



Maritime Ireland / Wales  
INTERREG 1994-1999



# Assessment of Human Activity in the Coastal Zone

A research project linking Ireland and Wales

December 2001



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Maritime (Ireland / Wales) INTERREG Programme- Building Bridges.

# **Maritime Ireland / Wales INTERREG 1994 – 1999**

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### **Maritime Ireland/Wales INTERREG Report No. 9.**

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## Maritime (Ireland/Wales) INTERREG Programme 1994 – 1999

The EU Maritime (Ireland/Wales) INTERREG II Programme (1994-1999) was established to:

1. promote the creation and development of networks of co-operation across the common maritime border.
1. assist the eligible border region of Wales and Ireland to overcome development problems which arise from its relative isolation within the European Union.

These aims are to be achieved through the upgrading of major transport and other economic linkages in a way that will benefit the constituent populations and in a manner compatible with the protection and sustainability of the environment. The Maritime INTERREG area includes the coastline counties of Meath, Dublin, Wicklow, Wexford and Waterford on the Irish side and Gwynedd, Ceredigion, Pembrokeshire and Carmarthenshire on the Welsh side and the sea area in between.

In order to achieve its strategic objectives the programme is divided into two Areas:

Sub-Programme 1: **Maritime Development:** transport, environment and related infrastructure (€59 million)

Sub-Programme 2: **General Economic Development:** Economic growth, tourism, culture, human resource development (€24.9 million)

The Marine and Coastal Environment Protection and Marine Emergency Planning Measure (1.3) has a total budget of €5.33 million of which €3.395 million is provided under the European Development Fund. EU aid rates are 75% (Ireland) and 50% (Wales).

The specific aims of Sub-Programme 1.3 are:

- to promote the transfer of information between the designated areas
- to establish an in-depth profile of marine/coastal areas for conservation of habitat/species
- to explore, survey, investigate, chart the marine resource to provide a management framework
- to develop an integrated coastal zone management system
- to improve marine environmental contacts and co-operation
- to promote the sustainable development of the region
- to improve nature conservation

### Joint Working Group

The Joint Working Group, established to oversee the implementation of Measure, consists of 5 Irish and 5 Welsh representatives.

Irish representation: Department of the Marine & Natural Resources, Department of the Environment & Local Government, Department of Transport, Energy & Communications, Local Authority and Marine Institute.

Welsh representation: National Assembly for Wales, Countryside Council for Wales, National Trust, Local Authority (Dyfed), Local Authority (Gwynedd).

This Report series is designed to provide information on the results of projects funded under Measure 1.3. Protection of the Marine & Coastal Environment and Marine Emergency Planning.

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## Abstract

The Irish Sea Science Co-ordination Group (ISSCG) identified human impacts on the coastal zone as a priority area for collaborative Irish Sea marine environmental research and protection (Boelens, 1995). The identification of trends in human use of the coastal zone is considered to be an essential prerequisite to better planning of measures to manage particular activities.

The study presented here on trends in human activity in coastal zones of the Maritime INTERREG II region of the southern Irish Sea was carried out by the Coastal Resources Centre (CRC) in University College, Cork, and the Centre for Research into Environment and Health (CREH) in the University of Wales, Aberystwyth. The study considered aspects of development and human impacts within the coastal zone. Once trends relating to human activities were identified, and where possible quantified, associated impacts and issues were also assessed and quantified. Trends and impacts were identified by sector, in keeping with the format adopted in the environmental assessment report entitled *Ireland's Marine and Coastal Areas and Adjacent Seas* (Boelens *et al.*, 1999).

Sectoral trends examined in the present study included those in demography, development, tourism, urbanisation, marine pollution, offshore resources, etc. The attributes of the associated data were assessed in relation to the purposes for which they are used, and gaps and limitations were identified. Recommendations on appropriate management measures necessary to promote sustainable use of coastal zones were made.

In actuality, data on human impacts on the coastal zone of the Irish Sea are not available in an integrated form. Agencies involved in making policy decisions or in managing the use of coastal marine resources often experience difficulties in obtaining reliable information on key factors. During the preparation of this report, data were difficult to source, and when sourced they were rarely in a format suitable for analysis with regard to relevance to the coastal zone. The study concluded that the quality of information available is variable and not conducive to a systematic, comparative analysis of combined impacts of activities on the coastal zone. The information and statistics that are collected by state agencies are intended to meet the needs of specific sectoral or geographical interests, and are not necessarily appropriate for extrapolation to issues of relevance to the coastal zone.

The lack of availability of information in a format suitable for assessing the characteristics of the coastal zone as an entity may be indicative of the lack of recognition, on both sides of the Irish Sea, of coastal zone management as a discipline. This limitation is identified in the draft coastal zone management policy for Ireland (Brady Shipman Martin, 1997) as the principal element to be addressed for effective future planning. The findings of the current project suggest that this limitation remains. Similarly in Wales, no single body is responsible for coastal zone management. Neither is there an agreed framework within which policy and planning can be properly integrated. Without such a thematic focus in either country it is difficult to ensure the collection and collation of pertinent data and information. Such information is imperative for making effective policy and management decisions for the coastal zone of the Irish Sea.

Throughout this study, differences with regard to issues of relevance to the Irish and Welsh coasts became apparent. For example, the Welsh coast has not experienced the same extent of population pressures, development, resort renewal, habitat loss etc. commonplace in Ireland. In comparison, Wales has several coastal fora that provide a focus for co-operation between regulatory agencies and local stakeholders; this concept is as yet undeveloped in Ireland.

The report assesses the impact of human activities on the coastal zone and contains recommendations related to data and information needs for effective coastal zone management, as well as sector-specific recommendations. Implementation of the recommendations of the project will be of benefit to the work of policy makers, resource managers and planners with responsibilities in the coastal zone, on both sides of the Irish Sea.





# 1 Background to the Study

The Irish Sea Science Co-ordination Group (ISSCG) identified human impacts on the coastal zone as a priority area for collaborative Irish Sea marine environmental research and protection (Boelens, 1995). Boelens *et al.* (1999), in their contribution to the Quality Status Report (QSR) for the Celtic Seas Region (carried out under the auspices of the OSPAR Convention<sup>1</sup>), again highlighted the shortage of information in this area. Human impacts on the coastal zone were endorsed as a priority area for research by their inclusion for support in the INTERREG II Programme: Measure 3 – *Protection of the Marine and Coastal Environment*.

The Irish Government's draft policy for coastal zone management (Brady Shipman Martin, 1997) identified the lack of suitability and capacity of current management regimes and practices to deal with the complexity of the coastal zone as the principal issue necessary to secure proper management of the Irish coast. The need to improve levels of co-ordination and integration in management structures and policy, and for guidance on planning requirements for the coastal zone, were also emphasised in the draft policy.

The objectives of the study reported on here, were to:

- Identify trends in human activity in coastal areas of the Maritime INTERREG II region of Wales and Ireland; assess and quantify associated impacts as far as possible;
- Review relevant data on factors affecting the impact of human activities in the coastal zone area;
- Assess the attributes of these data in relation to the purposes for which they are collected; identify gaps and limitations;
- Recommend that appropriate management measures necessary to promote sustainable use of the coastal zone are then made, based on the analyses.

A Geographic Information Systems (GIS) platform was developed by the Welsh team for the Welsh coastline, based on methods established by the Coastal Resources Centre (CRC) as part of the Risk Assessment and Collaborative Emergency Response in the Irish Sea (RACER) INTERREG II project (O'Connell *et al.*, 2000). This GIS compiled various datasets and digitised maps of features relevant to coastal issues in the study area.

The attitudes of planning and regulatory authorities with responsibilities relating to the coastal zone vary according to individual opinions and experiences. While the lack of data to inform coastal zone management decisions is a significant drawback to conserving national coastal assets, the lack of structures to allow best use of the information and advice that is available is also inhibitory.

Assessing human impacts on the coastal zone encompasses vast amounts of information. The outcome of this analysis is summarised in the recommendations on management measures (Section 6).

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<sup>1</sup> Convention for the Protection of the Marine Environment of the Northeast Atlantic 1992 (Oslo-Paris)

## 2 The Study Area

### 2.1 Definitions of the Coastal Zone

The term coastal zone is used to denote a zone of transition between non-maritime terrestrial and freshwater ecosystems and wholly marine components of global ecosystems. There cannot be a rigid definition of the coastal zone, as boundaries quantifying resources depend on the specific resource in question, and on how this resource interacts with others in the system. Many varied interpretations exist as to the extent of the coastal zone (see for example: EEA, 1995; EC, 1999a). The coastal zone may be defined as:

*the interface where the land meets the ocean, encompassing shoreline environments as well as adjacent coastal waters. ...For planning purposes the coastal zone is a special area, endowed with special characteristics of which the boundaries are often determined by the specific problems to be tackled (World Bank, 1993).*

The coastal zone seldom corresponds to existing administrative or planning units. Natural coastal systems and the areas in which human activities involve the use of coastal resources may extend well beyond the limit of territorial waters, and many kilometres inland. Indeed in the LOICZ (Land Ocean Interactions in the Coastal Zone) definition, the coastal zone is *the area between 200m above and 200m below sea level* (see <http://www.nioz.nl/loicz>). There is widespread agreement that to understand and manage the coastal zone, both the catchment areas and the processes along the continental margins should be included.

### 2.2 The Study Area

The study presented here was carried out on the Irish Sea INTERREG II region. The western boundary of the study area extends from Co. Louth along the east Irish coast to Carnsore Point, Co. Wexford, and westward along the Celtic Sea coast to Youghal Bay, Co. Waterford. The eastern boundary of the study area extends from Bangor on the north Welsh coastline to Swansea in the south of Wales. The volume of the Irish Sea is approximately 2,400km<sup>3</sup>, of which 80% lies to the west of the Isle of Man (DETR, 2000a). The bottom topography of the Irish Sea is dominated by a deep north-south channel (>100m). The western and eastern fringes of the Irish Sea are represented by relatively shallow strips (<40m in the west and <50m in the east). Within the Irish Sea there are two tides per day. The configuration of the tides means that the tidal range is less on the Irish side (DETR, 2000a). The combined publications *Directory of the Celtic Coasts and Seas* (JNCC, 2000), the *Quality Status Report of the Marine and Coastal Areas of the Irish Sea and Bristol Channel* (DETR, 2000a) and the Marine Institute's *Ireland's Marine and Coastal Areas and Adjacent Seas: An Environmental Assessment* (Boelens *et al.*, 1999) provide abundant information on the physical attributes of the Irish Sea area. Other information of relevance is available in reports prepared by the ISSG (Irish Sea Study Group) (1990), and by the Irish Sea Forum ([www.liv.ac.uk/~isf1/isfhome.html](http://www.liv.ac.uk/~isf1/isfhome.html)).

#### ***Ireland***

A total of 705km of Irish coastline, spanning six counties, occurs within the study area. This area includes Ireland's capital city, Dublin, with a population of 1.25 million, and the major shipping ports at Dublin and Rosslare (Co. Wexford), and Waterford. Uniquely, Dublin City encompasses a coastal UNESCO Biosphere Reserve, namely the North Bull Island, Co. Dublin. The study area also incorporates the main fishing harbours of Howth (Co. Dublin), Kilmore Quay (Co. Wexford), Dunmore East and Helvick (Co. Waterford).

The east Irish coast includes a number of inlets and estuaries of importance to birds, various marine life, recreation and shipping. Sandy beaches occupy a large portion of the east coastline, supporting an important tourism industry. The inshore seabed is comprised almost entirely of

sediment which ranges in composition from sand, shell and gravel to larger clast sizes (Boelens *et al.*, 1999). Numerous small bays and estuaries are scattered along the south coast, which is moderately sheltered from the prevailing west to southwest winds (Figure 2.1). In Wexford, more than half of its 264km long coastline is composed of sandy seashore; the remainder consists of rock and muddy shores. The south-facing coast becomes more rocky and indented with less-sandy beaches and more intermittent sections of mud (JNCC, 2000).

The habitats occurring along the coastline provide both seasonal and permanent breeding sites, resting sites along migratory routes, and important nursery grounds for many species. Expansive saltmarsh regions are common in the larger estuaries. Intertidal flats with abundant invertebrate life serve as crucial feeding grounds for wildfowl and waders during the winter. Extensive intertidal habitats with developing mudflats are present in Co. Waterford (JNCC, 2000). The coastline is also botanically rich; *Zostera* (eelgrass) beds are found in some of the sand and mudflat localities. Sand dunes also provide important habitats for a diverse range of both invertebrate and plant life. Sandy beaches are important feeding areas for waders as they contain an abundant supply of invertebrate populations. While shingle beaches are not generally common along the Irish coastline, they can be found in some localities along the Irish boundary of the study area, e.g., Kilcoole, Co. Wicklow. These shingle beaches support abundant invertebrate species, and are commonly inhabited by terns (Newton *et al.*, 2000). Grey seals occasionally use remote sandy beaches as haul out and pupping sites. For an account of grey seal population status in the entire INTERREG II study area, see Kiely *et al.* (2000), while Lidgard (1999; 2001) gives details of the breeding status of grey seals specifically on the east and southeast coasts of Ireland. Fifteen species of cetaceans have been recorded in the Irish Sea (M. Mackey, Coastal Resources Centre, UCC, pers. comm., 2001). Rogan *et al.* (2001) reported that 12 species of cetaceans and 2 species of seals (pinnipeds) had stranded in the INTERREG II study area. The harbour porpoise was the most commonly recorded of the cetaceans that stranded, while the grey seal was the most commonly stranded pinniped. Rogan *et al.* (2001) concluded that the Irish Sea within the study area is an important habitat for marine mammals, and harbour porpoises in particular.

The macrofaunal benthic communities of the western Irish Sea have been mapped; there is a noticeable relationship between the faunal communities and the sediment type. Six communities have been identified, as follows: *Amphiura*, *Brissopsis*, *Abra*, Shallow *Venus*, Deep *Venus* and hard substrate communities (Boelens *et al.*, 1999).

### **Wales**

Most of the Welsh coastline is included in the study area, totalling 1,322km (originally defined by Region 12 in *Coasts and Seas of the United Kingdom*: Barne *et al.*, 1995). No offshore limit for the coastal zone has been set, but an inland limit of 10km has generally been assumed (based on previous research). Sand dunes are distributed along the coastline, while saltmarsh environments, which are very productive habitats, are common along estuaries. These saltmarshes possess a diverse range of flora and provide suitable habitats for wintering and passage waterfowl such as the barnacle goose (*Branta leucopsis*). Approximately 30% of the coastline of England and Wales is shingle, providing a popular habitat for breeding birds such as Arctic tern (English Nature, 1999). The many marine inlets dotted along the Welsh coastline possess a wide range of marine biological communities. The reefs and islands off the open coast also support important marine communities. The adjacent waters possess extensive sediment flats, which provide spawning grounds for a variety of shellfish (crab, scampi) and finfish (plaice, herring, cod and whiting) (UK National Report for the Convention on Biodiversity: <http://www.biodiv.org/natrep/index.html>). The region is also nationally important, as Cardigan Bay has the only recognised resident community of bottlenose dolphins in England and Wales (Evans, 1995). A profile of the coastal sensitivities of both Irish and Welsh INTERREG II coastlines is provided by the RACER project GIS, housed in Irish and Welsh Coast Guard headquarters.

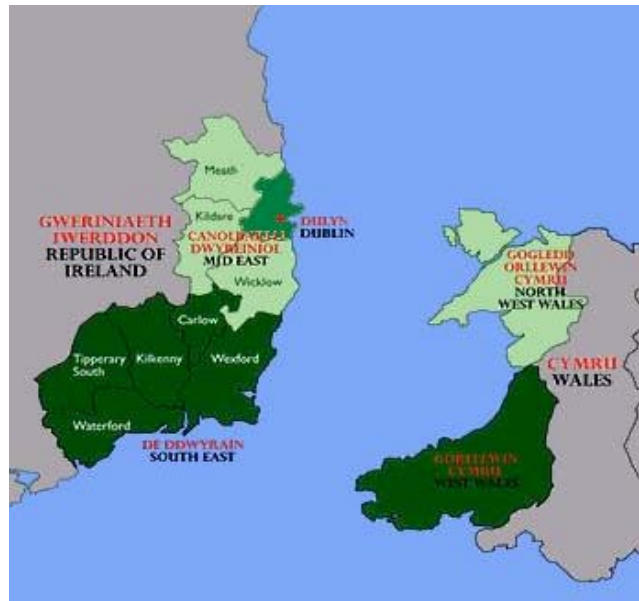


Figure 2.1: INTERREG II area (<http://www.interreg.ie/>).

## 2.3 Demography of the Study Area

Contrasts in settlement patterns between the Irish and Welsh coastlines of the study area are apparent. Over half of Ireland's population, that is approximately 1.7 million people, live in the coastal zone (Boelens *et al.*, 1999). The UK DETR (2000a) QSR report states that in England and Wales the figure is approximately one third of the total population, i.e. 16.9 million people.

### *Ireland*

In Ireland, the study area includes the most densely populated parts of the country. Based on the 1996 population census, the overall population density in this part of the coastal zone is 215.9 people per km<sup>2</sup>, compared to the national figure of 25.4 people per km<sup>2</sup> (Boelens *et al.*, 1999). The study area contains 11 of the 21 largest towns and cities in the country, including Dublin. Eighty four percent (84%) of the coastal population of the study area live in urban districts or boroughs (extrapolated from CSO statistics of 1996).

The overall population of the study area in Ireland increased by 6.8% between 1981 and 1996, from approximately 1.5 million to nearly 1.6 million people (Table 2.1). However, this growth was unevenly distributed. The populations of Meath and Wicklow, the two counties bordering Dublin, increased by 15% and 17.4% respectively. Below average increases occurred in counties Louth, Dublin and Wexford. Much of the higher rates of increase in Meath and Wicklow are attributable to overspill from Dublin; an element may also be due to inward migration from Wexford and Louth.

