose is to identify which aspects of the environment are likely to be relevant to the environmental report, and which therefore require further analysis.

Table 5: Assessment of Types of Action against SEA Objectives

THEMATIC OBJECTIVES		SEA OBJECTIVES																
		Protect & enhance natural & cultural heritage			Protect/conserve natural resources						Maintain/improve human environment				Protect marine environment			
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Strengthening research, technological development and innovation	1	0	0	0	+?	+?	0	+?	+?	?	+?	+?	0	0	0	0	0	0
	2	+	+	+	+?	+?	0	+	0	?	+	0	0	0	+?	+?	+?	+?
	3	0	?	?	0	+?	0	+?	+?	0	+?	+?	0	0	?	?	?	?
	4	+?	+?	+?	0	+?	0	+	+?	+?	+	0	0	0	+?	+?	+?	+?
	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7	0	?	0	0	+?	0	+?	+?	0	+?	+?	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	9	0	0	0	0	0	0	0	0	+?	0	0	+	0	0	0	0	0
	10	0	0	0	0	0	0	+?	+?	?	+?	+?	0	0	0	0	0	0
Promoting climate change adaptation, risk prevention and management	1	+?	+?	+?	+?	+?	0	+	+?	0	+	0	0	0	?	?	?	?
	2	+?	+?	+?	+?	+?	0	+	+?	0	+	0	0	0	?	?	?	?
	3	+?	+?	+?	+?	+?	0	+	+?	0	+	0	0	0	?	?	?	?
	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5	+?	+?	+?	+?	+?	0	0	0	0	+?	0	+?	+?	+	+	+	+
	6	0	+	+	+	+	+?	0	0	0	+?	0	0	0	+	+	+	+
	7	0	0	+?	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Protecting theenvironment and promoting resource efficiency	1	?	?	?	?	?	0	?	?	?	?	?	+?	+	?	?	?	?
	2	?	?	?	?	0	0	?	0	0	?	?	0	0	?	?	?	?
	3	?	?	?	0	0	0	?	0	0	+	0	0	+	0	0	0	0
	4	+	+	+	+	+	+	+	+	0	+	+	+	+	+?	+?	+?	+?
	5	++	++	++	++	++	+	0	0	0	+	+	+	+	++	++	++	++
	6	+	+	+	+	+	+	0	0	0	0	0	+	0	0	0	0	0
	7	+?	+?	?	+	+	+	+	+	0	?	0	+?	+	0	0	0	0

Table 6: Overall assessment

Thematic Objective/Type of Action		Likely ✓/×	Comments
Strengthening research, technological development and innovation	1	?/✓	Some potential in terms of sustainable use of natural resources/climate change adaptation/human wellbeing. Otherwise generally neutral. Unlikely to reduce travel, and projects may stimulate more cross border travel.
	2	0	Some potential in terms of managing water and efficient use of energy where these are the subjects of the innovation. Unlikely to reduce the need to travel.
	3	?/✓	Depending on the nature of the process or product, some potential for minor positive environmental outcomes including air quality, energy and water management.
	4	?/✓	As above, this depends on the type of action proposed. Most likely to deliver on sustainable use of natural resources.
	5	?/✓	As above.
	6	?	Positive environmental outcomes will depend on what are seen as the needs of the area and by whom. Requires careful project assessment. Could address human wellbeing.
	7	✓	Likely to deliver on sustainable natural resource use, reductions in needing to travel by providing local access to resources.
	8	?/✓	Although the proposal is unlikely in itself to deliver environmental benefit in the short term, it will promote public engagement and support for environmental

			innovation.
	9	**0**	Unlikely to result in significant environmental benefits, although this depends on the nature of innovative business ideas.
	10	**?**	Probably neutral overall, but there may be an increase in traffic. 'Internationalisation' may result in some use of air traffic.

Thematic Objective/Type of Action		**Likely ✓/×**	**Comments**
Promoting climate change adaptation, risk prevention and management	**1**	**?/✓**	Some potential to promote good practice in adaptation, which should result in positive measures within the life time of the programme - although this action provides the platform for such promotion and knowledge sharing - important to ensure that this is high quality and accessible.
	2	✓	Development of an evidence base is central to decision making - should result in environmental benefit in the medium/long term.
	3	✓	This action combines the previous two - providing a platform for sharing knowledge and for assessing state and responses. Should be beneficial in the long term.
	4	✓	Similar to the above, with some likelihood of positive effects.
	5	**?/✓**	Should result in significant benefits, especially to water quality, flood amelioration and reduction in erosion. It is critical, however that the ecosystem approach be adopted - 'improvement' may not necessarily incorporate natural systems.
	6	✓✓	This action is likely to result in significant and wide ranging positive environmental effects, both to coastal and to marine environments.
	7	✓	Linking to actions 1-4, with potential for significant positive effects in the medium to long term, especially in the sphere of energy and water use, waste management and innovative approaches to flood management.

Thematic Objective/Type of Action		Likely ✓/×	Comments
Protecting theenvironment and promoting resource efficiency	1	?/×	Critical appraisal of proposals will be necessary to avoid unforeseen impacts arising from tourism pressures - erosion, congestion, traffic, loss of character etc as a result of 'taking full advantage...' especially at key sites already under pressure. Opportunity to recycle income into conservation?
	2	?/×	Depends on the nature of tourism development - increase in coastal infrastructure may be necessary; increases in marine traffic may disturb sensitive species; diving may generate pressures on sensitive habitats and archaeology.
	3	?/✓	May increase capacity to improve biodiversity and heritage management and to promote their conservation.
	4	✓	Likely to be positive, especially as maintaining coastal quality will require interventions upstream to ensure water quality, upland soil management etc - ecosystem approach central to this proposal. Need to be clear about defining 'attractive'.
	5	✓	As above - supporting local initiatives will increase capacity for environmental management.
	6	✓	As above - developing and demonstrating traditional and creative skills will require interventions in environmental management.
	7	?/✓	Knowledge exchange/sharing expertise will be central in supporting other measures.

11.1.2 In some cases it can be difficult to determine the likelihood of significant impacts. In fact, it can be difficult to agree whether *significance* at this level is used in the context of the proposed programme and the environment within which projects will operate individually or cumulatively, or whether it is used in the context of the whole of the environment covered by the two regions. There may for instance be locally significant effects as a result of projects that may be not apparent or considered significant at this strategic level.

11.1.3 In this case the assessment is based on likely significant effects on the Irish-Welsh coastal and marine environments over the lifetime of the programme. This is not to say that longer term considerations have not been made, nor that a neutral score necessarily means that there will be

no long term benefit beyond the timescale of this programme. Annex II provides a more detailed assessment.

11.1.4 The assessment is made on the basis of a number of assumptions regarding terminology. Some reference has been made to the ecosystem approach. This term is not used in the draft IWCP, although reference is made to ecosystem services in relation to ToA6 (page 60). The term 'climate change adaptation' is used widely. It is assumed that this refers to various activities including technological approaches as well as land management and spatial policies and planning. The IWCP aims to address climate change concerns in the context of a 'jobs and growth agenda'.

11.1.5 **Conclusion**

The programme overall provides opportunities to significantly impact positively on the environment, although it is not possible to be categoric. The previous programme iteration described **forty five** types of action, of which **eleven** could be said with confidence to offer significant positive effects; **eighteen** could offer positive effects depend on the type, scale and location of the actions. In **thirteen** cases the effects were thought likely to be neutral or minimally positive. There were some concerns regarding **four** types of action, **two of which remain**.

11.1.6 The current iteration describes **twenty four** types of action. Of these, **nine** can be said with confidence to offer significant positive effects; **nine** can offer positive outcomes depending on the nature of the proposals; **three** are likely to be neutral overall. In **one** case, the extent of positive effects would depend on what are perceived as the 'needs' of a given community of interest. In most cases the effects may be **both positive and negative** depending on which environmental aspects are considered. The term 'attractive' needs to be defined in terms of what tourists and local people perceive it to mean.

11.1.7 In the case of the **two** types of action that raise concern, these relate to two key phrases that remain unaltered since the earlier programme iteration, namely: '...business opportunities to take full advantage of the sustainable management of natural resources...', in the context of '...niche tourist attractions...'; and the reference '...marine tourism development...'

There is a distinct possibility of negative environmental effects unless these are carefully assessed in the context of specific proposals, individually and cumulatively. Issues include seaborne invasives, disturbance to marine wildlife, marine infrastructure and coastal development.

11.1.8 Finally, whilst the emphasis on renewables technologies appears to be less in this iteration of the programme, it is worth noting that whilst they contribute significantly to reductions in carbon-based energy and to emissions, there remain some concerns over their effects on the amenity and the biodiversity of the coastal and marine environment.

11.1.9 As a matter of principle, the key to minimising negative environmental impact should be **avoidance**, and therefore projects likely to impact negatively on environmental interests should not be supported via this programme. Where there might be a conflict between one environmental interest and another, rigorous analysis of a project's implications should determine whether and how to proceed. Any project that might trigger an EIA should be subject to particular scrutiny.

12 ALTERNATIVES

12.1 Selection and discussion of alternatives to the proposed Co-operation Programme

12.1.1 The SEA Directive requires a discussion of reasonable alternatives to the proposed IWCP. The Directive does not specify what is 'reasonable' but does state (in paragraph 5.12) that a discussion of alternatives should include *'...the likely evolution of the current state of the environment without the implementation of the alternative'.* The Directive does not specify whether 'alternatives' means alternative programmes, or different alternatives *within* the proposed programme.

12.1.2 The purpose of analysing alternatives is to determine whether the proposal offers the optimal option in terms of sustainable development. The priorities and themes are not prioritised in any way, since the underlying rationale is that they are mutually reinforcing and therefore equally important for achieving the overall programme objectives.