Table 2.1: Coastal county population statistics 1981-1996 in Ireland. (Source: CSO 1996 & 1991).

<i>County</i>	<i>1981</i>	<i>1986</i>	<i>1991</i>	<i>1996</i>
Louth	88,514	91,810	90,724	92,166
Meath	95,419	103,881	105,370	109,732
Dublin	1,003,164	1,021,449	1,025,304	1,058,264
Wicklow	87,449	94,542	97,265	102,683
Wexford	99,081	102,552	102,069	104,371
Waterford	88,591	91,151	91,624	94,680
<b>Totals</b>	<b>1,462,218</b>	<b>1,505,385</b>	<b>1,512,356</b>	<b>1,561,896</b>

Tourism can have significant temporary impacts on local populations; seasonal increases can result in local populations increasing threefold from winter to summer (Boelens *et al.*, 1999).

### *Wales*

West Wales has one of the lowest population densities in England and Wales. Around 70% of the coast remains relatively undeveloped and essentially devoted to agriculture. Aberystwyth is the only major town on the west coast. Most urban areas are located around the estuaries and major bays on the northern and southern coasts, e.g. Swansea, Llanelli, Milford Haven, Llandudno and Bangor. Relatively low permanent populations (e.g. fewer than 5,000 residents) are recorded in many towns. Little change in overall population (5.2 to 7.1%) has been recorded throughout west Wales in the period 1991-1995. In 1996, statistics for population density of the west Wales coast showed densities ranging from 20 to 130 persons per km<sup>2</sup> (DETR, 2000a).

The relatively small population does not leave the west Wales coastline without potential development pressures. Projected increases in the number of households over the period 1991-2016 are in the order of 223,000 (DETR, 2000b). As most population centres are in coastal areas, it is not unreasonable to assume further development will occur, and inevitably result in increased pressures on green sites. Of the 100,000-strong population in the Eryri/Llyn area, about a third reside in a 20-mile wide coastal band between Penmaenmawr and Caernarfon (Eryri/Llyn LEAP). Regional seasonal increases in population, particularly during the summer months, are also experienced in the Welsh study area.

### *Trends*

- *Regional increase in population density:* From 1986 to 1996, increases in population density in the 10km wide coastal band to the north and south of Dublin ranged from 5% to 18%, while there was a decrease of 4.3% in the city of Dublin.
- *Increased urbanisation:* Almost all of the coastal towns in the Irish study area have increased in population from 1991 to 1996 (CSO, 1991; 1996). The urbanised section of the coastal zone increased by 10.3% from 1975 to 1990. The number of houses in coastal counties increased by between 47% and 180% from 1994 to 1997. The amount of industrial land increased by 16.6% between 1975 and 1990 (Boelens *et al.*, 1999).
- *Seasonal pressures:* Coastal populations may be up to three times greater in summer than in winter as a result of seasonal influx.

### *Issue*

- *Data acquisition:* Under the Statistics Act 1993, demographic data in Ireland are collected on a national basis through the five-yearly census of population carried out by the CSO. However, the geographical basis for the collection of census data results in boundary areas that are rarely contiguous with those relevant for coastal zone management. Indeed, coastal ward data were rarely reported or freely available. The situation in Wales is very similar, where administrative boundaries are used in compiling census statistics and population mapping. Moreover, the change from county to unitary planning areas in Wales has compounded this problem of acquisition of relevant data.

### **3 Introduction to Integrated Coastal Zone Management (ICZM)**

#### ***3.1.1 The European Commission (EC) and ICZM***

No single EU Directive or legislative measure applies exclusively to the coastal zone. However, there are various EU policies which impact directly on the coastal zone and the activities that take place there. These policies include, *inter alia*, EU Structural Funds, the Common Agricultural Policy (CAP), the Common Fisheries Policy, the Fifth and Sixth Framework Programmes, and the Habitats, Birds and Water Framework Directives. In addition, a strategy specifically addressing ICZM within the European Union was published in 2000 and is summarised below.

##### *The EU Strategy on ICZM*

The EU ICZM Strategy (EC, 2000) emerged on completion of the 35 Demonstration Programme (DP) ICZM projects and thematic studies (European Commission Communication 511/95). The objective of the strategy is to improve management of coastal zones. The strategy was designed to meet prior commitments to the sustainable management of the coastal zones, including the EU's obligations under international agreements, such as: Chapter 17 of Agenda 21; the Jakarta Mandate on marine and coastal biodiversity under the Convention on Biological Diversity, and the FAO's Code of Conduct for Responsible Fisheries (Article 10 of which is devoted to ICZM). Chapter 17 of Agenda 21 emphasises that the well-being of coasts and seas is of global concern (Robinson, 1992).

The ICZM strategy defines the EU's role as one of leadership and guidance to support the implementation of ICZM by Member States at local, regional and national levels. To encourage ICZM action the strategy includes a proposal for a European Parliament and Council Recommendation to the Member States. The strategy is expected to improve implementation of existing EU legislation and policies in coastal zones.

##### *EU Water Framework Directive (WFD)*

The Water Framework Directive (2000/60/EC) is regarded as the most important legal stimulus at EU level to date for integrated planning. The Commission will produce detailed guidelines for Member States, indicating how policies relating to coastal zones can be incorporated into River Basin Management Plans. The Directive is considered to be part of the mechanism within which to implement ICZM. The Water Framework Directive (WFD) goes some way to minimising the sectoral approach to water quality and biological quality management. It applies to waters extending up to one nautical mile offshore and is moving towards protecting ecological quality by incorporating, within its environmental objectives, quality in biology, hydrology, morphology and chemistry. Developments under the WFD are currently underway in the southeastern region of Ireland. The Environmental Protection Agency (EPA) is the regulatory body charged with competence in implementing the WFD in Ireland, in association with Local Authorities. The Water Framework Directive is discussed in more detail in Section 4.6.3.

#### ***3.1.2 ICZM in Ireland***

In Ireland, Government Departments (Department of the Marine and Natural Resources (DoMNR); Department of Environment and Local Government (DoELG); Department of the Arts Heritage, Gaeltacht and the Islands (DoAHGI); Department of Defence, state agencies, Local Authorities, fisheries boards, harbour authorities, the Naval Service, the Coast Guard etc., all have roles in the management of the coastal zone. Unlike other EU Member States, Ireland has no specific local strategies or plans for ICZM. In effect, the County Development Plans (CDPs) and harbour development plans incorporate aspects of ICZM. This is unlike the situation in Wales (Sections 3.1.5 and 3.1.6). A strategy document entitled *Coastal Zone Management - A Draft Policy for Ireland* was published in 1997 (Brady Shipman Martin, 1997). It is only a discussion



document and there is, as yet, no national policy on ICZM in Ireland. Key issues and recommendations to emerge from the document included:

- Ireland's legislative and administrative framework in the coastal zone is sectoral and complex, with a strong land/marine divide.
- This sectoral approach is characterised by a lack of integration in coastal planning. In addition there are both real and perceived weak linkages, most frequently expressed as inadequate consultation.
- ICZM should be introduced by means of a phased approach by adopting a programme that progressively moves from an interdepartmental committee, in a number of steps or phases, to an independent unit.

The DoELG, in association with the Local Authorities, is responsible for the management, use, activity and development of the physical environment up to Mean High Water Mark (MHW). However, powers introduced under the Planning and Development Act 2000 give Local Authorities jurisdiction as planning authorities over development on the foreshore that adjoins the functional area of the planning authority. This does not replace the need for a foreshore licence from the DoMNR; any development on the foreshore still requires a foreshore licence as well as planning permission. The DoMNR is responsible for all developments seaward of the MHW. The Environmental Protection Agency (EPA) is unique in having functions that extend across the landward-seaward divide. This feature of the EPA has been consolidated under the EU Water Framework Directive.

#### *Current Status*

The DoMNR has, in its *Strategy Statement 2001-2003* (DoMNR, 2001a), reiterated the need for a comprehensive integrated framework for sustainable management and development in the coastal zone. The strategy states that *the Department is committed to developing, as a priority, in co-operation with other relevant Departments, an integrated coastal zone management strategy and legislative framework*. One of the main strategies in the near future is to put in place consolidated and streamlined systems for the management of the coastal zone and natural resources. The commitment is reflected in the announcement in 2001 that the Minister for the Marine and Natural Resources is to appoint a top senior civil servant in his Department to handle coastal zone management. The brief will involve working with a number of agencies and interest groups, including the Departments of Environment and Local Government; Arts, Heritage, the Gaeltacht and the Islands; and Local Authorities bordering the coastline (*Irish Times*, 2001a).

An interdepartmental committee on ICZM has been established, and within the context of a national spatial policy, a draft report on ICZM is in preparation. The draft report will form part of a series of research papers, which will contribute to the National Spatial Strategy (expected to be finalised in 2002). The report examines the status of current policies, and their implications, and the requirements for coastal zone management structures. The findings of the National Spatial Strategy (DoELG, 2001a), in relation to human pressure on the coastal zone, are in keeping with those uncovered throughout this study:

- Tourism and recreation pressures are likely to increase;
- Development pressure and port activity are projected to increase;
- Aquaculture intensity will increase in the future;
- Sea-level rise and the subsequent impacts of flooding and erosion are recognised;
- Pressure on habitats and environmentally designated areas from other activities and land uses will increase.

### **3.1.3 Community-based Initiatives on ICZM in Ireland**

#### *The Bannow Bay Coastal Zone Management Group (BBCZMG)*

A local voluntary initiative was set up in Bannow Bay, Co. Waterford in 1996 to encourage and assist the development of a coastal zone management plan for the bay. Bannow Bay is designated as a Special Area of Conservation (SAC) and hosts a wide variety of activities within its relatively small, sheltered estuarine environs. The volunteers succeeded in bringing representatives of different users of the bay together, to share views and develop an understanding of the sometimes conflicting activities present. The work of the Bannow Bay Group has laid the foundation for further development of ICZM in the local area. However, such work is hugely dependent on the personal commitment of a few local individuals and is not sustainable without adequate funding and Government recognition.

#### *The Bantry Bay ICZM Charter*

The Bantry Bay ICZM Charter project was developed to address the challenge of successful coastal zone management around Bantry Bay. Bantry Bay is an area of outstanding scenic landscape and contains Ireland's state oil transshipment terminal, one of Ireland's largest fishing ports, a high density of aquaculture units and a busy tourist industry. An association of three partners (Cork County Council, Coastal Resource Centre [University College, Cork] and the Nautical Enterprise Centre [Cork Institute of Technology]) was funded by the EU LIFE Programme as one of the 35 EU ICZM DP mentioned in Section 3.1.1.

The Bantry Bay ICZM Charter contains a range of specific proposals for the management and development of the area's coastal zone. Each proposal is based on a common set of principles agreed by the various stakeholders (individuals, companies, authorities and agencies) that support the Charter. These principles include consensus, partnerships, transparency, sharing of information, social inclusion, improvement of the environment, "polluter pays" principle, use of best information and expertise, island friendly approach, respect for traditional livelihoods, environmental monitoring, and sustainability (Connolly *et al.*, 1999).

#### *Irish Beach and Dune Management Plans*

Ireland's second EU LIFE ICZM DP (Section 3.1.1) was launched in 1997 as a collaboration between the University of Ulster and Donegal County Council (McKenna *et al.*, 2000). Its aim was to demonstrate coastal zone management by developing beach and dune management plans for seven sites in Co. Donegal. The management plans were based on studies of the natural and social environments at each site. Ecological, geomorphological and social processes at each site were investigated. The involvement of the coastal communities in this interdisciplinary study was a key feature in the development of management plans that introduced sustainability into the utilisation of beach and dune systems.

#### *CLAMS*

Details of Bord Iascaigh Mhara's CLAMS (Co-ordinated Local Aquaculture Management Systems) initiative for local aquaculture management are outlined in Section 4.3.2. CLAMS initiatives bring together the relevant state agencies and locally based parties involved in aquaculture with the local CLAMS (BIM) officer and group.

### **3.1.4 ICZM in Wales**

The change in procedures that occurred after the implementation of the Government of Wales Act (1998) led to the transfer of many statutory responsibilities to the National Assembly for Wales (former Welsh Office). The review presented here contains a summary of ICZM policy guidance for the UK, preceded by an overview of the existing regulatory framework and ICZM plans, as they apply in Wales.



### *The UK Policy Context*

Currently, there is no UK strategy for ICZM. National policy is set out in *Planning Policy Guidance Note 20: Coastal Planning*, published in September 1992. No single body has comprehensive powers of coastal zone management; rather, many organisations work together within a complicated legal framework. The UK Government's view is that ICZM is best achieved on a voluntary basis; it does not propose to introduce specific legislation on ICZM. However, existing legislation is not considered sufficient for the purpose.

In Wales, a number of voluntary ICZM fora have been established, such as the Morecambe Bay Partnership. This partnership has set up an ICZM initiative for Morecambe Bay, and communicates on a regional level through the Partnership of Irish Sea Coast and Estuary Strategies (PISCES); the latter facilitates ICZM regionally in the northwest of England (see McKenna *et al.*, 2000). The present framework is based on national sectorally driven legislation, delivered by local planning authorities through voluntary partnerships with other agencies. Guidance issued by the Department of the Environment (DoE), MAFF<sup>2</sup> (now DEFRA) and the Welsh Office, outline existing arrangements for achieving sustainable coastal zone management (DoE UK and the Welsh Office, 1993a, 1993b; MAFF and the Welsh Office, 1993, 1996). More recently, issues of integrated management have been specifically addressed in *Coastal Zone Management – Towards Best Practice* (DoE UK, 1996). Complementary to this report, the DoE UK (1995) published *Policy Guidelines for the Coast*. Key points include:

- Sectoral responsibilities for managing the coast should be maintained;
- Existing institutional structures and their statutory responsibilities should be respected;
- Above Mean Low Water Mark (MLWM), Local Authorities have powers to control development and use of land under the Town and Country Planning Act 1990;
- Management plans should be prepared only where justified by local issues or the need to bring together existing agencies' activities;
- Where necessary, coastal management plans will normally, but not invariably, be best led by local government.

Since the 1<sup>st</sup> July 1999, the status of any guidance from England has been mostly replaced (according to territorial limits) by the Welsh National Assembly's land-use planning document. Strategic guidance is now provided within *Planning Guidance (Wales): Planning Policy, First Revision 1999* (PG(W)PP), supplemented by a series of *Technical Advice Notes* (TANs) (see also *Concordat between the Department of Environment, Transport and the Regions and the Cabinet of the National Assembly for Wales, March 2000*) (NAW, 2000a). Development planning and control is undertaken in the context of policy guidelines to support the National Assembly's statutory requirements. As might be expected, the general legislative and administrative systems in Wales are very similar to those extant in England. In the context of PG(W)PP, general guidance relating to the coast is made with the aim, *inter alia*, to better manage developed areas and preserve undeveloped and heritage coastal landscapes (PG(W)PP, 1999).

More specific coastal planning issues are outlined in *Technical Advice Note (Wales) 14: Coastal Planning 1998* (TAN(W)14). In this report, reference is made to key planning considerations that Local Authorities should address when evaluating coastal developments. These include proposals for development, nature and landscape, conservation and recreation. Implementing this guidance is the responsibility of local planning authorities through the preparation of coastal policies in their Unitary Development Plans (UDPs) (NAW, 2000b). Local Authorities are advised to consult the Countryside Council for Wales (CCW) and Environment Agency Wales (EAW) in the preparation of coastal policies. While MLWM is the jurisdictional boundary for land-use planning purposes, criteria for defining coastal zones are relatively flexible (TAN (W) 14, 1998).

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<sup>2</sup> In the UK, the functions of the Ministry of Agriculture, Fisheries and Food have been taken over by the Department for Environment, Food and Rural Affairs.

The coastal zone is a complex area for development planning and management generally. Below MLWM is mostly outside the scope of the Welsh National Assembly's planning regulatory framework. Despite this, local planning authorities are advised to be mindful of the geographical extent of coastal issues and physical processes affecting the coastline. An area of influence offshore, as well as onshore, is required to be considered by planning authorities when deciding on coastal developments. While there is no universally accepted definition of the coastal zone (*sensu* Gubbay, 1993), it is incumbent on coastal managers and policy makers to fully consider the spatial dynamic of coastal processes within and beyond their administrative area.

### **3.1.5 Welsh National Coastal Fora**

Several coastal fora exist which co-ordinate activities for the whole of Wales. The Wales Coastal Forum, launched in March 1997, promotes good practice and initiates liaison between the coastal engineering groups and other bodies with coastal interests. The co-ordination and role of this group may evolve alongside recent changes within the National Assembly for Wales. In addition, the Irish Sea area has seen the continued contribution of work undertaken by the Irish Sea Forum (formerly Irish Sea Study Group). This body, developed through a need to ascertain the environmental health of the Irish Sea, has produced a number of detailed reports (ISSG, 1990; [www.liv.ac.uk/~isf1/isfhome.html](http://www.liv.ac.uk/~isf1/isfhome.html) ), along with 21 seminar papers. These documents are subject-based, with the primary intention to assist in the long term sustainable development of the Irish Sea marine and coastal environment. Other groups of relevance to coastal zone issues in Wales include the Association of Welsh Coastal Groups and Arfordir.

The OSPAR Convention, to which the UK and Ireland are signatories, is designed for the protection of the North Atlantic Ocean. In the UK, coastal zone fora established at national level address some of the issues associated with OSPAR. However, there are no equivalent fora in Ireland with whom the UK fora can co-operate.