12.1.3 Whilst it might be possible to envisage a range of scenarios, such as an 'economic growth first' scenario as opposed to, say an 'environment first' or a 'food security first' scenario, as is common in many policy forecasting studies, it would be inappropriate in this case, since the EU, Irish and Welsh Governments have indicated that the scenario they seek is a 'sustainable development' scenario which seeks to integrate social, environmental and economic priorities. There is thus no definitive 'first', since it is not the intention to seek 'trade-offs'.

12.1.4 Assuming this, there are a number of constraints in terms of alternatives including:

- Time - the IWCP is subject to a seven-year timescale. Whilst it may be possible to manage the pace of proposals within this time period, it is likely that most will not be realised within, say the first two years. It is not reasonable to discuss operational timescales beyond the remaining five-year window.

- Funding - this appears to have increased from €70.3m under the 2007-2013 programme to €79.2 for the 2014-2020 period[129]. It would not be reasonable to discuss alternative global figures, since the figure is settled.

[129] Commission implementing decision of 16 June 2014. Annex I page 22.

- Deployment of funds - Article 9 of the Common Provisions Regulation (1303/2013) identified eleven thematic objectives (TOs). Article 6 of the Specific Provisions for ERDF support for territorial co-operation requires that at least eighty per cent of the fund shall be concentrated on a maximum of four of the eleven TOs. The Ireland-Wales partnership might have considered alternative TOs to the three selected, or may have opted to select a fourth TO. It would perhaps not be reasonable to explore every possible combination, but it is noted that one TO places an emphasis on transport infrastructure, others on poverty and employment issues, another on education and another on public administration.

- Policy - it would not be reasonable to consider alternatives that are not consistent with EU, UK and Wales policies.

12.1.5 It is a requirement to consider what might be the state of the environment without programme implementation, and this 'do nothing' option is therefore one of the alternatives selected. By 'do nothing' is meant literally withdrawing support for interregional cooperation.

12.1.6 Another alternative might be to continue with the 2007-2013 programme.

12.1.7 It should be noted that of the eleven options identified in the regulation, the three TOs in the programme include the two most overtly environmental TOs available, namely:

- Promoting climate change adaptation, risk prevention and management
- Protecting the environment and promoting resource efficiency

12.1.8 Table 7 considers the likely effect on the SEA objectives of each of the following options:

1 Do nothing
2 Continue the existing Programme
3 TO group A - transport infrastructure
4 TO group B - education for employment
5 TO group C - institutional capacity
6 TO group D - private sector/SME investment
7 Implement the proposed Programme.

Whilst it is somewhat speculative, it reflects a detailed analysis of a wide range of programmes and strategies based around these themes, as well as an aggregated assessment of the objectives of the 2007-2013 and the

proposed 2014-2020 programme. The number of question marks reflects the levels of confidence and challenges in being categoric.

Table 7: Assessment of alternatives

		Alternatives						
		Do nothing	Continue as before	Transport infrastructure	Education for employment	Institutional capacity	SME/business	Proposed programme
SEA Objectives								
A	Protect places, landscapes & buildings of archaeological, historic & cultural value	?	✓?	×?	✓?	✓	×?	✓?
B	Protect/enhance landscapes, seascapes, townscapes & the countryside	?	✓?	×?	✓?	✓	×?	✓?
C	Protect/enhance biodiversity	?	✓	×?	✓?	✓	?	✓
D	Protect/ improve the region's water quality	×?	✓	×?	✓?	✓	O	✓
E	Protect the water resource; ensure its sustainable use	×?	✓	O	✓?	✓	?	✓
F	Guard against land contamination, reuse existing buildings & previously developed land of low ecological quality	×?	✓?	?	✓×	✓?	✓×	✓?
G	Minimise the requirement for energy generation use, promote efficient energy use & increase the use of energy from renewables	?	✓	×?	✓×	✓×	✓×	✓✓
H	Minimise waste; increase re-use, recycling & recovery rates	?	?	O?	✓?	✓?	✓×	✓?
I	Minimise the need to travel; provide alternatives to car use	?	O?	×	×	✓?	×	O?

J	Limit/adapt to climate change	**×?**	**✓**	**×**	**✓?**	**✓?**	**?**	**✓✓**
K	Protect/ improve air quality	**×?**	**✓?**	**×**	**×?**	**✓?**	**×**	**✓?**
L	Improve physical & mental health; reduce health inequalities	**?**	**✓?**	**✓×**	**✓?**	**✓?**	**✓?**	**✓?**
M	Improve public access to land	**?**	**?**	**×?**	**✓?**	**✓?**	**O**	**✓?**
N	Protect seabed features - support processes, habitats & species characteristic of the marine landscapes.	**×?**	**✓?**	**O**	**O**	**✓?**	**?**	**?**
O	Protect water column features - support the characteristic processes, habitats & species	**×?**	**✓?**	**O**	**O**	**✓?**	**?**	**?**
P	Protect water quality of component water column features - support processes, habitats & species characteristic of the water column & associated seabed habitats	**×?**	**✓?**	**O**	**O**	**✓?**	**?**	**?**
Q	Maintain biota quality	**×?**	**✓**	**?**	**✓?**	**✓?**	**?**	**✓**

12.1.9 **Discussion**

A - Protect places, landscapes & buildings of archaeological, historic & cultural value

Most of the alternatives are likely to support this SEA objective, or at least not impact on it significantly. Education for employment, especially when combined with institutional capacity development, are likely to produce jobs that focus on protecting cultural and heritage assets. The 2007-2013 OP aimed to build skills and knowledge. However, it also sought to promote SME development, which may have impacted on some local sites. The proposed IWCP similarly aims to develop skills and knowledge, and to promote SME development. The option most likely to have negative impacts would be the transport infrastructure one.

B - Protect/enhance landscapes, seascapes, townscapes & the countryside

Similarly, most of the alternatives would either promote this objective, or would not impact on it significantly, although increasing economic activity linked to development may present challenges. Transport infrastructure development would most likely pose challenges.

C - Protect/enhance biodiversity

The main threats to biodiversity are likely to be an expansion of economic activity linked to development, and upgrades of road infrastructure. All the other options have the potential to support biodiversity measures. Building institutional capacity could be of benefit in terms of better human and material resources and management tools, and both the 2007-2013 and proposed programmes have an overt biodiversity protection and enhancement objective. Increases in tourism development as proposed by the IWCP may have detrimental effects.

D - Protect/ improve the region's water quality

Even under a 'do nothing' option, both regions are committed and required under WFD to address this objective. However, their capacity might be somewhat limited by a lack of funds. Transport infrastructure might pose a threat unless significant mitigation were put in place. It is unlikely that expansion of the business sector would generate significant impacts in itself, since it is likely that SUDs schemes would be put in place alongside waste management systems. Under the 2007-2013 and proposed programmes it is likely that measures will be taken to address water quality issues as part of the broader programme.

E - Protect the water resource; ensure its sustainable use

Increased development will almost inevitably require a greater demand in water resources unless smart technology is in place to mitigate. A 'do nothing' option will require own resources to address issues such as leakages. Institutional capacity could help in terms of monitoring and regulation. The 2007-2013 and proposed programmes have explicit objectives for this issue, especially where they converge with the ERDF programme.

F - Guard against land contamination; encourage re-use of existing buildings & of previously developed land of low ecological quality

Improvements in transport infrastructure may result in increases in invasives species and oily runoff may contaminate nearby land.

Development, both public and private, will require land, which may be brown or green land. There may be opportunities to recycle old buildings, but these may be expensive to retrofit and may not be first choices for SME/business expansion. None of the alternatives explicitly addresses this issue, although promoting heritage could be supportive.

G - Minimise the requirement for energy generation use; promote efficient energy use & increase the use of energy from renewables

Only the 2007-2013 and proposed programmes are likely to deliver significant positive outcomes, especially where linked to the ERDF programme objectives. Expanding transport infrastructure is likely to increase energy demands from road transportation, although it will be beneficial in terms of reduced bottlenecks where they exist (perhaps generating new ones downstream). Economic development, whether private or public, will increase energy use, and will require mitigation. The current and proposed programmes both set out to address this objective, the proposed IWCP perhaps more explicitly.

H - Minimise waste; increase re-use, recycling & recovery rates

Road building has become more efficient with regard to using local materials and minimising waste, and therefore there is unlikely to be a significant negative from this option. Waste management is an option in terms of work opportunities, and increased public sector capacity may result in improvements to municipal waste treatment. Economic expansion and development may increase waste, which will need measures to address it. Opting out could be an opportunity lost, although requirements to meet waste directives would apply in any case.

I - Minimise the need to travel; provide alternatives to car use

This is problematic under all alternatives. except perhaps that building institutional capacity may bring forward a stronger public transport system under other programmes. R&D and building links will inevitably require increased communication, possibly via travel rather than ICT.

J - Limit/adapt to climate change

The proposed IWCP is particularly strong on messages in regard to this issue, more so than the 2007-2013 programme. A 'do nothing' option will forego significant funds to facilitate this objective. Expansion in economic activity presents both challenges and opportunities, especially where linked to developments in technology and the clustering of energy efficient

hubs that use renewable energy. Promoting SME expansion will not by itself promote this objective.

K - Protect/ improve air quality

Local air quality may improve in those areas where bottlenecks currently exist, but may deteriorate elsewhere as a result of increases in traffic. Without parallel measures, economic expansion may result in increased traffic movements and energy use. None of the options considers radon as an air quality issue. This is known to be associated with Welsh coastal communities, and it is possible that increased institutional capacity may allow for the amelioration of radon sensitive sites.

L - Improve physical & mental health; reduce health inequalities

Most options have some positive potential. The proposed IWCP in particular aims to promote opportunities to coastal and peripheral communities which will provide benefits in terms of cohesion and access to services. Whilst improvements in road infrastructure will help in terms of access, they might also impact on rural communities negatively through influxes of traffic. Improved education and employment opportunities, and institutional capacity could also have positive outcomes.