### **3.1.6 Regional Coastal Fora**

There are various regional coastal fora in Wales. A number are Local Authority led, while others have evolved through local conservation groups. As such, the long term viability of some fora has proven to be transitory. Currently, there are two major coastal fora operating within the INTERREG area for Wales: the Cardigan Bay Forum, and the North Wales Coastal Forum. A third, the Gower Countryside Forum covers the whole of Gower, and a fourth, Fforwm Glannau Môn, has a remit covering the Isle of Anglesey.

Where it exists, regional<sup>3</sup>-scale collaboration has a key role to play in ICZM (European Commission Communication COM/2000/547). In England, nine Regional Development Agencies (RDAs), set-up under the Regional Development Agencies Act 1998, co-ordinate regional economic, social and environmental development. The main purpose of the RDAs is to produce Regional Planning Guidance notes (RPGs) to inform local authority development plans. *Planning Policy Guidance Note 11: Regional Planning 2000* (PPG11) emphasises that RPGs should take account of coastal issues.

In Wales, only informal guidance on joint working arrangements between local planning authorities exists within PG(W)PP and *Unitary Development Plans Wales (Draft Guidance for Consultation, (NAW, 2000b)*. As highlighted by Ballinger (1997), one problem is that liaison between neighbouring authorities at a regional level has been reliant on informal and often irregular contact between individuals and departments. However, the scale of this activity has become increasingly formalised in Wales following the creation of the four National Assembly Regional Committee areas.

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<sup>3</sup> The term "region" is here used with regard to planning groups which operate below the level of Wales as a whole, but above that of individual Unitary Authorities.

Regional planning strategies have been developed for the Welsh region. Within these regional planning documents, strategic coastal issues are recorded as key planning concerns. They recognise the advice given in PG(W)PP and TAN(W)14, with reference to designated environmentally important zones, flooding, and the need to guide inappropriate development away from undeveloped parts of the coast. The difficulties of ensuring the correct balance between sustainable economic and environmental considerations were also indicated. Several more regionally specific planning issues were raised within individual planning strategies. In southeast Wales, the development of facilities for wastewater treatment to help reduce pollution at sea and enhance marine biodiversity and bathing water quality, appears as a key planning topic. Whilst in the former mid and west Wales region, the quality of the coastal area in maintaining sustainable tourism through the promotion of a green tourism sector was indicated.

*Estuary/Coastal Management Plans:* these non-statutory plans, in line with guidance by the DoE UK (1996), promote integrated and sustainable locally based ICZM in Wales. Of the coast and countryside strategies reviewed, environment, heritage, coastal recreation/tourism, coastal defence and access issues are strongly covered. Similar concerns including recreational activities, water quality, nature conservation, shoreline management, navigation and commercial fishing are to be reconciled within the Teifi and Conwy estuary plans, awaiting publication at the time of preparation of this report.

### **3.1.7 Sustainable Development**

Sustainable development has been defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (The World Commission on Environment and Development, 1987).

#### ***Ireland***

The Irish Government's sustainable development strategy *Sustainable Development – A Strategy for Ireland* (DoE, 1997) takes the form of a framework rather than a series of dedicated initiatives. The strategy includes overall aims, goals and sectoral programmes for agriculture, forestry, marine resources, energy, industry, transport, tourism and trade. There are ten overall priorities for action; these are general and lack quantitative targets and deadlines. Examples of priorities include:

- Maintain the quality, quantity and diversity of natural endowments;
- Undertake a high level of environmental protection;
- Set out sustainability objectives for agriculture, forestry, the marine, energy, industry, transport, tourism and trade so as to encourage long term growth and competitiveness within a quality environment.

The aims set out under the sectoral programmes are also general, but the strategy does represent a change in thinking about the progress of development in Ireland. The strategy recognises the need for integration with policy actions and interlinking between Government Departments to promote environmental quality. The overall aim of *Sustainable Development – A Strategy for Ireland* is referred to in Appendix IV of the National Development Plan (NDP, 2000; p 301). This aim makes explicit the need to ensure that development occurs without compromising the quality of the environment. Appendix IV of the NDP concerns the approval of a pilot procedure for eco-auditing the NDP. It is intended that an Environment Co-ordinating Committee be established for the life of the plan, and indicators of environmental performance be developed and implemented.

Comhar, the National Sustainable Development Partnership, was set up in 1999 as a consultative and advisory body. No full report has yet been made by the Government on progress in implementing the sustainable development strategy, but a comprehensive overview of many relevant developments is provided in *Ireland's Environment – A Millennium Report* (EPA, 2000a; Chapter 15).

Responses relevant to the sectoral programme for marine resources in the *Sustainable Development – A Strategy for Ireland*, as noted in the EPA report (2000a) include:

- Need for legislation relating to polluting activities at sea and to aquaculture;
- Upgrading of urban wastewater treatment plans (set to continue under the NDP, as described above);
- The work of Dúchas in developing aquaculture zoning plans in Special Protection Areas (SPAs);
- Provision of facilities in ports for receiving ship waste;
- Bathing water quality monitoring and the European Blue Flag beach scheme;
- The annual Coastwatch Europe survey; and
- Local Authority programmes against coastal erosion (also set to continue under the NDP).

The report also notes the continuing gap between coastal zone management policy and legislation.

### *Wales*

There is a growing awareness within Wales of the need to secure both the economic prosperity and environmental quality for future generations. Details of the National Assembly's Sustainable Development Scheme are set out in the consultation paper *A Sustainable Wales: Learning to Live Differently, 2000* (NAW, 2000a). This report adopts the four main objectives of the UK Strategy for Sustainable Development: *A Better Quality of Life: A Strategy for Sustainable Development for the United Kingdom* (DETR, 1999). These principal criteria are:

- Social progress which recognises the needs of everyone;
- Effective protection of the environment;
- Prudent use of natural resources;
- Maintenance of high and stable levels of economic growth and employment.

Sustainable management of marine and coastal areas are also covered in the report, which states that many activities, such as shipping, fishing, offshore mineral exploitation, coastal zone development and land-based activities require effective management to conserve the marine environment, while allowing sustainable use of its resources. The UK Government's commitment to this approach is set out with the aims to:

- Reduce or eliminate inputs of hazardous and radioactive substances of most concern by 2020;
- Maintain fish stocks above minimum levels necessary to reproduce, and press for improvements to EU Common Fisheries Policy;
- Raise consistent compliance with the EU Bathing Waters Directive to at least 97% by 2005.

There is no comparable strategic guidance in Wales outlining sustainable marine development. However, an increasing recognition that climate change-induced sea-level rise is likely to have a significant effect on flooding of coasts and low-lying areas in the future is presented in *Wales: Changing Climate, Challenging Choices 2000* (Farrar and Vaze, 2000), a scoping study initiated by the National Assembly for Wales. In addition, concerns for bathing, drinking and river water quality, and the Natura 2000 network of conservation sites receive a limited coverage on the National Assembly for Wales web-site: <http://www.betterwales.com>. On the positive side, sustainable maritime zone development, which embraces the prudent use of natural, cultural and scenic resources, combined within an ICZM framework, is recognised in Countryside Council for Wales (CCW) Maritime Policy.

CCW is the National Assembly's adviser on sustaining natural beauty, wildlife, amenity and open-air recreation in Wales and its inshore waters. In addition to the main *Maritime Policy* document, the CCW has also incorporated coastal/maritime priorities within their wider review of sustainable development in Wales entitled *A Living Environment for Wales 1999*, and also in the *Vision Statement (Pre-Consultation Draft) 2000*. These reports outline several emerging issues, which should be considered in any future ICZM strategies. A better conserved and less polluted coastline and sea was prioritised as a key concern, plus a network of safe areas for the conservation of fin and shellfish stocks, and the need for statutory arrangements to secure effective protection and management of coastal areas. The need for a proactive approach to establish a sustainable inshore fishing industry was also emphasised, as was the promotion of greater access to the coast and the desirability of a strategic approach to designated areas off-shore for renewable energy generation. The importance of ongoing surveying, monitoring and mapping of the marine environment of Wales was highlighted as central to the provision of future information and advice on sustainable coastline development.

## 4 Coastal Issues

### 4.1 Coastal Development

Until recently Ireland was regarded as one of the world's fastest growing economies, and was in a position to examine the experiences of those European countries that had previously undergone similar economic expansion. Yet, continued destruction of sensitive habitats, serious pollution of estuarine and coastal waters, traffic congestion and housing development, the latter often without adequate Environmental Impact Assessments (EIAs), all indicate that Ireland is not benefiting from the experiences of other Member States. It could be argued that Ireland is ignoring the principle of sustainability and the precautionary principle, and proceeding to rapidly develop without adequately accounting for basic environmental guidelines and economic safeguards.

Ireland's economic boom in the late 1990s resulted in development pressures focused on areas with direct access to the sea, and areas with views of the seascape. These pressures are most evident in developments associated with the expansion and regeneration of coastal holiday destinations (as a result of investment opportunity incentives), which exacerbate the coastal squeeze phenomenon. Between 1993 and 2000, Irish house-building levels doubled to the highest rate in Europe relative to its population. This has given rise to increased demand for development land and pressures on the associated supporting infrastructure: water and sewerage facilities, roads, public transport and amenities. Physical developments are frequently located between the road and the shore. Significant developments are particularly evident along the east coast.

The development process in Ireland has been aided by favourable attitudes and opportunities from national agencies (for example, tax incentives, resort renewal schemes etc.). In addition, many Local Authorities wish to maximise economic development in those coastal areas that have few other resources. Such development is often associated with destruction of habitats, loss of access, loss of scenic amenity value, and environmental degradation. Conflicts arise between competing activities as and when undeveloped coastal land is designated for preservation and conservation. In some instances the designation of protected areas has resulted in over-development in non-designated areas (often bordering designated areas), although the non-designated areas may also be of high ecological value and importance.

Observations on human impacts recorded in the Irish Sea INTERREG II area are categorised in this report in accordance with the issues identified in the European Strategy for ICZM. The most common forms of development adjacent to coastal areas are: road networks, football fields, golf courses, children's play areas, caravan parks, car parks, toilet facilities, cafés and shops. Large-scale developments include hotels, holiday cottages and apartment complexes. Some of the local impacts resulting from such developments include levelling of areas, provision of septic tanks, development of access roads, and increased erosion impacts due to trampling. Sand dunes are particularly at risk from development of amenities such as golf courses and caravan parks. The necessity for shoreline armour subsequently increases, as natural shoreline erosion processes threaten property. Such armour often exacerbates coastal erosion problems in other areas.

The ECOPRO (1996) report on *Environmentally Friendly Coastal Protection in Ireland: Codes of Practice* recommended a restriction on development in coastal areas, and that a setback line from Mean High Water Mark (MHW) should be established. A setback line defines the landward margin of a shore-contact zone within which there is a ban on development. Some authorities use distances from 30 to 100m. In Wexford, the County Council has adopted a set back of 50m from soft coasts. This approach is not widely adopted in Ireland. In Denmark, development within 100m of the beach is prohibited, increased to 3km for development of holiday homes and hotels.



### *Signage*

Signage in coastal areas is an important aspect of resource use and management. Signs inform the public about facilities, while warning about restrictions and hazards. Signs can also provide explanatory information about the resources of the area, and about local efforts to adopt management practices. However, signs in coastal areas are often erected without consideration for location, or associated signs. Ideally, signs should be located where they can be seen by those to whom they are directed, without detracting from the visibility of other signs, or from scenic views. The most obtrusive signs noted on study visits in Ireland were those advertising resort renewal developments and holiday homes along the east coast. In addition, signs declaring aid from EU structural funds were often particularly intrusive, although informative. Bórd Fáilte (the Irish Tourist Board) signs identifying location of facilities were informative; however, national directional road signs were inadequate.

### *Trends*

- *Increase in housing:* Between 1990 and 1992 the housing stock in Ireland increased by 15%; in the five years preceding 1997 housing stock increased by 82%. Areas north and south of Dublin showed increases in house completions of over 74% between 1994 and 1997. Waterford also experienced major increases in its housing stock during this time.
- Development pressures on the coastal zone continue to increase as a result of social and economic driving forces. There is still insufficient information by which to judge the current rate and long term environmental implications of coastal development (EPA, 2000a).
- The LACOAST (LAnd cover changes in COASTal zones) project (<http://www.geo.ucl.ac.be/LUCC/research/endorsed/lacoast/lacoast.htm>) examined an area of 2,535,707 ha, in a 10km wide band around the Irish coast, to quantify changes in land use within the coastal zone from 1975-1990. The study showed that discontinuous urban fabric increased by 10.3% in that time, with a pattern of urbanisation at the expense of farmland. Within the Irish part of the INTERREG II study area, counties Dublin and Wicklow showed the greatest increase in urban expansion.
- The Irish National Roads Authority (NRA) was established in 1994 under the Roads Act 1993 and is tasked with road development. The NRA is exempt from the Freedom of Information Act. Road development under the NDP focuses on the current radial road network emanating from Dublin to the larger cities. Developments involving the construction of the M50 in Dublin and upgrading the N11 to Wexford into a dual carriageway, are of relevance to the study area. Significant reductions in transit times will contribute to pressures for further residential development on the east coast (NRA, 2001).

### *Issues*

- *Coastal erosion:* In Ireland, coastal erosion is evident mainly in counties Wexford and Wicklow; in the Welsh area coastal erosion is evident in North Ceredigion and Eryri/Llyn. Erosion is often exacerbated by inappropriate human infrastructure development, and development too close to the shoreline.
- *Habitat destruction:* This is evident as a result of poorly planned building and land development; specific examples are evident in Drogheda and Dublin.
- *Loss of biodiversity:* Decline of coastal and offshore fish stocks as a result of damage to coastal spawning grounds; evident in the Irish Sea in general.
- *Contamination of soil and water resources:* Including ballast water issues; potential risk to mudflats and saltwaters in Dublin and Wexford.

- *Water quality:* Instances where the quantity of wastewater exceeds treatment capacity; evident in holiday areas, e.g. Courtown, Co. Wexford and Anglesey, Wales.
- *Competition between users for resources:* Numerous activities (recreational, commercial, cultural etc.) are conducted within the coastal zone. Competition and conflict between various users was evident throughout the study area, particularly in Ireland.
- *Uncontrolled development of tourism initiatives:* Evident throughout the study area, particularly in Ireland.
- *Degradation of resources through pollution:* This is a common feature throughout the study area, particularly in Ireland.
- *Marginalisation and emigration:* Lack of appropriate infrastructure is often evident in rural coastal areas; in general it is not an issue in the southern and eastern regions of Ireland.

### ***Case Studies of Local Issues***

#### ***Tramore Strand (Co. Waterford)***

The landfill site at Tramore Co. Waterford is close to the beach and does not comply with current requirements for landfill siting. The landfill has almost reached capacity and its life span in terms of available capacity is very short. The County Council currently operates the Tramore landfill without a licence. An application for a licence has been sent to the Environmental Protection Agency (EPA). A decision by the EPA on whether to grant, refuse, or grant the licence with conditions had not been made at the time of production this report. Waterford County Council intends to close the Tramore landfill as soon as possible; the application for a licence from the EPA is considered to be a means of satisfying a legal requirement and not as a means of extending the life of the landfill. Because of the gradual introduction of regulations under the Waste Management Act 1996, some sites are allowed to operate under certain conditions whilst their application is being considered; Tramore is included in this category. The EPA is also preparing a decision with respect to the waste licence application for the Dungarvan landfill site, also operated by Waterford County Council. The Kilbarry landfill site, which is operated by Waterford Corporation, is awaiting a licence decision from the EPA. It is proposed, that all three facilities be closed within two years and replaced with a joint landfill site for Waterford city and county, most probably at a site west of Dungarvan (*Munster Express*, 2000).

#### ***Dunmore East (Co. Waterford)***

Stabilisation measures on the cliff walls in the inner harbour of Dunmore East are planned by the DoMNR for Waterford County Council, despite the objections of local conservationists. These cliff walls are home to a colony of kittiwakes, unique to the area. These seabirds do not normally nest in such public areas. The DoMNR are ensuring that all necessary precautions will be taken, on advice from Dúchas (the Heritage Service) and BirdWatch Ireland. A divisional engineer with the DoMNR has highlighted the necessity for the stabilisation process, as recent erosion has brought the cliff edge to within a couple of feet of the public road (*Irish Times*, 2001b).

#### ***Killiney Beach (Co. Dublin)***

Iarnród Éireann commenced major coastal protection works on Killiney Beach, without obtaining a Foreshore Licence and without consulting the local beach management group or Local Authorities. The company stated that emergency works were required to prevent damage by coastal erosion to the Dublin-Rosslare railway line. The works involved deployment of heavy machinery and deposition of large boulders on the shore, causing significant damage according to local interest groups. The DoMNR halted works pending an application for a foreshore licence. Iarnród Éireann, however, claimed it did not require permission for emergency work and the Attorney General advised that legislation dealing with the maintenance of railways had precedence over the Foreshore Acts where there was urgent work necessary, essential for public safety (*Irish Times*, 2001c).



### ***Tax Incentive Schemes***

*The Seaside Resort Renewal Scheme*, launched in Ireland in 1995 and now completed, allowed the designation of certain coastal resorts for significant tax incentives for investment, including:

- Incentives for capital tax allowances on the development cost of property used as tourism facilities;
- Double tax reduction for tenants paying rent in property developed and let during a qualifying period;
- Expenditure on the provision of residential accommodation, which is let primarily to tourists, which may qualify for allowance against tax on other rental income.

Allowances were available for new buildings and refurbishment and conversions of existing properties. Resorts designated in the study area include Tramore, Courtown, Arklow, Mosney Laytown, Bettystown, and Clogherhead. The scale of development has varied from minor, at Clogherhead, Laytown/Bettystown/Mosney and Arklow, to large scale, and continuing development at Courtown.