M - Improve public access to land

This is not explicitly promoted in any programme, but the effects of increased tourism based on natural and cultural assets could lead to increases in access. Improvements in the management of nature sites is also likely to bring with it increased access to such sites. These are explicit objectives both in the 2007-2013 and proposed programmes.

N - Protect seabed features - support processes, habitats & species characteristic of the marine landscapes

Developing institutional capacity in the sphere of marine ecosystem management would inevitably result in better understanding and more effective protection measures. Both the 2007-2013 aim to promote management of marine ecosystems. However, the proposed programme appears to present more robust opportunities in renewables R&D in the marine environment, which may be of some concern. Furthermore, the proposed programme aims to promote a more robust agenda for marine based tourism which may create pressures. Significant expansion of coastal tourism may also raise concerns about waste management.

O - Protect water column features - support the characteristic processes, habitats & species

Similar concerns as above. The development of marine-linked renewables in the proposed programme is a cause for concern.

P - Protect water quality of component water column features - support processes, habitats & species characteristic of the water column & associated seabed habitats

As above, the renewables and tourism themes linked to coasts and the marine environment suggest that pressures will need to be anticipated and avoided. There may be significant tensions between promoting tourism and ensuring the quality of shellfish beds in certain areas.

Q - Maintain biota quality

A 'do nothing' option in this sphere is unlikely to result in adequate funds for positive outcomes for marine biodiversity, and the likelihood is that pressures will continue and increase. The 2007-2013 and proposed programmes both explicitly aim to address this objective. Promoting education and employment, especially when linked to institutional capacity building, may support R&D in marine biodiversity.

12.1.10 Conclusion

Unsurprisingly, the 2014-2020 IWCP contains elements of three of the alternatives, in that it aims to promote education and knowledge exchange, economic opportunities for both communities and for SMEs, and institutional capacity building. It builds on the 2007-2013 programme, partly as a result of research carried out in that programme on climate change and on the coastal and maritime environment[130].

Given that more funding is available for delivering the programme objectives there appear to be significant opportunities for positive environmental outcomes. On that basis, and depending on interpretation of some terminology, the proposed programme appears to be optimal.

[130] Whilst not explicitly linked to the 2007-2013 programme, documents such as the Irish Government's 'Harnessing our Ocean Wealth: An Integrated Marine Plan for Ireland' (2012); 'Delivering Green Potential' (2012); and the National Climate Change Adaptation Framework (2012) have helped to drive the 2014-2020 proposals

13 MONITORING

13.1.1 The SEA of the European-level INTERREG Programme[131] states that:

'The highly indirectness (sic) *of potential environmental effects of the INTERREG EUROPE Programme due to its nature does not allow the identification of measures to monitor possible impacts on the environment by projects funded by this Programme. Thus, the monitoring must aim to ensure that no adverse effects to the EU environmental objectives and the EU environmental policy are supported by INTERREG EUROPE, even if the direct impacts will occur in the long run only.'*

13.1.2 However, the INTERREG regulation[132] itself identifies a set of environmental indicators, for monitoring and reporting purposes:

Table 8: Environmental indicators identified in the regulation

ENVIRONMENT		
Solid Waste	tonnes	Additional waste recycling capacity
Water supply	persons	Additional population served by improved water supply
	m^3	Estimated reduction of leakage in water distribution network
Wastewater treatment		Additional population served by improved wastewater treatment
Risk prevention and management	population equivalent	Population benefitting from flood protection measures
	persons	Population benefitting from forest fire protection and other protection measures
Land rehabilitation	hectares	Total surface area of rehabilitated land
Soil sealing	hectares	Change in land sealed due to development
Nature and biodiversity	hectares	Surface area of habitats in better conservation status
ENERGY AND CLIMATE CHANGE		
Renewables	MW	Additional capacity of renewable energy production

[131] see Dr. Dräger & Thielman (2014): http://www.interreg4c.eu/fileadmin/User_Upload/PDFs/INTERREG_EUROPE_Environmental_Report.pdf

[132] Annex to Regulation 1299/2013 on Specific Provisions for the support from the European Regional Development Fund to the European territorial cooperation goal.

Energy efficiency	households	Number of households with improved energy consumption classification
	kWh/year	Decrease of annual primary energy consumption of public buildings
	users	Number of additional energy users connected to smart grids
GHG reduction	Tonnes of $C0_2eq$	Estimated annual decrease of GHG

The potential for internal tensions between these indicators is apparent. Furthermore they are headline quantitative indicators, and therefore do not in themselves provide sufficient information on environmental outcomes. Whilst WEFO and its Irish counterpart will monitor a number of outputs and outcomes related to the above indicators, it is important that the monitoring of effects is more widely scoped.

13.1.3 The SEA Guidance defines significant effects as positive, adverse, foreseen and unforeseen. The methods and scope for gathering information either directly or indirectly are not defined. There is no requirement, for instance, to aggregate or collate potentially relevant data from other monitoring sources under other laws or programmes[133].