Opinions on these schemes have been mixed. The tax incentive schemes have allowed development and social and aesthetic improvement in certain coastal towns such as Youghal, Co. Cork. However, some groups, e.g. Environment Watch Ireland, refer to the schemes as *The Great Irish Tax Incentive Scam*, (<http://www.home.zonnet.nl/ireland22/taxit.htm>). The frequent location of the schemes on the waterfront has alienated many local communities and tourism and amenity groups; the developments often interfere with the seascape and with traditional rights of access to the shore. The Seaside Resort Renewal Scheme may have had serious negative impacts by exerting excessive pressures on local infrastructure and community with little local gain (EPA, 2000a). A range of impacts has been identified (EPA, 2000a), some of which are listed below:

#### **Social**

- Local community has had little input;
- Locals have more difficulty securing planning permission for one-off small scale developments than outside contractors experience for large scale developments;
- Designation of extensive areas and concentration on new developments did little to upgrade the rundown areas of the chosen resorts;
- Focus on self-catering developments was not market driven and has resulted in over-supply.

#### **Economic**

- Developments have increased property prices beyond the means of local first-time buyers;
- Investors have been attracted away from areas requiring investment;
- Focus on self-catering accommodation has reduced the potential spend of visitors locally as they bring their own food and drink;
- Little of the profit from rented accommodation benefits the local community, as it is directed to outside developers.

#### **Environmental**

- Excessive pressure on infrastructure leads to water shortages, pollution and traffic congestion;
- Over-development on the coastline results in coastal squeeze;
- Many resorts are in close proximity to designated areas intensifying concerns regarding the negative environmental impacts arising from increased local tourism activity;
- Some developments have detracted from the character of the local area;
- Developments have resulted in loss of access to the foreshore; over fragmentation of the foreshore; damage to dune vegetation.
- Developments have resulted in increased erosion.

## 4.2 Coastal Agriculture

Agriculture has been identified as the biggest source of pollution in Irish rivers and lakes (McGarrigle, 1999). Intensive agriculture in Ireland has led to a reduction in semi-natural habitats and to a decrease in biological diversity (Lee, 1999). When considering impacts of agricultural activities on coastal areas, grazing on sand dunes and associated areas impact significantly on the resources of the coastal zone. Access to grazing on dunes and associated wetlands is traditionally an important resource for coastal farmers. Mature dune habitats, rich in plant and animal life, are more productive than the marram-dominated mobile and semi-fixed dunes. However, in some instances overgrazing can lead to erosion, with associated loss of biodiversity. In addition to grazing, other farming practices that may adversely impact coastal areas include: soil enrichment (fertiliser and slurry application), and sand removal for land improvement, building etc. Untreated agricultural effluent has resulted in enrichment and deoxygenation in coastal lagoons, estuaries and bays.

Under the influence of the EU Common Agricultural Policy (CAP), Ireland's traditional mixed farming pattern has become increasingly specialised and mechanised. The decrease in tillage area with corresponding increases in pasture and also hay and silage production is most apparent. The rate of agricultural intensification will moderate under CAP reforms, including set-aside and increased reductions in livestock numbers and stocking rates. Measures such as these, introduced in the 1990s, should help to lessen the risk of damage to fresh, coastal and marine waters from the agricultural sector.

Since its introduction in 1994 in Ireland, the Rural Environment Protection Scheme (REPS) initiative has encouraged more environmentally sensitive farming, including reductions in the use of fertilisers and pesticides, and better pollution control (DAF, 1999). New REPS reforms include management plans for designated areas (Section 4.11.1). Natural Heritage Areas (NHAs) intersecting the farms of REPS participants are protected by management agreements, and attract high payments for the farmers concerned. Farmers with Special Areas of Conservation (SACs) and Special Protected Area (SPA) designations on their land have a right to compensation for loss of income and additional costs associated with the farming restrictions (Lee, 1999). Such allowances and schemes provide incentives to farmers to comply with conservation and manage their property appropriately.

There is a recent trend in agriculture towards diversification into forestry, agri-tourism, deer farming and alternative crops such as oilseed rape. There has been a substantial increase in forestry (0.55%, 12,912ha) in the coastal zone, mainly through planting in wetlands (EPA, 2000a). However, only 9% of Ireland is forested at present and there has been a decrease in new planting since 1996 due to increasing land prices. The LACOST project revealed that coniferous forests increased by 38.3% nationally between 1975 and 1990, to occupy 2.5% of coastal zone land (DETR, 2000a).

### *Issues*

- *Agricultural effluent:* Silage effluent may be the most serious water pollutant generated by farming; silage is now the dominant livestock feed in Ireland. The risk of pollution from silage effluent is reduced by improved storage facilities, but the introduction of baled silage has introduced a new problem of waste plastic. The shift towards more intensive systems of production has increased potential for runoff or leaching of animal manures, compound fertilisers and silage liquor into surface and coastal waters.
- *Water quality:* Recent granting of planning permission in Co. Waterford for a piggery at Stradbally (inland, but within the coastal zone watershed) has caused local controversy (at the time of preparation of this report an application for an Integrated Pollution Control (IPC) licence was with the EPA). Nutrient discharge has adverse effects on water quality and poses a major threat to rivers, estuaries and ultimately the adjacent coastal waters.

- *Loss of agricultural land:* Agricultural land is being pushed further north from Dublin. Agricultural land in the Bettystown-Laytown area was re-zoned in 2001, to allow for greater housing development to serve the greater Dublin population. There is increasing pressure in Wexford to develop old farm buildings for tourism and leisure purposes. It appears likely that pressure for development on agricultural land on the south coast will increase as farming becomes less profitable.
- *Water contamination:* In the Welsh study area the increasing use of a new toxic synthetic pyrethroid sheep dip is an escalating threat to water quality. This threat is identified in a number of the LEAPs (e.g. Anglesey, Meirionnydd and North Ceredigion) for the INTERREG II coastline (consult the individual LEAPs for the Welsh INTERREG II area and see Table 4.18).
- *Data acquisition:* Assessing the extent and effects of coastal agriculture on the environment is constrained by the lack of distinction between national agriculture statistics and the proportion attributable to coastal agriculture.
- *Eutrophication:* Runoff from agricultural land is a major source of nutrient input to coastal waters, resulting in eutrophication. Increasing inputs of nitrogen and phosphorous into marine waters can result in increased primary productivity and growth of nuisance algae. The associated increase in water turbidity, slime production, and oxygen depletion in deep waters can lead to mass fish and benthic fauna deaths (DETR, 2000a).

#### *Data Sources and Potential Future Requirements*

In Ireland, the primary sources of data on the agricultural sector are the Department of the Environment and Local Government (DoELG) and Teagasc (the Irish Agriculture and Food Development Authority). The EPA and the Central Statistics Office (CSO) also hold data on the agriculture sector. Up to date information on the Irish rural environment is still incomplete and inadequate to allow for a fully comprehensive assessment (EPA, 2001a). The impact of agriculture is only one factor in the rural environment but it is certainly a significant one. In Ireland, waste loadings from agriculture contribute significantly to the total national waste arisings (Section 4.5). Recent studies by the EPA indicate that surface water quality in Ireland is deteriorating, largely as a consequence of nutrient rich runoff causing eutrophication within water bodies. Neff (1998) also highlighted the impact of agricultural practices on NHA-designated coastal areas (Section 4.11.2).

In Ireland, initiatives such as REPS offer some form of mitigation; however, REPS has only a 20% participation rate within the Irish INTERREG II area (EPA, 2001b). In response to the deteriorating quality of Ireland's surface waters, the EPA conducted research on nitrogen and phosphorous agricultural inputs. The EPA (2001) published *Developing a National Phosphorous Balance for Agriculture in Ireland*. This discussion document sets out the way forward in addressing the issue of nutrient input. In addition, the EPA (2001a) also published *Rural Environmental Indicators*. Although this document does not solely address agriculture, it does offer suggestions on how to communicate qualitative information on environmental issues in an agricultural context. Dúchas (undated) have released a guide to agricultural best practice entitled *Nature on the Farm*. This advisory booklet outlines the best approach to agricultural practice in or adjacent to saltmarsh, dune, mudflat and beach environments. The EU Water Framework Directive (2000/60/EC) will also require adherence to measures aimed at reducing unnecessary nutrient inputs into river and coastal waters (Section 4.6.3).

## 4.3 Fishing and Aquaculture

### 4.3.1 Fishing

Fishing in the Irish Sea and Celtic Sea increased considerably in the 1970s. The Irish fishing fleet accounts for 30 to 35% of the total international landings (for both finfish and shellfish) in Ireland. In 1996, 7 of the top 20 Irish ports were located within the study area, with landings amounting to €24.3 million and 26,546 tonnes (representing 13.3% and 9.2% of the total national values respectively). In descending order of landings value, the seven ports were: Dunmore East, Howth, Wexford, Duncannon/St. Helens, Kilmore Quay, Arklow, and Skerries. Dunmore East is the most important fishing port in the southeast of the country; based on 1998 fish-landing figures supplied by DoMNR, its tonnage value was over 11,000 tonnes, with a monetary value of close to €8.9 million. Data for species fished within the Irish Sea and the monetary value of catches are given in Table 4.1. Many other ports are of local socio-economic significance; these include Carlingford and Clogherhead on the east coast, with landings of nephrops, flatfish, roundfish, whelks and other shellfish species (Table 4.2). Helvick on the south coast has significant landings of mixed demersal species.

Table 4.1: Statistics for fish landings in the Irish Sea. (Source: Marine Fisheries Service Division, 2000).

<i>Species</i>	<i>Value of 1998 landings in Ireland ( € million)</i>	<i>Percentage of total Irish landings for 1998 from the Irish Sea</i>	<i>Biological Limits</i>
Sole	4.4	22%	Concern
Nephrops	1.7	40%	No concern
Plaice	3.2	40%	No concern
Cod	8.3	15%	Concern
Haddock	7.0	28%	Concern
Whiting	6.7	16%	Concern

In Wales, commercial fishing takes place from the ports of Holyhead, Cemaes Bay and Amlwch, and from the mainland ports of Bangor, Caernarfon and Conwy. Smaller fleets operate from Borth, Aberdyfi and Aberystwyth. Principal catches include skate, mackerel, herring and bass during the warmer months, with whiting and codling taken over the winter period. The principal fishing ports in the Irish/Welsh study area are listed in Table 4.3.

#### *Trends*

- *Effort*: Fishing effort by the Irish Sea fishing industry increased by 40% between 1986 and 1991 (Hillis *et al.*, 1994).
- *Landings*: In 1997 the Irish fishing fleet landed 300,000 tonnes of fish and shellfish, worth in excess of €183 million. The value of landings increased more than threefold from 1984 to 1997. Statistics specifically for the fisheries of the Irish Sea in 1998 are given in Table 4.1.
- *Biological limits*: In 1999, Irish, Spanish, French and UK vessels took an estimated 76,000 tonnes of cod, haddock and hake from Irish waters. Of this total, Irish vessels landed an estimated 10,800 tonnes with a value of €17.8 million. The population of many species, particularly cod, are considered to be outside safe biological limits (CEED UK, 2000a).

- *Conservation measures:* Ireland conducted a cod-tagging programme from 1997 to 2000; over 2,200 cod were tagged using external and data storage tags. These new data were crucial to the Irish Sea Cod Recovery Plan discussions (ICES, 2001).
- *Increase in number of vessels:* The number of boats registered in the Irish Sea by the Republic of Ireland, England, Wales, Northern Ireland and France rose from 294 in 1983 to 374 in 1991, despite targets set for reductions in tonnage and power agreed under Multi-Annual Guidance Programmes (MAGPs) between 1987 and 1991 (Hillis *et al.*, 1994, as in DETR, 2000a). Between 1991 and 1996, decommissioning reduced the number of vessels greater than 10m in length in the Northern Ireland fleet by 27%. The number of Irish vessels fishing in the Irish Sea has declined in recent years.
- *Salmon:* Irish commercial salmon fishery involves drift nets, draft nets and other fishing gear such as snap nets; it normally accounts for 85 to 95% of the nominal salmon catch. Recreational anglers account for the balance (5-15%). In the mid 1980s and early 1990s the drift net catch declined considerably. The overall Irish salmon catch has been at historically low levels recently.
- *Policy requirements:* In Ireland, there is a desire to formulate an individual policy and resource management strategy for the inshore fisheries sector, resulting in more local control of the resource. This also recognises the socio-economic role of inshore fisheries in rural areas and the potential it presents for diversification. An Irish Inshore Fisheries Advisory Committee (IFAC) has been proposed; there are also Local Inshore Fisheries Development Committees. Responses from pilot schemes in Cleggan (Co. Galway), Wexford and Dingle (Co. Kerry) have been encouraging.
- *Conservation:* Stock conservation management has also been increasingly devolved to the local level with fishermen viewed as custodians of the sea.
- *Information gap:* Irish inshore fishing vessels (<15m) account for over 80% of the Irish national fishing fleet, yet vessels under 10m in length are not required to record their catches. This means that a reliable long term dataset on inshore fisheries in Ireland does not exist; the resultant significant data gap is currently being addressed.
- *Investment:* In an effort to develop Ireland's marine resources, over €95 million is to be invested in both inshore and offshore fisheries over the period of the Irish NDP (2000-2006). Planned developments include improvements in processing, crew training, decommissioning old vessels and funding deployment of modern vessels. While this will improve Ireland's fleet capacity in relation to competition from foreign boats, it could contribute to the ever-increasing pressure on fish stocks. The establishment of Local Inshore Fisheries Development Committees (see above) and allocation of funds under programmes such as Supporting Measures for Sea Fisheries Development highlight the Irish Government's intention to develop the potential of the inshore fisheries sector.

## *Issues*

### *Overfishing*

- *Sustainability:* The EPA stated that the wild fisheries market (fish and shellfish stocks) may be approaching an unsustainable level (EPA, 2000a).
- *Recruitment:* Cod stock in the Irish Sea is now estimated to be one quarter of what it was 20 years ago. Recruitment of young fish to the adult stock failed in 1997 and 1998 and the existing adult stock is almost entirely made up of fish spawned in 1996 (Minister for the Marine and Natural Resources, Dail Debates Official Report, 16/02/00).

Table 4.2: Fisheries and aquaculture practices along the east and southeast coasts of Ireland.

<b><i>Irish East Coast from Carlingford Lough to Wicklow</i></b>		<b><i>Fisheries/Aquaculture Type</i></b>
Inshore and coastal		Plaice nursery grounds and herring spawning grounds, lobster potting.
Carlingford Lough	(Co. Louth)	Oysters, clams, cockles.
Boyne Estuary	(Co. Meath)	Mussel fishery.
Dundalk	(Co. Louth)	Commercial harbours
Drogheda	(Co. Meath)	
Greenore	(Co. Louth)	
Giles Quay	(Co. Louth)	
Annagassan	(Co. Louth)	Small fishing ports
Clogherhead	(Co. Louth)	
Balbriggan	(Co. Dublin)	
Skerries	(Co. Dublin)	
Mornington	(Co. Meath)	Main fishing port in the Meath area.
Howth	(Co. Dublin)	Large fishing port: demersal fishery, herring and nephrops.
<b><i>Irish East Coast – South of Dublin</i></b>		<b><i>Fisheries/Aquaculture Type</i></b>
Inshore and coastal		Lobster, crawfish, whelk potting, herring spawning grounds (in winter), some seed mussel fishing areas.
Offshore waters		Scallop fishing ground, scallop operation at Carne (Co. Wexford).
Arklow	(Co. Wicklow)	Fishing port and commercial port.
Courtown	(Co. Wexford)	Small fishing port.
Wexford Harbour		Fishing port and extensive mussel cultivation.
Rosslare Harbour	(Co. Wexford)	Major ferry and container port, fishing port.
<b><i>Southeast Irish Coast</i></b>		<b><i>Fisheries/Aquaculture Type</i></b>
Kilmore Quay	(Co. Wexford)	Fishing port.
Bannow Bay	(Co. Wexford)	Oyster trestles, clam cultivation and public cockle fishery and oyster operation at Duncormick.
Carne and St Helens	(Co. Wexford)	Small fishing ports.
Waterford		Inshore fisheries: some lobster and crayfish potting. Herring spawning grounds extend west to Tramore; Waterford Harbour (mussels).
Dunmore East and Helvick		(Co. Waterford) Large fishing ports - demersal fisheries, herring and nephrops.
Slade, Ballyhack, Duncannon, Ardmore		(Co. Waterford) Small fishing ports.
Dungarvan Bay		(Co. Waterford) Significant oyster and mussel operations.



- *Sustainable management*: Concerns regarding the sustainability of the cod fishery and the health of cod stocks in the Irish Sea led to the development of the Irish Sea Cod Recovery Plan. The plan was initiated in 2000 and entered its second year of operation in 2001 (*The Irish Skipper*, 2001).
- *By-catch reduction*: An objective of the Irish Sea Cod recovery plan is to reduce by-catch of cod in the nephrops fishery (ICES, 2000). The European Commission has expressed strong concern about large by-catches of cod in prawn fisheries areas, where spawning cod are congregating. The Irish Sea Cod Recovery Plan involved the closure of the area northeast of Lambay Island (covering the coasts of Dublin, Meath and Louth). As a consequence of the recovery plan, prawn fishermen were controversially prohibited from fishing the area for a period of ten weeks (14 February to 30 April).
- *Technical management*: During the 2001 recovery plan a modified separator trawl tested by Bord Iascaigh Mhara (BIM) in 2000 enabled the Irish nephrops fleet to operate in the area. An important regulatory condition specifies that where the by-catch of cod exceeds 18% by weight, a fishing vessel using the new gear must leave the area for a period of at least 24 hours (*The Irish Skipper*, 2001).