13.1.4 There are three key challenges related to monitoring the environmental effects of the IWCP. Firstly, the data is dispersed across a number of statutory and non-statutory bodies. The bringing together of three statutory bodies into Natural Resources Wales will help to bring together a significant amount of environmental data related to the proposed IWCP's implementation. Nonetheless, it would be helpful for the regional partners to ensure some co-ordination between collating the data needed to address the IWCP's objectives and that needed to address the environmental objectives in this report.

13.1.5 The second issue is that it in some cases environmental effects may be impossible to attribute directly to the proposed Programme. The Irish Government is committed to the principles of sustainable development, and the Welsh Government has a legal duty to promote sustainable development. Its Programme for Government is based on sustainable development principles. A wide range of parallel actions are likely to deliver on these objectives were the funding to be available. It is impossible at this level to determine the synergies and tensions between

[133] (COWI/AS Denmark 2009 p133).

the various interventions that might determine particular environmental outcomes.

13.1.6 For example, whilst it is possible to calculate an output, such as biodiversity increases from a particular project, the overall *outcome* in terms of overall biodiversity gains in a particular area is likely to be influenced by other factors, not least climate-related phenological changes. This makes it difficult to report genuine environmental gains (or losses) in a way that can be confidently attributed solely to the IWCP.

13.1.7 The third challenge is a logistical and economic one. Different measures are needed for different environmental targets, and they often require different timescales incorporating different skills in capturing and analysing data. The costs entailed are significant, and therefore adequate monitoring may be influenced by economic constraints. Some degree of self reporting is necessary, but this would still require sampling for ground truthing purposes.

13.1.8 Monitoring, and especially programme evaluation, should therefore be approached with these challenges in mind.

13.1.9 Table 9 summarises some of the key monitoring bodies for the SEA objectives identified in table 4. University departments are commissioned to carryout monitoring on behalf of the statutory bodies and the government departments. Organisations such as the Health and Safety Executive/Health and Safety Authority are responsible for monitoring workplace safety issues. Natural Resources Wales (NRW) monitors the state of Wales' woodlands and the condition of tree species, including threats from diseases, whilst in Ireland this function is likely to be shared between the National Parks and Wildlife Service (NPWS), the Environmental Protection Agency (EPA) and the Forest Service. Local councils on both sides of the Irish Sea undertake monitoring of the effects of their spatial planning policies as required by national laws, as well as a number of environmental and health topics including air quality and waste (in association with the statutory agencies). A number of non-governmental and public bodies play a significant role in managing and monitoring biodiversity. In Ireland these include the Heritage Council and An Taisce. In Wales the RSPB and Wildlife Trusts are important partners, working with statutory bodies through Wales Environment Link.

The list of monitoring bodies is indicative only, and is designed to illustrate the wide range of data holding organisations.

13.1.10 The list of indicators is not necessarily definitive, and has been drawn from a variety of sources[134]. It is recommended that the list is reviewed and refined as individual projects are brought forward in order to ensure that the indicators address relevant environmental objectives as well as those of the Programme itself.

[134] There are number of guidelines on the selection of indicators, including the European Environmental Agency. RSPB provides a useful review of marine indicators. A number of indicators were derived from the spatial plans and SEAs of constituent authorities.

Table 9: Monitoring against SEA objectives

	Objective	Monitoring bodies	Indicators (examples)
Protect and enhance natural and cultural heritage	Protect places, landscapes & buildings of historic, cultural & archaeological value	**Cadw/ Royal Commission on Historic and Ancient Monuments/Heritage Council/An Taisce/National Monuments Service/Office of Public Works** monitor condition of historic buildings; condition of sites; maintain databases **Local planning authorities** - monitor building standards; conservation areas; development management; protected buildings; maintain EIA databases **NPWS** - manages and monitors protected landscapes **Archaeological Trusts** maintain relevant data and carry out research	Condition of sites on agricultural land Number and condition of listed buildings LANDMAP culture aspects - condition Number of community-owned or managed biodiversity/amenity assets Register of SAMs - condition status National Inventory of Architectural Heritage Condition of National Heritage Areas - targets in management plans
	Protect/ enhance landscapes, seascapes, townscapes and the countryside	**Local planning authorities** - monitor building standards; conservation areas; development management; listed buildings; maintain EIA databases	LANDMAP visual and sensory aspects - condition Register of conservation areas Use of conditions with planning permissions Targets in local/county development plans

	Protect/enhance biodiversity	**NRW/NPWS/Heritage Council** monitor condition of sensitive sites/species; Appropriate Assessment case studies/invasive species/data on landscape character **Wildlife NGOs (e.g. Birdwatch Ireland/RSPB/Irish Rare Birds Committee)** monitor condition of species and habitats; maintain databases **Local authorities** hold ecological data linked to LBAPs and county sites	Conservation status of SAC/SPA features dependent on/impacted on by agriculture Conservation status of target species/habitats dependent on/impacted on by agriculture Conservation status of NNR/SSSI features dependent on/impacted on by agriculture Presence & condition of unfarmed features - hedges, scrub, fallow areas, buffers, trees, ditches & ponds Percentage area of independently certified woodland (such as FSC) Lowland/upland farm birds - target species, presence, numbers - overwintering, breeding, spring feeding Woodland birds - target species, presence, numbers - overwintering, breeding, spring feeding Presence/location of invasive species

	Protect/enhance biodiversity (continued)		Condition of Geological Conservation Review (GCR) sites that are SSSI's Common land in management agreements

	Objective	Monitoring bodies	Indicators (examples)
Protect and conserve natural resources	Protect/ improve the region's water quality	**NRW/EPA** monitor ecological and chemical condition of river systems; bathing water quality; maintains databases. **Water companies** monitor chemical quality **Local authorities** also carry out monitoring of water quality **NPWS** carry out/monitor works linked to water ecosystems	Bank erosion remediated (length) Chemical/ecological quality of rivers Number of agriculture-related pollution incidents Eutrophication statistics Estuary water condition Bathing water quality Area designated as Nitrate Vulnerable Zone Number of water pollution incidents, category 1 & 2 Water quality measures in local/county plans Use of conditions/regulations with planning permissions

	Protect the water resource & ensure its sustainable use	**Water companies/NRW/EPA** monitor abstraction and discharges of water; losses. Flood risk databases.	Water abstracted (licensed) Water abstracted (unlicensed) Agricultural discharge to water courses Number and cost of flooding incidents
	Guard against land contamination, encourage reuse of existing buildings & of previously developed land of low ecological quality	**Local planning authorities** monitor land availability including 'brownfield land' and maintain databases	Amount of brownfield land remediated/ developed Buildings recycled Policies/targets in local/county development plans

	Minimise the requirement for energy generation, promote efficient energy use & increase the use of energy from renewable resources	**Department of Communications, Energy and Natural Resources** is responsible for implementing measures to increase penetration of renewable energy technologies and holds data **Local planning authorities** permit renewables schemes and hold data on permissions, conditions, etc **UK Department of Energy and Climate Change** provides statistics	Additional capacity of renewable energy production Number of energy users connected to smart grids Number of households with improved energy consumption classification Decrease of primary energy consumption of public buildings Energy saved Number of micro-generation schemes established
	Minimise waste/ increase re-use, recycling & recovery rates	**Local authorities** monitor municipal waste including recycled waste	Waste arisings by sector Waste arisings by disposal Domestic waste arisings Waste recycled or composted

	Minimise the need to travel; provide alternatives to car use	**Local authorities** develop policies and monitor use of public transport. Organisations such as the **Urban Institute Ireland** and academic partners such as **NUI Maynooth** carry out studies and monitoring In the UK, the **National Travel Survey** and the **Department for Transport** provide data **Welsh Government Economy and Business** promotes broadband access and holds statistics	Availability of public transport (bus and rail) - national, regional, local National Park/county, local buses; taxis; community schemes Promotion of public transport associated with tourism Additional households/businesses with broadband access at least 30 Mbps

	Objective	Monitoring bodies	Indicators (examples)
Maintain and improve the human environment	Limit/adapt to climate change	A wide range of institutions carry data, including **Centre for Ecology and Hydrology; National Soil Resources Institute; Countryside Survey.** **Teagasc** researches the Irish agricultural sector and holds data on soils and emissions **Forestry Commission/Service** maintain soil databases for planting. **EPA** monitors greenhouse gas emissions **Local planning authorities** promote climate change adaptation in planning	Change in soil organic carbon, acidity, nitrogen, biology Water capture Changes in area of grassland and woodland CH_4 emissions Number of micro-generation schemes established Change in ecological footprint Estimated decrease in GHG
	Protect/improve air quality	**NRW/EPA** and **local authorities** issue permits and monitor air quality; maintain databases	Change in ammonia,CH_4, N_2O, ozone Air quality incidents Radon remediation programmes Percentage of sensitive habitat area exceeding critical loads for acidification and eutrophication

	Improve physical & mental health; reduce health inequalities	The **Public Health Observatory** monitors health and wellbeing issues and maintains databases **Welsh Health Survey** provides data **Health Information and Quality Authority** monitors health information **Dark Sky Discovery**, **NRW and NPWS** promote tranquil areas and dark skies	Change in number and extent of tranquil areas Percentage of dark sky at night by area Access to services e.g. GP, hospital, broadband Increase in employment Decrease in poverty
	Improve public access to land	**National parks, AONBs** and **local authorities** monitor visitor statistics; **Visit Wales** and **Regional Tourism forums** maintain records **Fáilte Ireland** promotes tourism including access **NRW/NPWS** hold databases on open access	Hectares of Open Country and Common Land Length and condition of PROWs and cycleways Amount and condition of accessible land in agri-environment schemes