#### *Impact of Fishing on Other Juveniles, Non-target Fish Species and Other Aquatic Organisms*

- *Demersal discards*: In 1996, an estimated 15,300 tonnes of undersize and non-target fish were discarded by demersal fleets around Irish waters and in waters along the west coast of the UK. In the same year the quantity of demersal fish discarded from Irish fleets was estimated at 9,300 tonnes, corresponding to a total demersal landing value of 46,000 tonnes (EPA, 2000a). Thus, in 1996, 20% of the demersal landings of the Irish fleet were discarded.
- *Pelagic discards*: No figures are available on discards of non-target species from the Irish pelagic fleet; however, as an indication, data from the Netherlands trawl fisheries showed that discards made up 23% of the mackerel landings and 13% of the horse mackerel landings in 1996 (Boelens *et al.*, 1999).
- *Non-target fish species*: The main by-catch species from the Irish Sea fishery are monk, hake, dogfish, gurnard and lemon sole (Marine Fisheries Services Division, 2000).
- *Impact of trawling*: Fishing gear towed along the seabed can cause significant disturbance to seabed communities. Boelens *et al.* (1999) provide percentages of the total area of seabed in the Irish Sea that was trawled or disrupted by fishing gear in 1994: 25% by otter trawling, 22% by beam trawling, and 8% by shellfish dredging.
- *Threats to seabirds and cetaceans*: Marine mammals and bird species are under continual threat of by-catch. A programme to assess by-catch of cetaceans by Irish and UK bottom-set gillnet fisheries was carried out from 1992 to 1994 on the Celtic Shelf, southwest of Ireland and Britain (Tregenza *et al.*, 1997a & 1997b). It was estimated that in 1994 the total annual by-catch of 2,000 porpoises represented 6.2% of the estimated population of harbour porpoises in the Celtic Sea, and 0.3% of common dolphins in the Celtic Sea (Hammond *et al.*, 1995; Tregenza *et al.*, 1997a & 1997b).

Table 4.3: Principal fishing ports in the study region (smaller ports grouped).

<i>Ireland</i>	<i>Wales</i>
Carlingford Clogherhead Skerries Howth Dun Laoghaire, Arklow, Courtown, Wexford Kilmore Quay Duncannon/St Helens Dunmore East Helvick, Dungarvan	Caernarfon and Conwy Cemaes Bay Amlwch Holyhead Aberdovey, Barmouth, Porthmadoc, Aberdaran, Aberystwyth, Borth and Aberdyfi St Davids, Solva, Fishguard, New Quay, Aberaeron and Cardigan Milford Haven Port Talbot, Ynyglas, Penclawdd, Llanelli and the Three Rivers area Swansea

#### 4.3.2 Aquaculture

Aquaculture in Ireland has grown from production of 5,815 tonnes (€3.2 million) in 1980 to 31,113 tonnes (€62.9 million) in 1997. Salmon are the principal species farmed, followed by rope mussels and oysters. While most of the industry is concentrated in the west and northwest of the country, there is extensive oyster and mussel cultivation in the southeast region of Ireland.

The main aquaculture sites along the east and southeast coasts of Ireland are in Carlingford Lough (Co. Louth) and along the Wexford and Waterford coastlines (Boelens *et al.*, 1999). The main species cultivated are:

- Oysters in Carlingford Lough;
- Mussels in Wexford Harbour;
- Scallops at Carne and Ballytrant (Co. Wexford);
- Oysters in Duncormick (Co. Wexford);
- Clams and oysters in Bannow Bay (Co. Wexford);
- Mussels in Waterford Harbour;
- Clams and oysters in Dungarvan Bay (Co. Waterford).

#### Trends

- *Potential growth:* Increase in supply of seafood cannot come from increased catch, as the fishing industry is experiencing depletion in stocks. Any sustainable development of the fish-based food sector is likely to come from aquaculture. The DoMNR commissioned a report on the potential for aquaculture development in Ireland in 2000: *Irish Aquaculture – The Future: Strategies for Meeting the Global Seafood Challenge*. It concluded that by 2015, the Irish industry has the potential to grow by 300% (DoMNR, 2000b). If developed in a sustainable manner, Irish aquaculture output could expand from 39,000 tonnes per annum (current) to nearly 160,000 per annum, with an increase in value from €75 million to over €571 million per annum. The predicted increase will focus on production of salmon, sea trout, mussels and oysters. This would be achieved by a suggested investment of €76 million by 2005 (DoMNR, 2000b). While the majority of this development is likely to be focused on Atlantic coasts, it is possible that areas on the east and southeast coast, such as Bannow Bay in Waterford, will be targeted for aquaculture development.



- *Increased output:* BIM projects that the Irish aquaculture output will increase from 46,203 tonnes valued at €87.5 million in 1999 to 97,023 tonnes valued at €175.6 million in 2008 (BIM, 2001).
- *Socio-economic value:* Total employment in the marine food sector in 1998 was 15,720 persons (Marine Institute, 1998). The aquaculture production sector has increased and had reached a value of approximately €76 million in 2000 (EPA, 2000a).

#### *Issues*

- *User conflict:* There are occasions of conflict of interests between aquaculture and conservation; many of the estuaries suitable for aquaculture are designated as areas for conservation protection. This leads to a conflict between those wishing to develop the aquaculture industry further and those who are responsible for fulfilling requirements under both international and national legislation for the protection of these fragile environments. Guidelines for zonation of aquaculture in ecologically sensitive estuarine regions are under development by Dúchas. Other user conflicts may arise with regard to the use of piers, storage of equipment, and also location of offshore installations.
- *Alien species:* The possible introduction of non-native species associated with importation of bivalves and the potential negative impacts from large scale intertidal culture and harvesting of bivalves on the surrounding ecology of the area is a concern (Boelens *et al.*, 1999).
- *Impact on benthos:* The loss of nutrients from the culture areas through the harvesting of shellfish, and the potential impact of disturbance, shading and high faecal and pseudo-faecal production by oyster trestles and clam trays on the benthos is also a problem (Boelens *et al.*, 1999).
- *Harmful algal events:* There are also concerns that the waste generated by fish farms contributes to the increased frequency of algal blooms and generation of toxins responsible for shellfish contamination.
- *Visual impact:* Objections have been raised with regard to the visual intrusion caused by aquaculture installations in scenic areas. The DoMNR has issued guidelines to minimise the visual impact of fish farms (DoMNR, 2001c).
- *Infrastructural requirements:* There is an apparent lack of infrastructural support in areas of established aquaculture ventures and also in areas deemed suitable for new farms.

#### *CLAMS*

In 1998, BIM in association with the Marine Institute introduced a system for aquaculture management known as Co-ordinated Local Aquaculture Management Systems (CLAMS). CLAMS allows for integrated planning of local management and development of aquaculture in any given region. CLAMS provides a framework within which all baseline data can be amassed and used to draw up a development plan appropriate to the region. CLAMS brings together all relevant national bodies/agencies, regional and local groups involved in aquaculture, as well as the local CLAMS officer and group (BIM, 2000). This holistic approach and consultation format aims to speed up the flow of information, augment conflict resolution processes and reduce obstruction in the development of aquaculture. CLAMS is committed to the development of the aquaculture industry and not intended to be of use in mitigating objections to the industry. CLAMS does not incorporate a strategy to promote further integration of activities with sectors other than aquaculture. Bannow Bay in Co. Wexford, the pilot site for CLAMS implementation, is one of three national areas implementing the system (the others are Roaringwater Bay, Co. Cork and Killary Harbour, Co. Mayo).

### *Measures for Protected Areas*

Many of the estuaries and bays used for aquaculture, in particular those used for shellfish cultivation, are designated as sites of national and international importance for wetland birds. Both BIM and Dúchas have conducted research into the effects of aquaculture on ecologically designated areas. These studies provide valuable guidelines for the operation of aquaculture within or in close proximity to ecologically sensitive areas. Dúchas is currently compiling conservation plans for all SPAs, taking into account all activities within a given site. For any SPA that has shellfish farming within its area, an aquaculture zoning plan will be included, with the aim of minimising the environmental impact of aquaculture while allowing for its development.

### *Measures to Address Visual Intrusion*

Although visual impact is not the sole criterion for assessing aquaculture applications, it is a factor to consider. Some aquaculture infrastructure requires planning permission from the Local Authority; this is outside the remit of the DoMNR. The DoMNR has recently produced *Guidelines for Landscape and Visual Assessment of Marine Aquaculture* (DoMNR, 2001c). This document was developed in response to the increasing number of objections lodged with the Aquaculture Appeals Board on the basis of negative visual impacts caused by marine aquaculture. The DoMNR also proposes the use of technical assistance such as computer modelling, photo montages etc. in the assessment of visual intrusion on landscape-seascapes.

### *Data Sources and Potential Future Requirements*

Comprehensive information exists for the fishery sector in the Irish Sea. There is a strong baseline of data on which to formulate new management and monitoring programmes. In Ireland, the Marine Fisheries Services Division of the Marine Institute (MFSD) holds data on fish stocks, including mackerel, cod, haddock, whiting, plaice, monkfish, hake, rays, dogfish, shellfish and pollack. As well as catch statistics, the MFSD holds information on recruitment, fishing mortality and spawning stock biomass. In the UK, DEFRA maintains a fishing survey database as well as a fisheries statistics database and a biological sampling database.

The fishery sector of the INTERREG II area is confronted with similar issues of concern facing the fishery sector worldwide. The Irish Sea has difficulties in relation to overfishing (particularly cod), by-catch and discards. Future data requirements include information on the environmental impacts of fishing. The trend in devolution of stock conservation management to the local level, with fishermen viewed as custodians of the sea, should be maintained and developed. The criteria necessary to promote and further the regional management of fishing should be identified. It is suggested that in parallel with new management and monitoring initiatives there should be as much transparency as possible. Problems have arisen in the past when those at the local level who are actually involved in the fishery sector were not fully informed of the terms of reference used to develop management protocols.

In Ireland, both BIM and the Marine Environment Health and Services Division (MEHS) of the Marine Institute collate data on aquaculture. BIM is also responsible for the inshore fisheries sector. BIM maintains an online species directory of all commercially fished and farmed species in Ireland. The MEHS has responsibility for monitoring metals, nutrients and environmental trends in the Irish marine environment, and for monitoring biotoxins in shellfish. All findings are presented in the Fishery Leaflet series published by the Marine Institute.

While many of the perceived impacts of aquaculture will be mitigated against by the measures outlined above, there is still more to be done. The pace of ecological assessment of aquaculture impacts needs to develop in tandem with the growth of the industry. In Ireland, the proposed increase in aquaculture to 300% by the year 2015 should be integrated into seascape, landscape and conservation evaluations and management.

## 4.4 Tourism and Recreation

The generally unspoilt coastlines of Ireland and Wales within the INTERREG II study area provide stunning scenery, offshore islands, good beaches, coastal cliffs and historically important resort towns. Popular recreational areas for sailing and boating include Milford Haven and Dublin Bay. In addition, there are smaller recreational harbours and marinas scattered amongst many natural sheltered bays in the area.

The current and predicted trends in tourism and recreational activity are important when assessing human impacts in the coastal zone. Tourism must be managed in a balanced manner to prevent influxes of visitors that may threaten the quality of the environment and the wildlife on which the industry is itself dependent. Recent increases in economic growth have led to a greater demand for access to marine tourism and leisure facilities. There are also growing demands for active rather than passive recreational activities, resulting in rapid expansion of marine tourism.

In *Sustainable Development – A Strategy for Ireland* (DoE, 1997) tourism is identified as one of Ireland's major indigenous industries, and one of the fastest growing. The Marine Institute and the Economic and Social Research Institute's (ESRI) *National Survey of Water-based Leisure Activities* (Marine Institute, 1997) estimated spending of €385 million per annum in this sector (1.1% GNP).

The impacts of tourism related developments on the coastal zone are numerous, and have become more prevalent with the increased availability of funding through tax incentives, EU grants etc. Bord Fáilte (1995) has stated that *the quality of the environment is fundamental to the success of all other elements of the (tourism) product*. In an effort to establish sustainable tourism development, the Irish Department of Tourism and Sport allocated €3.2 million in 1998 for 20 pilot Tourism and the Environment projects. Several projects were initiated along the Irish east coast, for example in Dundalk, Wicklow and Waterford (URL: [http://www.irlgov.ie/tourism-sport/pressroom/Pressrel\\_1998/pr\\_13091998.htm](http://www.irlgov.ie/tourism-sport/pressroom/Pressrel_1998/pr_13091998.htm)).

The high environmental quality on which the Irish tourism industry has been dependent to date results more from low population pressures, rather than from any strategic management approach. This lack of management has already impacted on the environment, and may ultimately contribute to tourist dissatisfaction, and loss of repeat business. The very remoteness that attracted the tourist may itself be lost through over-development of tourism related-facilities.

The Wales Tourist Board (WTB) is an important stakeholder in coastal zone management. Their policy document on tourism (WTB, 2000), gives emphasis to sustainable tourism in which the cultural and environmental context of the coast is developed to optimise economic and social benefit. The need to strike the correct balance between levels of usage and environmentally sensitive sites and the need to ensure sustainable development is considered a national priority.

### *Trends*

- *Growth of tourism:* The overall purpose of the tourism element of the Irish NDP is to increase tourism revenues by 4.7% per annum for the years 2000-2006. This may be achieved by increasing tourism in off-peak seasons and developing tourism in areas further away from the traditionally popular tourist destinations in Ireland (Oram, 2001).
- *Investment:* The tourism industry employs 138,000 people in Ireland, equating to more than one in twelve jobs and will invest €190 million in overseas marketing over three years to 2003 (NDP, 2000).
- *Contribution to GNP:* Between 1986 and 1995 tourism in Ireland rose from under 5% of GNP to around 7% (Boelens *et al.*, 1999).

- *Increase in number of visitors:* Visitor numbers to Ireland doubled during the 1990s (NDP, 2000) and have increased steadily for eight consecutive years, increasing by 7% in 1999 to 5.9 million. The Irish Government aims to increase visitor numbers to eight million by 2006 and increase tourism-related employment by 28% to 177,000. The largest ever budget of €444 million has been allocated to support tourism development over the period of the NDP (i.e. 2000-2006). A further €190 million has been allocated to the creation of the Multi-annual Tourism Marketing Fund (NDP, 2000).
- *Visitors to southeast Ireland:* It is estimated that 315,000 overseas tourists visited Co. Waterford in 1999, generating €38 million in revenue (Marine Institute, 2001a).
- *Domestic visitors:* Despite a low of 40% in 1997, the proportion of holiday makers among domestic visitors to the southeast of Ireland has grown to 60% in 1999. In addition, the number of trips taken outside the peak summer months has grown markedly, with trips taken in the months January to April growing to 26% of all trips (compared to 20% in 1995) (Marine Institute, 2001a).
- *Coastal leisure activities:* While there has been an overall decline in traditional coastal resort holidays, estimates in Ireland show that in the period between 1970 and 1995 the number of day trips to the coast increased by 600%. The Marine Institute estimated that 1.5 million Irish adults participate in maritime and coastal related leisure activities, resulting in 29 million day trips per year. This reflects a move towards more diverse marine and other coast-based activities (Marine Institute, 1999; 2001b).
- Domestic residents took 6.2 million holidays in Ireland during 1996. For the 40% of Irish holidaymakers originating from the Dublin area, the nearby southeast coast was the most popular destination, accounting for 60% of the destinations from Dublin (DETR, 2000a). The National Coastline Study (1972) predicted that this region would experience difficulties in meeting future demands. In Wales, over seven million residential holiday makers visit the principality each year, together with around one million day visitors on fine weather weekends. The majority, 60%, visit the coast (Dunbar *et al.*, in Barne *et al.*, 1995).
- *Socio-economic benefit:* The tourism industry in Wales, particularly in Pembrokeshire and along the Cardigan Bay coast, has been compared in terms of its national economic importance, to that of the southwest peninsula of England. Tourism is a major local socio-economic benefit in Wales, with almost two million visitors a year to the Eryri/Llyn area (Eryri/Llyn LEAP).
- *Secondary industries:* An estimated 40% plus of the Llyn area workforce is employed in the distribution, hotel and catering sectors which provide for the tourism and leisure industry. This is compared to a figure of 20% for Wales as a whole (Eryri/Llyn LEAP).

#### *Issues*

- *Visitor pressures on coastal ecology:* Coastal tourism depends on the quality and diversity of the coastal environment; increases in tourist numbers have been shown to threaten areas of high ecological and resource value.
- *Carrying capacity:* An assessment of the sustainability of tourism destinations, and their carrying capacities, would be a first step towards development and implementation of management policies in the Irish Sea INTERREG II area.
- *Information gap:* There is often insufficient data to assess impacts of tourism; carrying capacity should be assessed.

- *Anthropogenic impacts:* Excessive human activity in coastal areas can displace seabirds, disturb roosting and nesting and deny feeding opportunities; this is particularly evident on the North Bull Island, Co. Dublin. Human activity also impact on seal pupping and haul out sites within the study region (Kiely *et al.*, 2000). Increased use of power boats and jet skis has resulted in accidents, conflicts with other users and disturbance to wildlife. The scale of the problem needs to be assessed and effective control measures implemented (Eryri/Llyn LEAP – Consultation Report Issue ER/31).
- *Threats to ecology:* Recreational developments have led to ecological damage at sites of international and national conservation value. Neither ASI, NHA nor SAC designations have proved sufficient to afford statutory protection against potentially damaging developments. A 1992 study of NHAs (then ASIs) in four coastal counties in Ireland showed that 37% were damaged, and 16% were under immediate threat. Recreation pressure was the most frequently cited cause of damage (Neff, 1998).
- *Development pressure:* Funding availability has encouraged rapid expansion of facilities such as golf courses, holiday homes and marinas, caravan parks, etc., the cumulative effects of which are not always foreseen or managed. Poorly planned developments and increased tourism can overload local infrastructures, leading to pollution and environmental degradation. This has led to increasing pressures on coastal habitats. Sand dunes are probably the most seriously affected areas on the Irish coast. Vegetation damage leads to erosion, leading to loss of wildlife and amenity value. The cumulative pressure of vehicles, pedestrians and caravan-use leads to increased instability of dune systems. Caravan parks in particular represent a pervasive impact on the coast and often lack proper infrastructural facilities, in particular for sewage disposal. The negative visual impact of caravan and camping sites is raised as a concern in the North Ceredigion LEAP.
- *Infrastructural support:* Recognising the need to improve marine leisure facilities in Ireland, the Government has allocated a total of €25 million for the development of marine tourism and leisure infrastructure under the NDP. Proposals are underway for marina developments and improvements along the east and particularly the southeast coasts (e.g. Kilmore Quay; Co.Wexford, Youghal Harbour and Ballycotton, Co.Cork).
- *User conflicts:* Common water sports in the Anglesey area include: canoeing, windsurfing, sub-aqua diving, jet skiing and increasingly surfing (Anglesey LEAP). As the numbers participating in these activities increase so too does the potential for conflict between differing users and interests. For example, at Llyn Maeiog windsurfers and anglers compete for space with one another (Anglesey LEAP – Action Plan Issue AN/24). Conflicts can occur between recreational activities and commercial uses of the coastal zone, for example, seal watching and inshore fishing.
- *Motorised recreational craft:* The impact of powered craft in sensitive intertidal and coastal areas has been raised as a concern, as is the need for a strategic framework for recreation (Teifi LEAP – Action Plan Issue TE/29). In recognition of potential conflict between various users Ceredigion District Council has developed a guide outlining best practice for boat users and boat operators (North Ceredigion LEAP).

#### *Data Sources and Potential Future Requirements*

Quantitative information on coastal tourism is extremely limited in the INTERREG II region. A national survey of water-based leisure activities in Ireland, carried out by the Economic and Social Research Institute (ESRI), provides a more detailed indication of participation levels and expenditure by Irish residents in water-related leisure activities (Marine Institute, 1997). In Wales, equivalent information is lacking. Much of the information on the tourism sector in Ireland is

market driven rather than scientifically focused. Similarly, information on the rate and impact of coastal development associated with tourism infrastructure is insufficient.

The Tourist Board in Wales compiles statistical data on a national and district basis; however, specific coastal-related information is rarely accessible. Local Authority visitor surveys are similarly constrained. However, these surveys provide supplementary information on visitor activities and attractions, helping to establish the user profile of those facilities which may impact on the coast.



Plate 1: Marina in Waterford City. The Port of Waterford facilitates commercial vessels and pleasure craft.

#### **4.4.1 Angling**

Within tourism, angling is regarded as a low impact sector, with few infrastructural requirements beyond the provision of accommodation and access points, and vessels for offshore angling. Angling in Ireland is largely associated with the inshore fisheries sector, particularly at a management and administrative level. Because of the inclusion of the angling sector under the umbrella of the inshore fisheries sector it is difficult to ascertain precisely the contribution of the angling sector to the national economy. The inshore fisheries sector contributes approximately €38 million to the national economy and represents approximately 21% of all fish caught by Irish fishermen (DoMNR, 1999a). In 1997 the sea angling sector alone was worth €30 million (Dunlop *et al.*, 1999).

- At present, Ireland's angling resources offer scope for considerable development and economic return. There is now an impetus from all administrative levels and associated bodies (from Government through to local angling clubs etc.) to invest in a sustainable and profitable future for the sector. Angling offers the potential for diversification and income generation for many coastal communities. The Tourism Angling Measure, which operated from 1994 to 1999, provided a €23 million investment into the sea angling sector (Central Fisheries Board, 1999). The Central Fisheries Board has continued its commitment to the investment into the sector with a proposed €127 million input over the 2000-2006 period (Central Fisheries Board, 1999). The NDP has also committed a sum of €30 million to the development of angling for the same period. Popular angling locations along the Irish INTERREG II coastline include North Wexford, Greystones and Cahore areas. The extensive coastline from Carlingford Lough, Co. Louth (used for tope fishing)



to Wexford (used for flounder and bass fishing) offers a variety of venues for visiting anglers (Central Fisheries Board, 2001).

#### *Trends*

- *Sea angling*: Ireland's domestic sea angling has increased by 50% since 1988 (DoELG, 2001a).
- *Overseas visitors*: There has been an increase in the number of overseas anglers visiting Ireland from an estimated 170,000 in 1996 to approximately 264,000 in 1999. This represents a growth in numbers of about 7% annually (Central Fisheries Board, 1999).
- *Increase in participation*: There has been a growth in participation by domestic anglers in Ireland from an estimated 190,000 in 1996 to approximately 255,000 in 1999, representing an annual increase of about 5% (Central Fisheries Board, 1999).
- *Future opportunities*: There are programmes available (for example the EU Pesca Programme) to encourage stakeholders involved in the inshore fisheries sector to diversify into sea angling.
- *Future development*: Kilmore Quay (Co. Wexford), Helvick (Co. Waterford) and Balbriggan (Co. Dublin) have been identified as sites for future development of the sea angling sector (BIM, 1999).
- In Wales, the Menai Strait is important from an angling perspective. Most of the length of the Strait is open to angling, with over 500 shore anglers present during summer weekends. In addition, about 20 commercial angling boats operate from Caernarfon, Port Penrhyn, Port Dinorwic, Beaumaris and Conwy. Bass are regularly fished at Maltraeth Bay and around Puffin Island. Mullet and flounder are also locally abundant and support recreational angling in estuaries throughout Puffin Island (Anglesey LEAP).

#### *Issues*

- *User conflicts*: There have been conflicts between anglers and Local Authorities with regard to the designation of Blue Flag Beaches. An approach was made within Wicklow County Council to prevent angling on a Blue Flag Beach, by the implementation of bylaws. This issue was not resolved at the time of completion of this report (*Irish Times*, 2001d).
- *Impact of fisheries*: There is concern in Wales that highsea fisheries are unable to discriminate between salmon stocks from different rivers. The impact of highsea fisheries on migratory fish is therefore a potential risk to the sustainable exploitation of migratory fish (Anglesey, Eryri/Llyn, Meirionnydd and Cleddau/Pembrokeshire LEAPs).
- *Reduced numbers of returning salmonids* within the Cleddau catchment from 1989 to the mid 1990s has been linked to agriculture pollution, degradation of habitats and the impact of recent droughts (Cleddau/Pembrokeshire LEAP).

#### **4.4.2 Sailing**

Sailing has been identified as a major potential contributor to the expansion of marine tourism in Ireland. The sailing industry in Ireland is regarded as underdeveloped, fragmentary and small scale (Marine Institute, 1999). The seasonal impacts of weather on the industry are considered a restraint to its development as a full-time profitable activity.

The INTERREG II region of Ireland's coast is regarded as lacking in sailing facilities. The proximity of the Irish and Welsh coastlines ensures that cruising between Wales and Ireland is an attractive option for enthusiasts (Marine Institute, 1998). There are no comprehensive estimates for the number of sailing visitors who come to Ireland each year. Previous research conducted by the Marine Institute indicates that overseas sailing visitors to the southeast come from the British market (especially Wales) and the French market. An estimated 90 overseas vessels visited the marina in Waterford in 2000. At Kilmore Quay, the number of overseas boats visiting the marina was over 360 (Marine Institute, 2001a). The ESRI, in a national Irish survey on water-based leisure activities, estimated that approximately 144,000 persons participated in boating or sailing nationwide over the period 1995-1996 (Marine Institute, 1997).

Given the large level of urbanisation on the east coast of Ireland, it is likely that sailing will increase in that area. Sailing is particularly popular in Dublin Bay, where in 1989 an estimated 15,000 people participated in sailing (DETR, 2000a). Currently, almost half of Ireland's marinas are located along the south and southwest coasts, with great potential for development on the east and southeast coasts. EU funding and private investments have facilitated an increase in marina development. This increase is apparent in the recent interest in marina development along the Irish east coast (see case study: *The Changing Face of a Harbour*). The Marine Institute also participated in the INTERREG II project *Marinas and Yachting in the North West Metropolitan Area (MAYA)* producing the report *Options for Development in Waterford Estuary* (Marine Institute, 2001a). The Marine Institute has also published specific *Guidelines for Planning a Marina Development* (Marine Institute, 2001b) and *A Development Strategy for Marine Leisure Infrastructure* (Marine Institute, 2000c).

#### *Trends*

- Initiatives such as the Marine Institute's *Investment Programme 2000-2006 for the Water-based Tourism and Leisure Sector in Ireland* (Marine Institute, 1999) promote the development of marine tourism in the form of enhanced facilities for water sports and angling, development of eco-tourism and support services. Development will focus on selected *clusters* of sites that have been categorised as developed, developing and under-developed. The continued construction and development of marinas is likely to have direct consequences from a socio-economic perspective, but may place increased pressure on the coastal environment.
- *Potential development:* Under the investment programme outlined above, a number of primary locations within the Irish INTERREG II area are identified for development (namely Carlingford, Wicklow, Arklow, Courtown, Dunmore East and Helvick). Sites identified as secondary locations in need of marine leisure development include Balbriggan, Colliemore, Cahore, Rosslare, Fethard, Duncannon and Bunmahon (Marine Institute, 1999). The strategy prioritises marina developments in areas where there is an existing marine access structure, i.e. small ports and harbours; this approach should minimise habitat loss.
- *Secondary benefits:* Potential associated spin-offs such as establishment of new service industries, construction of hotels, apartments and holiday homes etc, will increase the tourist and resident populations and could potentially increase the local real estate value (NECL, 2000b).

#### *Issues*

- *Threats to ecology:* Many marinas are located near vulnerable beach and dune systems, mudflat and saltmarsh habitats. Dredging of marina basins and approach channels can also lead to problems.



- *Public access:* In some instances, construction of marinas limits public access to the foreshore.
- *Water quality:* Specific issues relating to marine craft and associated facilities include the impact of discharges of bilge water and toilet waste from boats, and visible oil pollution within docks and marinas (Anglesey LEAP – Action Plan Issue AN/21). Inadequate provision of waste repository facilities is also an issue.
- *Impacts of development:* As the tourism sector expands, further development pressures on the coast will be inevitable.

### *The Changing Face of a Harbour – A Case Study*

Kilmore Quay, Co. Wexford was a small harbour until the early 1990s; since then it has developed rapidly (Plate 2). In 1989 a severe storm caused significant damage to the harbour wall and repairs were required. The new pier was developed in the early 1990s. The late Hugh Coveney (Minister for the Marine) instigated the development of the harbour: a new wall was built, an access channel was dredged, and the harbour was also dredged. An improved slip-way was built to facilitate the life boat stationed at Kilmore Quay, which had previously been launched from the beach. The navigation aids to the harbour were improved and leading lights were provided. In addition, buoys were placed outside the harbour, minimising many of the hazards in the approaches to the harbour. A once small fishing village was transformed into a picturesque sailing destination.

Kilmore Quay is strategically located, as the only marina between Cork Harbour on the south coast and Arklow on the east coast. The fishing tonnage was trebled in five years; the marina currently supports over 800 visiting yachts a year. There are approximately 50 pleasure vessels/yachts, a number of power boats as well as angling boats berthed in the marina. The marina contributes about €1.9 million a year to the local economy.

Kilmore Quay is not a DoMNR-operated fishing harbour, rather, it is owned by Wexford County Council. A harbour master was employed upon completion of the many improvements made to the harbour. This appointment was made to ensure the generation of income from the harbour and to regulate boat movements. The harbour is practically self-sufficient as fees are obtained from the fishermen, while the yachtsmen also pay mooring fees. An annual income of between €102,000 and €127,000 is generated by the harbour, covering operating costs. The developments at Kilmore Quay coupled with favourable economic trends have led to a change in the composition of the fleet at Kilmore Quay. As local fishermen increased their tonnage they invested in larger boats, some of which were too large to enter the harbour; as a result they now land in Cobh, Howth, or Waterford.

*Interview with Eddie Barrett – Kilmore Quay Harbour Master, County Wexford (February 2001).*



Plate 2: Kilmore Quay, Co. Wexford, a significant fishing port and marina in the study area.

#### 4.4.3 Golf Courses

Golf courses were traditionally regarded as benign developments (Plate 3). In Ireland golf courses did not require planning permission until May 1994 (they still do not require an EIA). Their development has occasionally resulted in ecological damage at sites of international conservation value, especially dune systems. The artificial maintenance of grasslands for golf courses can result in structural and ecological alterations, reducing the physical and biological integrity of the system. European Union and state funding has facilitated the rapid expansion in the number of golf courses in Ireland (70 golf courses have been developed since 1990; 20 on the coast; DETR, 2000a). In Wales, a similar trend has been noted (78 golf courses recorded within 10km of the coast in 1995; Dunbar *et al.*, in Barne *et al.*, 1995).

Golf clubs at coastal locations frequently own the nearby dune systems. Some course developments make minimal changes to the natural morphology of the site, while others involve substantial structural developments. Golf course developers may also erect rock armour defences against erosion; these local protection measures usually contribute to increased erosion on the adjacent coastline. Golf courses often have a lower conservation value than sensitively grazed dunes. The artificial sward of golf courses has non-indigenous grasses that are sprayed with fertilisers and pesticides. However, golf courses may protect against the proliferation of holiday home developments, and so in part contribute to the retention of seascape amenity, although they restrict public access to the shore. In the event of a decline in the world economy, the tourist-based focus on which Irish coastal golf clubs rely may not maintain sustainable returns on investment. Thus, there is a possibility that investors may seek to re-develop some of the coastal courses into hotel, holiday and recreation complexes.



Plate 3: Portmarnock Hotel and golf links, Co. Dublin. (Source: D. Swan Tigerline Ltd.).

#### 4.4.4 *Eco-tourism*

Within tourism, eco-tourism is the fastest growing sector, providing many economic and employment benefits to communities while increasing public awareness of the environment. However, it is essential that eco-tourism as a sector is developed in a sustainable fashion.

Eco-tourism based on seal, seabird and dolphin watching, is a growth area. The presence of seals at haul out and pupping sites in southwest Wales attracts considerable tourist interest (Young, 1998). Initiatives such as the Wexford coastal path which extends from Carnsore Point to Hook Head have improved access to the coast while encouraging the public to explore the ecology of the area (DETR, 2000a). Similarly, the Saltee Islands (Co. Wexford) and the islands off Co. Dublin are important amenity areas, and are home to significant seabird and seal colonies. They are visited throughout the months of April through to October by tourists, naturalists, anglers etc. The impact of eco-tourism on seal, cetacean and seabird populations has not been quantified. Baines *et al.* (1995) speculated that the development of seal-watching boat trips around Ramsey Island in Wales may have contributed to the decline in the number of seals breeding there during the early 1990s.

The nature of grey seal breeding makes them particularly vulnerable to disturbance by tourism. Seals arrive at their coastal breeding sites in August; 95% of pups are born between September and October. The main tourism season thus overlaps with the early part of the breeding season, which is the most sensitive time of the year for seal populations (Kiely *et al.*, 2000). Because of the small size of seal colonies in the area, seals are likely to be sensitive to the effects of human disturbance; thus, the development of seal tourism must be regulated for it to be sustainable. In a study on the population status and dynamics of grey seals on the east and southeast coasts of Ireland, disturbance to the seals due to tourist activity was particularly evident (Lidgard, 1999).

Minimising disturbance to seals and other marine mammals can be achieved through the issue of a national code of conduct, based upon the knowledge of how the species respond to disturbance.

For example, a code of conduct/practice was developed by Rogan *et al.* (2000) for the operation of vessels in the vicinity of small cetaceans in the Shannon Estuary. The points in the code included:

- Keeping a distance of 10m from any animal;
- Not exceeding 5 knots when less than 100m from cetaceans;
- Limit of four vessels at any one time;
- Time limit of 30 minutes in the vicinity of cetaceans;
- No swimming with cetaceans;
- No use of jet skis within 100m of cetaceans.

#### **4.4.5 Difficulties in Regulating Marine Leisure Activities**

While voluntary methods such as codes of conduct are useful in curbing activities, enforcement of legal measures is often required. Methods should be suggested for mitigating disturbance and to devise codes of conduct for eco-tourism, and the general public, in environmentally sensitive areas. There is a lack of legislation to deal with the wide range of activities on beaches. There are often problems with reckless driving on beaches, littering, noise pollution, jet skiing, horse riding, golf, dog control etc. As a further complication, previous legislation did not encompass both sides of the MHW; the new powers granted to Local Authorities under the Planning Act 2000 ensure jurisdiction over any development on the foreshore adjoining the functional area.

Ireland uses bylaws for beach management in a number of ways (MacLeod *et al.*, 2000). Bylaws are used in some areas to prohibit activities such as: littering, driving cars, jet skiing, water skiing, playing golf, horse riding, dog walking, excessive noise, gambling, disorderly behaviour, vandalism, games, trading, drinking, lighting fires, camping, obstruction, surfing and wind surfing. In the UK, the DETR has suggested that Local Authorities *should be given more general bylaw powers to regulate activities affecting the wider environment* (DETR, 1998).

Before marine leisure activities can be regulated, there is a need for information on trends in tourism and recreation in coastal areas. The shortage of such information may result in poor management of designated and sensitive areas, ultimately jeopardising the environmental integrity that may have originally attracted the tourist.

The present trend in increasing tourist numbers may not be sustainable. Peaks in tourist numbers during the summer season may strain the infrastructure of small coastal communities, ultimately damaging the environment. There is already evidence amongst foreign tourists of decreasing satisfaction with the environmental integrity of destinations in Ireland. An assessment of the sustainability of tourism destinations, and their carrying capacities, would be a first step towards development of integrated management policies. The possibility of using Environmental Management and Auditing Systems (EMAS) in management of tourism areas could be investigated. The concept of Destination Metabolism should be investigated. From this, an environmental impact index for tourism in the coastal area could be developed; this could lead to development of Green Destinations. The development of a Green Tourism Quality Mark should be encouraged. A pilot project on Green Certification of tourism initiatives could be developed for the INTERREG II area. The use of eco-levies in the Canaries and the Mediterranean should be reviewed, with a view to possible adoption of the method in Ireland and Wales.