	Objective	Monitoring bodies	Indicators (examples)
Protect the marine environment	Protect seabed features so that they can support the processes, habitats & species characteristic of the marine landscapes	In Ireland, **Marine Institute** is the national agency responsible for marine research, technology, development and Innovation in the Republic of Ireland **Coastal and Marine Resources Centre (CMRC), University College Cork**, seeks to make a significant contribution to the scientific understanding of coastal and marine environments and their management In Wales, **NRW** monitors the marine environment in Welsh waters **CEH Bangor** carries out research and holds data, as does the **Centre for Catchment and Coastal Research** The respective government departments (**Department of Agriculture, Food and the Marine** and **Department for Environment, Food and Rural Affairs**) are responsible for the state of the marine environment	Concentrations of hazardous substances compared to Environmental Quality Standards (EQSs) Hazardous substances in marine organisms Plastic particles in stomachs of seabirds Organochlorine/mercury concentrations in seabird eggs/feathers Hazardous substances in coastal waters Chlorophyll-a in transitional, coastal & marine waters Bathing Water quality

	Protect water column features so that they can support the characteristic processes, habitats & species	As above	As above
	Protect the water quality of the component water column features so they can support the processes, habitats & species characteristic of the water column & associated seabed habitats	As above	

	Maintain biota quality	As above	Number, abundance, diversity and evenness of taxa distribution Percentage of overfished stocks of commercial importance Fish catches by major species and area Accidental by-catch: birds, mammals and turtles Changes in proportion of large fish and hence the average weight and average maximum length of the fish community Aquaculture impact on genetic structure of wild fish populations Seabird population trends

13.1.10 It is not possible to monitor everything. Environmental indicators are a 'proxy' of the state of the environment, and where carefully selected will provide a picture of its condition. It is critical that indicators are sufficient in number to be comprehensive, but do not duplicate unnecessarily. It is important when aggregating data to higher levels, to ensure that critical factors are not lost, such as cumulative effects over periods of time that in themselves are not significant. It is also critical to capture *quality* as much as quantity. Simply quantifying the number of schemes entered into, or the amount of fencing or planting, does not in itself confirm that there has been an increase in quality environments.

The indicators above are not exhaustive, but have been selected to reflect the objectives, and aim to be sufficient enough to be reasonably attributable to the proposed programme.

14 FINAL CONCLUSIONS

14.1.1 The programme provides opportunities to address a number of environmental concerns. At this level it can be difficult to state with certainty that particular actions will have a significant positive environmental outcome, especially when considered in isolation. It is perhaps obvious, but environmental effects are likely to derive from a *combination* of actions, which will have cumulative and synergistic impacts.

.14.1.2 Taking a precautionary approach it is perhaps easier to anticipate that some actions may have a negative outcome, and these may need to be reviewed in the light of their potential for negative effects. Of particular concern are those actions that may generate increases in travel - perhaps inevitable in the drive for economic development and the 'internationalisation' of products and services. Actions that relate to technology or infrastructure and increases in marine and coastal tourism also require careful consideration. The planning system will normally apply.

14.1.3 It is important to be aware of the potential for conflict *within* the objectives of both the IWCP itself as well as the environmental objectives in this report. Legal obligations will take precedence in such circumstances, and any proposal likely to generate such conflicts should be screened out in the first instance.

14.1.4 Where avoidance is not an option, mitigation measures must be applied. The detail depends on the type of activity and the sensitivity of the receiving environment. Mitigation may include spatial, temporal, alternative site or design options. Compensation is not the same as mitigation, and should not normally be considered, since it implies an environmental loss.

14.1.5 When developing projects, we emphasise the need to adopt a robust ecosystem approach based on a systematic analytical framework, in order to ensure that any potentially negative effects can be quickly identified in order to assess the acceptability of a particular project and to reject or require amendments.

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ACRONYMS

ACA	Architectural Conservation Area
AQMA	Air Quality Management Area
Cadw	Welsh Government historic and heritage department
CAFÉ	Clean Air for Europe
CFRAMP	Catchment Flood Risk Assessment and Management Plan
CGS	County Geological Site
DoECLG	Department of Environment, Communities and Local Government
EC	European Community
EIA	Environmental Impact Assessment
EAP	Environmental Action Programme
EPA	Environmental Protection Agency
EU	European Union
GDA	Greater Dublin Area
GCR	Geological Conservation Review
HDA	Habitats Directive Assessment
HMWB	Highly Modified Water Body
HRA	Habitats Regulations Assessment
JNCC	Joint Nature Conservation Committee
IP	Investment Priority
IPCC	Intergovernmental Panel on Climate Change
ISPP	Irish Sea Pilot Project
IWCP	Ireland-Wales Co-operation Programme
LANDMAP	Landscape Management and Planning
NEA	National Ecosystem Assessment
NHA	Natural Heritage Area
NNR	National Nature Reserve

NPWS	National Park and Wildlife Service
OPW	Office of Public Works
OSPAR	Oslo/Paris convention for the Protection of the Marine Environment of the NE Atlantic
PM	Parts per Million
pNHA	Proposed Natural Heritage Area
RPA	Register of Protected Area
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
S.I.	Statutory Instrument
SoE	State of Environment
SPA	Special Protection Area
ToA	Type of Activity
TO	Thematic Objective
UNESCO	United Nations Education, Scientific and Cultural Organisation
UK	United Kingdom
WFD	Water Framework Directive
WG	Welsh Government
WIMD	Welsh Index of Multiple Deprivation