The impacts of the Resort Renewal Scheme on specific areas in Ireland should be assessed. In the majority of instances, the developments are along the seashore, with high visual impact. Such developments also impact on habitats and species in the area and limit public access to the foreshore. The impact of such developments on the limited availability of residential housing to local communities should also be assessed.

## 4.5 Waste Disposal

Pollution problems emanating from industry, urbanisation and land use are well documented. In addition, there is a growing awareness of air, light and noise pollution and the problems of marine litter within the coastal zone. Perceptions of pollution levels within the study area have the potential to adversely affect tourism, and leisure/recreational activities, as well as public health and nature conservation interests. A large proportion of the waste generated in Ireland each year is attributed to agricultural sources. A total of 80 million tonnes of waste was generated in 1998, 64.5 million tonnes of which was agricultural and 2 million tonnes municipal (Table 4.4). In 2000 the EPA (2000a) estimated that there had been an increase of over 100% in waste levels in the previous 15 years; this increase is expected to continue (EPA, 2000a).

Table 4.4: Sources and levels of waste produced in Ireland in recent years.

<i>Source</i>	<i>Year Interval</i>	<i>Waste Produced</i>
Agricultural waste	1998	64.5 million tonnes
Municipal waste	1998	> 2 million tonnes
Waste collected by Local Authorities	1984 - 1998	100% increase
Industrial waste	1995 - 1998	6.2 million - 9.1 million tonnes, 47% increase.
Hazardous waste	1996 - 1998	328,000 - 370,000 tonnes, 13% increase
Construction and demolition waste	1998	2.7 million tonnes

Unauthorised dumping on the coast is a major cause of concern and it is one of the most visible forms of marine waste disposal. Results from the 1997 and 1998 Coastwatch Europe surveys of the Irish coastline showed that metal items and landfill material were the most common large items of debris along the coast. There were fewer records of plastic, metal and glass drinks containers in the Coastwatch surveys around the Irish coast in 1998 than in 1997; however, the records were still higher than in the early 1990s. The 1998 report indicated that the number of beaches with sewage matter had increased during the 1990s. This has been related to the rapid development of caravan parks and holiday homes without a prior, sufficient sewage treatment infrastructure to support such development. Since 1989 there has been a significant increase in aquaculture-related litter, mainly plastic from oyster bag netting, ropes and floats. Shellfish and finfish farms were identified as major contributors to shoreline litter (EPA, 2000a). The 1999 Coastwatch Ireland survey concluded that littering on Ireland's beaches continues to increase.

Litter is a particularly widespread and persistent problem, with peaks in abundance at summer time. Some litter is washed ashore, while more is dumped directly on the shore by careless holiday makers. Tourists and recreational users are estimated to be responsible for 18% of the litter deposited along the coast. While litter has a visual intrusion, there are also associated health risks (e.g. from broken bottles) and environmental risks (e.g. seabirds and seals entangled in plastic, leading ultimately to death by strangulation or starvation). Litter is one aspect of beach usage that attracts considerable complaint by tourists. Provision should be made for more adequate allocation of bins, and their regular collection. Litter may be concentrated within areas where there are car parking, toilet and café facilities. Greater effort should be made to increase litter collecting facilities in such areas.

Rural beaches are particularly prone to dumping, as the instigator is unlikely to be observed, and dumping is difficult to control. Rubble is often dumped as a convenient method of disposal, and in some instances as an effort to build up eroding shorelines and to extend car parks and caravan parks. This situation is aggravated by the lack of authorised landfill sites, and increasing rates of



development and waste production. Dumping of crops, furniture and household refuse was evident at over 25% of the 782 sites surveyed by Coastwatch Ireland in autumn 1999 (compared to 7% of the 224 sites in the north of Ireland). The Coastwatch survey also identified badly managed landfill sites as a significant point source of pollution (Coastwatch Ireland, 1999). Litter is only one aspect of marine waste disposal; other forms of waste dumped in the marine environment are dealt with in sections below.

#### *Current Situation with regard to Waste Management in Ireland*

There have been significant improvements in waste management in Ireland since 1995 due to the implementation of the Waste Management Act 1996 and Integrated Pollution Control Licensing (EPA, 2000b). Ireland's Waste Management Act defines who is responsible for waste in Ireland. The following text is an extract from a Special Edition EPA Newsletter (EPA, 1999b):

*Local Authorities are now armed with extensive new powers under the Waste Management Act and are responsible for the supervision and the enforcement of the relevant provisions of the Act in relation to the holding, recovery and disposal of waste within their functional areas. With the exception of facilities licensed by the EPA, which will be monitored and enforced by the EPA, Local Authorities have the primary responsibility for all other monitoring and enforcement activities under the Act.*

The European Environment Agency (EEA, 1999) has predicted that by 2010, the level of paper, cardboard, glass and plastic waste generated will increase by approximately 40 to 60% of 1990 levels. Local Authority waste management plans and the National Hazardous Waste Management Plan (produced by the EPA in 1999) both strongly emphasise and promote prevention and reduction of waste. Ireland also needs to improve and increase its levels of recycling and to address the shortcomings of its waste management infrastructure.

*While Ireland's environmental quality is of a higher standard, at the same time, that quality is at risk of being eroded at a faster rate than is happening in most other European countries (EPA, 2000a).*

As noted in the Irish DoELG's Waste Management Policy Statement (DoELG, 1998), there is an urgent need to modernise waste management practice and to secure the provision of environmentally efficient infrastructure. The Government policy objectives with regard to waste management include: minimisation, prevention, re-use and recycling. To achieve these objectives the policy statement outlines specific considerations that have to be accounted for, these include:

- A fundamental change in waste management practice;
- Ireland has the chance to achieve a high level of performance, beyond EU compliance; it has the chance to include best practice and resource efficiency in economic sectors;
- The "polluter pays" principle must not be disregarded; those who pollute must pay for the treatment and appropriate disposal of the waste;
- The waste management infrastructure must be a cost-effective and independent alternative to landfill.

#### *Current Situation with regard to Waste Management in Wales*

A Stg£40 million indicative package of additional funding has been established to help Local Authorities and other organisations implement the Welsh Assembly's new waste strategy for Wales up to 2004. The allocation of the total Stg£3 million for 2001-2002 resources breaks down as follows:



• Local Authorities	£1,500,000
• Waste analysis	£500,000
• WRAP (Waste Resources Action Programme)	£650,000
• Environment Agency Wales (to combat illegal waste disposal)	£200,000
• Regional waste planning groups	£100,000
• Other waste related expenditure	£50,000

For 2002-2003 and 2003-2004 the Welsh Assembly has issued indicative figures of Stg£11 million and Stg£22 million respectively to Local Authorities (<http://www.wales.gov.uk>). Funding grants will be made available to Local Authorities for the implementation of recycling and composting schemes, the provision of education programmes and for the formation of partnerships between Local Authorities and public, private and voluntary sectors (<http://www.edie.net>).

## 4.6 Water Quality

### 4.6.1 Current Situation Regarding Effluent Discharge

Direct discharges to Irish freshwaters, estuaries and coastal waters include urban wastewater, domestic sewage and industrial (trade effluent) inputs. The Environmental Protection Agency (EPA) and local sanitary authorities in Ireland hold responsibility to ensure compliance under the Water Resources Act 1991, and the IPC provisions of the Environmental Protection Act 1990. The equivalent responsibility in Wales is held by the Environment Agency Wales (EAW).

Some of the impacts of poor quality estuarine environments include: loss of amenity value, disruption to fisheries and aquaculture and alterations to the flora and fauna. However, with increased investment through the Water and Sewerage Services Investment Programme (Ireland) and the Rural Water Programme (Ireland), the environmental quality of estuaries with excessive nutrient enrichment will be improved. Under the Water and Sewerage Services Investment Programme, basin management systems are being developed for the Boyne, Liffey and Suir rivers (within the study area). A total investment of €4.57 million has been allocated to establish monitoring and management systems in relation to water quality for the catchments of these rivers (DoELG, 2000a).

Water contaminants (such as nutrients, metals and polychlorinated biphenyls (PCB) contaminants from land-based sources) are routinely monitored by the EPA in Ireland and by the EAW in Wales. Despite this, data on direct discharges of industrial effluents in Ireland are scarce. Data on the spatial and temporal distribution of chemical contaminants in seawater, sediments, fish and shellfish in the Irish Sea and Bristol Channel are available from surveys conducted as part of the Joint Monitoring Programme (JMP) and the UK National Monitoring Programme (NMP) during 1990-1996. The Marine Institute holds a large amount of information on the water quality of shellfish waters along the Irish INTERREG II coast.

#### *Sewage and Nutrient Loading*

The EU Urban Waste Water Treatment Directive (91/271/EEC) requires that all significant discharges from sewage treatment works into areas vulnerable to organic enrichment and eutrophication must have a minimum of secondary treatment by 2005.

In Ireland, the majority of municipal outfalls are not treated, or receive primary treatment only. By contrast, along the coast of Wales secondary treatment is provided at around 51% of sites, although 36% of the sewage discharged within the study area continues to be untreated or receives primary treatment only as of 1999 (DETR, 2000b). Rural coastal areas often do not have a mains sewerage system, or have an inadequate system, designed for the resident population. In

the worst cases, untreated (or primary treated) sewage is released into the sea near beaches. Even where mains sewerage schemes exist, they were not designed to deal with the increase in numbers of caravan parks, holiday homes, the seasonal influx of visitors and day trippers. Streams flowing into the sea across a beach can be contaminated with agricultural effluents from slurry or silage. In addition, there can be natural threats to water quality by harmful algal bloom events.

In many areas, developments without a mains sewerage system use individual septic tanks; these are subject to overflow and leakage. Tanks associated with caravan parks on dune systems can contribute to nutrient enrichment. This may then lead to a change in the flora and fauna of the dune system. In addition to sewage, coastal areas are particularly susceptible to degradation of water quality from oil and chemical spills and leakage from boats, sewage from boats in transit or in dock, effects of anti-fouling paints, and also fish waste.

In Ireland, water quality surveys (groundwaters, lakes, rivers, estuarine and coastal water) were carried out between 1995 and 1997 by the EPA. General quality of estuarine and coastal waters around Ireland has remained high. The majority of estuaries did not contain excessive nutrient enrichment (EPA, 1999a). Localised pollution due to effluent discharges were observed in the Liffey and Boyne estuaries (EPA, 1999a). High chlorophyll(a) concentrations were regularly recorded during the summer, especially in the low-salinity reaches. High concentrations in the upper reaches of these estuaries may be due to poor flushing rates. Elevated phytoplankton growth is a regular feature of the following estuaries in the south and southeast: the Slaney, and the Barrow, Nore, Suir rivers. Between 1995 and 1997, winter nutrient concentrations were similar to background levels in the northeast Atlantic. From mid May to early June (1996), observations were carried out on a bloom of the Prymnesiophyte algae *Phaeocystis* in the western Irish Sea (EPA, 1999a). Excess production of a related species has been observed in the English Channel and the southern North Sea, and is linked to nutrient enrichment. However, there is no evidence to prove that the 1996 bloom was directly related to local nutrient inputs. Harmful algal blooms are identified as increasing in occurrence in Irish coastal waters (EPA, 2000a).

In Ireland, the largest specific allocation of funds relating to the effects of development on the environment is centred on improving water quality and delivering integrated waste management programmes, under the Rural Water and Waste Management measures respectively. Investment by the Irish Government to establish an appropriate waste management infrastructure in the south and east region amounts to €521 million. The Rural Water measure allocation (NDP, 2000) is €160 million, to be spent on:

- Water supply and sewerage services in small towns and villages;
- Upgrading quality-deficient group water schemes and installing new group schemes;
- Upgrading private individual water supplies to houses where an alternative public or group supply is not available.

These amounts together represent 2% of the total allocation (Table 4.5). However, the level of investment reflects the current infrastructure deficit in these areas. Many households do not have access to mains supply water and sewerage services. Some supplies may be in breach of the standards set in the EU Drinking Water Directive, and groundwater supplies may be at risk in areas close to urban centres.

#### *Trade Effluent and Heavy Metals*

There are a number of large trade effluent outfalls on the south Wales coast at Newport, Port Talbot and Swansea, and two outfalls in Amlwch, on Anglesey in north Wales. The east coast of Ireland is mainly affected by industrial effluent discharged into Dublin Bay via the Ringsend sewage treatment plant.

Table 4.5: Proposed NDP investment in the south and east (S & E) region under environment-related programmes (based on NDP, 2000).

<i>Programme</i>	<i>S &amp; E Region Allocation (€ million)</i>
Rural water	160
Waste management	521
Extra funding will be provided for National and Heritage Parks, Nature Reserves and National Monuments to consolidate and conserve the significant heritage infrastructure that is already in place and to extend the range of cultural and recreational facilities available (p. 169).	Amount unspecified
Total of specified amounts	681
Percentage of overall S & E Region allocation of €34,630 billion	2%

Mandatory annual reporting of selected contaminants (i.e. cadmium, copper, zinc, mercury, lead, nitrate, total nitrogen and phosphorus, orthophosphate,  $\gamma$ -hexachlorocyclohexane (lindane) and suspended solids) is carried out by the EPA for all principal rivers (Suir, Nore, Barrow, Slaney, Avoca, Liffey and Boyne) in the study area that discharge into OSPAR Convention waters, as designated after the Paris Commission in 1988.

#### *Toxic Contaminant Levels*

Between 1978 and 1998, a background survey of metals and chlorinated hydrocarbons in shellfish, finfish, water and sediments at a variety of locations around the Irish coast was carried out by the Marine Institute's Fisheries Research Centre; this work is ongoing. The survey concluded that Irish coastal waters carried very low levels of contamination from heavy metals or hydrocarbons. The overall trend in metal levels was stable; in the case of more marked contamination a reduction over time was evident. Despite this, relatively high mercury concentrations in the livers of seals, porpoises and dolphins (exceeding 100mg/kg wet weight in the northern Irish Sea), have been recorded (Boelens *et al.*, 1999).

Concentrations of priority organochlorines, DDT and polychlorinated biphenyls (PCBs), in the tissues of all fish and shellfish monitored were found to be less than 1% of the strictest values applied by OSPAR countries for the protection of human health (Boelens *et al.*, 1999).

Contamination by persistent organic pollutants remains a serious concern, owing to bio-accumulation and the potential sub-lethal effects of these contaminants. In particular, concentrations of DDE and dieldrin were measured at higher levels in porpoises sampled in Cardigan Bay compared with those from the east coast of Ireland. Elevated levels of PCBs and organochlorine pesticides were also recorded in the blubber of bottlenose dolphins from the coastal waters off the west Wales coast and in a sample of sediment taken from Aberystwyth Harbour (CEFAS, 1995).

Rogan *et al.* (2001) reported on the levels of 13 PCB congeners from the livers of stranded harbour porpoises in the INTERREG II study area, and found that levels were several times higher in this region than in the Atlantic (0.43-14.42 $\mu$ g/g in the Irish Sea; 0.004-0.008 $\mu$ g/g in the Atlantic).

#### *Tributyltin (TBT)*

Studies during the 1980s revealed that TBT was a widespread problem in Irish waters. TBT induces imposex (acquisition of male morphology by females) in dogwhelks. In the Irish study area, main occurrences of TBT contaminations are at Carlingford Lough, Greenore, Clogherhead,

Portraine, Howth, Wicklow Head, Cahore Point, Rosslare, Carnsore Point, Kilmore Quay, Hook Head, Waterford Harbour, Dunmore East, Tramore Bay and Dungarvan Harbour (Boelens *et al.*, 1999). Since 1987, regular surveys have been carried out to determine change in contamination levels of TBT in areas with aquaculture, small boat activity and at major ports. Results indicate a general reduction in TBT contamination in the vicinity of aquaculture sites and areas of small boat activity since 1987. However, increases have been recorded in other areas. Busy ports exhibited highest levels of contamination, followed by estuaries and bays where TBT paint was still used on vessels exempt from the 1987 TBT ban. Use of TBT continues to be a localised problem in Irish waters (EPA, 2000a).

Rogan *et al.* (2001) comment on the presence of low levels of TBT in harbour porpoises within the study area.

#### *Shellfish Waters*

The Marine Institute's Fisheries Research Centre has operated a national monitoring programme for detecting phycotoxins from planktonic algae, in shellfish, since 1984. Water quality and chemical contaminants in shellfish are monitored in Irish shellfish waters. In 1995 samples from 21 sites were analysed for physico-chemical parameters and chemical contaminants (Smyth *et al.*, 1997). The water quality of the shellfish-growing areas was good and complied with the requirements of the Quality of Shellfish Waters Regulations 1994. In 1996 the trace metal and chlorinated hydrocarbon concentrations in shellfish from Irish waters were monitored. Elevated levels of lead in mussels from Wexford and slightly elevated levels of cadmium in oysters from some other areas were recorded; however, levels of trace metal were consistently low (Bloxham *et al.*, 1998).

The Marine Environment and Health Services Division (MEHS) of the Marine Institute conducted a marine monitoring programme in Irish waters from 1997 to 1999. Under this programme the MEHS conducted further investigations into the trace metal and chlorinated hydrocarbon concentrations in shellfish. It has been discovered that total trace metals and chlorinated hydrocarbon levels in shellfish continued to be consistently low (McGovern *et al.*, 2001). Shellfish waters within the Irish INTERREG II area surveyed include Carlingford Lough, Wexford, Bannow Bay, Arthurstown and Dungarvan (McGovern *et al.*, 2001). A comprehensive compilation of reports on monitoring in Irish waters is available on the Marine Institute website (URL: <http://www.marine.ie/frc/environ/#MMP>).

The water quality monitored in the Irish shellfish-growing areas in 1997 and 1998 in terms of pH, temperature, suspended solids, salinity and dissolved oxygen was good and conformed to the guidelines of the 1979 Council Directive 79/923/EC (McGovern *et al.*, 2001). The efficient and regular monitoring procedures in place ensure that the risk to consumers of contracting shellfish poisoning as a result of the presence of phycotoxins is very small.

#### *Radioactivity in Irish Waters*

The Radiological Protection Institute of Ireland (RPII) is the state body responsible for monitoring radioactivity levels in the Irish environment. Results from continuous monitoring have shown a decline in radiocaesium levels since the early 1990s. Radiocaesium was one of the main radionuclides discharged up until the mid 1980s. However, there has been an increase in the discharge of another radionuclide, technetium-99, as a result of the commissioning of two new plants at Sellafield in the early 1990s (EPA, 2000a). Within the marine environment, consumption of seafood, and to a lesser extent involvement in marine recreation activities, are the most important exposure pathways for the public (RPII, 2001). Despite this, the RPII does not consider radioactive contamination within the Irish marine environment to pose a significant health risk. The RPII advises that it is safe to continue eating fish and shellfish and enjoying the amenities of the Irish Sea (RPII, 2001).

Radionuclides have been recorded in muscle samples from harbour porpoises stranded within the study area (Rogan *et al.*, 2001);  $^{137}\text{Cs}$  and  $^{40}\text{K}$  were detected at levels similar to those previously reported.

#### *Trends*

- *Inputs of heavy metals:* Despite some limitations in the available data, direct inputs of heavy metals, including cadmium, mercury and zinc, into the Irish Sea and Bristol Channel have declined since the mid 1990s. Inputs of lead show an apparent increase; the daily load of 4.0kg per day in 1990 rose to 9.7kg per day in 1996, originating from Ringsend, Dublin Bay.
- *Localised inputs:* Localised contamination results from the legacy of metal mining along some watercourses within the region. Elevated concentrations of copper and zinc, and to a lesser extent lead and cadmium, have been detected in the Avoca estuary on the east coast of Ireland. Despite such occurrences, inputs of cadmium, mercury, and zinc into the Irish Sea declined during the period 1990-1996, along with inputs of PCBs and  $\gamma$ -hexachlorocyclohexane (principally it would appear from decreases in direct inputs).

#### *Blue Flag Campaign*

Under the EU Bathing Water Directive (76/160/EEC) Member States are obliged to draw up a list of identified beaches which adhere to the microbiological and aesthetic bathing water quality standards outlined in the Directive. There is a basic mandatory standard, and a higher guideline standard. The DoELG, on application by Local Authorities, carries out water quality testing for the designated areas in Ireland.

In association with the Bathing Water Directive, the European Blue Flag Campaign was initiated by the Foundation of Environmental Education in Europe (FEEE) in 1987. This system allows recognition of beaches and marinas that are clean, well managed and promote care for the environment. In Ireland, the Blue Flag Campaign is administered by An Taisce (the Irish National Trust), while in the UK it is administered by the Tidy Britain Group. A Blue Flag is awarded where the beach has been monitored according to the Bathing Water Directive, and has reached the higher guideline standards. In addition, the beach must reach acceptable standards on several physio-chemical parameters, and 24 management criteria. The management criteria cover: environmental education and information, environmental management, water quality and safety and services.

There has been a slow but general increase in the number of Blue Flag Beach designations in Ireland between 1988 and 1999, going from fewer than 20 sites in 1988 to over 70 in 1999 and 2000. Bathing water quality has also been monitored more closely. Between 1992 and 1998 compliance of Irish coastal bathing water sites with mandatory and guideline standards was generally good (i.e. >80%). Compliance with mandatory criteria was highest in 1994 (100%). However, since then, compliance with the more stringent guidelines has decreased slightly (EPA, 2000a). Under the Water Framework Directive, parameters for bathing water quality are to be extended to streams entering beaches and associated coasts (WFD, 2000).

In 2000, there were 70 Blue Flag beaches in Ireland; Wales had 22, in addition to seven Blue Flag marinas. The Tidy Britain Group is currently piloting a Green Coast award in Wales. This award is targeted at relatively remote unspoilt rural beaches, with guidelines on water quality and sound environmental management. At least 25 beaches in Wales received the Green Coast award in 2000. In addition, Britain operates a Seaside Award Scheme, awarded to 272 beaches in 2000. Of these beaches, 97 were in Wales. The Seaside Award is an annual award given to beaches that comply with the mandatory standard of the Bathing Water Directive. The beaches must be safe, clean, well managed, and provide current and previous water quality information. The scheme also distinguishes between resort beaches and rural beaches.



In some instances, the designations of beach quality conflict with environmental values. For example, both the Blue Flag and UK Seaside Award require that seaweed be removed from the beach, as it is considered to attract insects and has an unpleasant smell. However, seaweed is part of the natural ecology of the beach system, and should not be considered as litter. The pilot Green Coast Award in Wales does not require the removal of seaweed.

Information relating to human impacts on coastal water quality in the UK has been reviewed by Cole *et al.* (1999) and by the Environment Agency, UK (1999). Overall, a UK-wide improvement in the quality of EC-identified bathing beaches has been recorded in line with the requirements of the EU Bathing Waters Directive (76/160/EEC). Point sources of pollutants have declined, although issues arising from diffuse sources remain problematic. For example, compliance with mandatory European standards for bathing waters along the coastline of Wales recorded an all-time high of 98.7 % in 2000. In Ireland, cases of non-compliance fell from 5.6 % in 1992 to 1.6 % in 1998. However, the effects of microbiological inputs (i.e. total and faecal coliforms) from diffuse sources within the study area, especially under high flow conditions, have caused potential compliance failures in some localities along the Irish and Welsh coastlines (Wyer *et al.*, 1997; 1998; 2000).

#### **4.6.2 Oil Pollution**

Reports of all marine oil pollution incidents in Irish waters have been recorded by the Irish Coast Guard (formerly the Irish Marine Emergency Services, DoMNR) since 1993. The Advisory Committee on the Protection of the Sea (ACOPS) has maintained comparable oil spill data for waters around the British Isles since 1965.

There have not been many serious incidences of oil spills on the east coast of Ireland, apart from the release of an apparently small (but unknown) quantity of oil in Dublin Bay in 1996. As a result, 500 oiled seabirds were washed ashore in Dublin Bay.

The *Sea Empress* oil spill off Milford Haven in February 1996 released over 72,000 tonnes of crude oil into the sea. Preliminary investigations of environmental contamination in southwest Wales showed that significant contamination of fish and shellfish had occurred in the area immediately bordering Milford Haven and a fishing exclusion zone was established. In addition, there were 7,000 bird casualties, of which 30% were seabirds (Haycock *et al.*, 1998). As the area affected by the spill also supports a grey seal population numbering about 5,000 animals (Baines *et al.*, 1995), concern for the welfare of the population prompted an investigation into the impact of the event on breeding grey seals in the area. Data collected by Dyfed Wildlife Trust suggested that up to 200 grey seals might have been directly contaminated by oil while hauled out on Skomer Island and other sites. The short and long term effects of this and other forms of environmental contamination on seal populations are not fully known.

While the *Sea Empress* oil spill impacted heavily on the Welsh coast, it had little impact on the Irish coast. Oil was washed up on the Irish coast in the form of tar balls, which were easily removed. Monitoring results prior to and after the incident also showed that the plankton in the southern Irish Sea was unaffected by the spill (SEEEC, 1998).

The INTERREG II project, Risk Assessment and Collaborative Emergency Response in the Irish Sea (RACER) was carried out by the Nautical Enterprise Centre (NEC-CIT), the Coastal Resources Centre (CRC-UCC) and Cardiff University. The number of accidents per year occurring in the waters off each coastal county in the study area was determined, as well the number of cargo spills and bunker spills for each category of accident. The expected number of oil spills in the waters off each coastal county was then calculated (Table 4.6). The study also developed a GIS for coastal sensitivity analysis of the coastline of the INTERREG II area (O'Connell *et al.*, 2000).



Table 4.6: Estimated volume of annual oil spills in the INTERREG II area (m<sup>3</sup>) (O’Connell *et al.*, 2000).

<i>County</i>	<i>Cargo Oil Spills (m<sup>3</sup>)</i>	<i>Bunker Oil Spills (m<sup>3</sup>)</i>		<i>Chemical (m<sup>3</sup>)</i>
	<i>Merchant Vessels</i>	<i>Merchant Vessels</i>	<i>Fishing Vessels</i>	<i>Merchant Vessels</i>
Dublin	11.801	29.404	0.061	3.300
Wicklow	22.909	3.628	0.080	3.714
Wexford	37.180	12.469	1.066	10.249
Waterford	10.417	3.115	1.710	3.868
Anglesey	14.305	15.419	0.084	4.893
Lleyn Peninsula	3.480	0.848	0.060	1.995
Powys	2.730	0.644	0.101	1.657
Dyfed	0	0	0.047	0
Fishguard	18.259	16.918	0.336	6.030
Milford Haven	148.909	13.99	0.759	16.365
Swansea	0.019	0.036	0	0.0230
<b>Total</b>	<b>327.0</b>	<b>97.3</b>	<b>4.3</b>	<b>56.0</b>

There have been few occurrences of pollution incidents associated with the Irish offshore oil and gas sector (located at Kinsale, Ballycotton and Helvick fields), as exploration and productivity are still limited. The main potential pollution risk associated with sub-sea exploration is the disposal of contaminated drilling spoil close to the drilling location. However, with present drilling techniques, the risk of a serious impact from this source is believed to be minimal (EPA, 2000a).

#### 4.6.3 Water Management

##### *EU Water Framework Directive (WFD)*

The EU Water Framework Directive (2000/60/EC) came into force in December 2000, establishing a new framework for Community action in the field of water policy. The Water Framework Directive (WFD) takes an holistic approach, addressing inland surface waters, estuarine and coastal waters and groundwater. A co-ordinated approach will therefore be required for the implementation of programmes and measures to achieve the objectives of the Directive. A 15-year period is allowed to each Member State, by which time the State must ensure compliance. Objectives of the Directive include:

- The protection and enhancement of the status of aquatic ecosystems (and terrestrial ecosystems and wetlands directly dependent on aquatic ecosystems);
- Provision for enhanced protection and improvement of the aquatic environment by reducing/phasing out of discharges, emissions and losses of priority substances;
- Protection of territorial and marine waters, and
- Establishing a register of protected areas e.g. areas designated for protection of habitats or species.

The WFD is based on the river basin as the natural unit for management, and will require the development of River Basin Management Plans. It is moving towards ecological quality by incorporating within its environmental objectives quality in biology, hydrology, morphology and chemistry. As well as maintaining water quality, the objectives specifically refer to protecting ecosystems:

- Protect ecosystems and achieve compliance with any standards and objectives for protected areas (e.g. areas designated for protection of habitats/species).

Measures adopted must include:

- Reviewing impact of human activity on the status of the waters.

The WFD is regarded as the most important legal stimulus at EU level for integrated planning, both coastal and inland. The European Commission will produce detailed guidelines for Member States, indicating how policies related to coastal zones can be incorporated into River Basin Management Plans. In the absence of a Directive on ICZM, the WFD is viewed by the EC as part of the mechanism within which to adopt ICZM. Its application to waters up to one nautical mile offshore goes some way to minimising the current sectoral approach to water quality and biological quality management. In Ireland, the EPA is the regulatory body charged with competence in implementing the WFD. The WFD uses biological communities as long term indicators of health of the water. This will be a particular challenge in estuarine and coastal waters.

Under the Articles 13-16 of the WFD, the Central Fisheries Board is required to:

*Ensure that a River Basin Management Plan is produced for each River Basin District lying entirely within their territory... at least nine years after the date of entry into force of this Directive (i.e. July 2009).*

Within the study area two River Basin Management Plans are being established in Ireland, one in the Dublin region and the other in the Wexford and Waterford region. Ireland is therefore in a good position to implement the WFD. The river basin project recently initiated in the southeast marks a first step in this direction (DoELG, 2001b). The objective of the project is to establish a water quality monitoring and management system for the combined river basins in the southeast and to provide the bulk of the baseline information required for the development of a comprehensive River Basin Management Plan. This information will be of relevance to Local Authorities and numerous other agencies and interests in relation to agriculture, fisheries, flood management and habitat protection. The project covers groundwaters, estuaries and coastal waters out to a distance of one nautical mile in counties Carlow, Kildare, Kilkenny, Laois, Offaly, Tipperary North, Tipperary South, Waterford, Wexford and Wicklow; it includes the rivers Slaney, Barrow, Nore and Suir. The cost of this €8.3 million project, will be recouped to the Local Authorities by the Department of the Environment and Local Government.

The earlier Three Rivers Project, to be completed by the end of 2001, also includes the Suir catchment, with the Boyne and the Liffey. A GIS for catchment management, Catchment Envisage, is being developed as part of the project (DoELG, 2001b), which may form the basis for a larger system for the southeast river basin project. By extending its coverage, a GIS such as this would also be invaluable for the management of coastal waters.

There are no county-based water management plans for the Irish counties in the study area, comparable to those developed under the LEAPs for Wales. Irish legislation provides for water quality planning on an integrated basis (i.e. surface, ground, estuarine and tidal waters) and for interauthority planning (since 1977). A catchment-based national strategy to combat eutrophication in rivers and lakes has been promoted since 1997. Counties Waterford, Wicklow and Meath have complete groundwater protection schemes in place (EPA, 2000a).

Dwr Cymr Welsh Water (DCWW, part of the Hyder group) has responsibility for providing drinking water and collecting and treating sewage for most of Wales. Excluded areas include the Severn catchment and also those parts of the river Dee and Wye catchments within England. DCWW is committed to undertaking its work in such a way as to protect the environment. The quality of Welsh coastal waters has improved accordingly, in response mainly to the EC Bathing Water Directive (76/160/EEC) and Urban Waste Water Treatment Directive (91/271/EEC)

(Lowe, 1995). The probability of new proposals under the Water Framework Directive, together with forthcoming World Health Organisation (WHO) water quality guidelines and the Annapolis Protocol (WHO, 1999) for beach management, will provide a new set of challenges for private water-based industries.

## **4.7 Renewable Energy Sources**

The requirement to comply with the Kyoto Protocol while still meeting the growing domestic demand for energy provides an impetus for diversifying into the renewable energy market.

In Ireland, the main focus on renewable energy as a resource has centred on wind energy. Wave energy has potential (more so on the Atlantic coast), but no implementation projects have been initiated. Tidal ranges in Ireland are not thought to be commercially viable in terms of energy generation. This situation is set to remain unchanged in the near future (Irish Energy Centre, 2001).

Approximately 2% of Ireland's total primary energy requirement is met by renewable sources, wind being the principal contributor. With an additional generating capacity of 500MW to be achieved from renewable resources in the period 2000-2005, the contribution of renewable sources is predicted to rise to 3.75% (Department of Public Enterprise, 2000).

To date, much of the initial development of Ireland's wind resource (onshore) has been centred on the Atlantic coast. There are plans to develop offshore wind farms in many locations, including the east coast (DoMNR, 2000d, 2000e, 2000f, 2000g). Because of the more accessible water depths near shore, the east and southeast coasts are considered more suitable for development than the western coastal waters. The east coast has an advantage over the west because of its superior electricity network and accompanying infrastructure.

The development of wind farms on the east coast is likely to take place within a specified distance from the shore, usually within 10km. Offshore locations are considered more desirable as the visual impact can be reduced (Department of Public Enterprise, 2000). In addition, any noise impact during the initial construction will be negligible.

Seven licences have been granted to four consortia to test locations off Ireland's east coast for offshore wind electricity generating stations. The DoMNR issued three licences to Harland and Wolff, two to the Kish Consortium, and two to Sure Partners and Wind Farm Developments Ltd. The investigation licences can run for four years, but do not allow construction of turbines. The wind park development by Sure Partners Ltd on the Arklow Bank was at an advanced stage at the time of preparation of this report. On completion, the Arklow site will be the world's largest wind park with 200 wind turbines with a 520MW electrical generating capacity. This will enable the wind park to supply over 500,000 homes with clean energy (*Environmental Management Ireland*, 2001).

The DoMNR has established a two-phased approach to offshore wind farm development; this consists of an initial licence, followed by a lease if development is to proceed. The licence is not an entitlement to construct; it is solely for the purpose of site-suitability investigations. These site investigation licences are valid for four years (DoMNR, 2000f, 2000g). Should the site be found favourable for development, a lease must then be obtained; a full EIA is required as well as full public consultation. In addition, a lease is granted only where authorisation to construct, and licences to operate and supply electricity, have been issued or are being processed by the Commission for Electricity Regulation (DoE, 1996).

In UK waters (as of May 2001), 18 wind farm developers pre-qualified for seabed leases for development of offshore wind farms. Two of these sites are located off Wales. If all sites go

ahead, between 1,000 and 1,500MW of power will be generated. The developers have three years to obtain all the required statutory consents, including fulfilling the requirements of the EIA and Habitats Directives (SAR, 2001).

#### *Issues*

- *Development constraints:* The exploitation of wind energy is constrained by a number of factors, primarily environmental issues, planning permission, constructional limitations and competition with other users. These constraints are site specific and emphasise the critical role EIAs and public consultation will have in any future development.
- *Areas of concern:* These include visual impacts, threat to migrating bird populations, disturbance to cetaceans, disruption of seabed ecology, conflict with the fishery sector (damage to spawning grounds and limits placed on access adjacent to developments), proximity to established shipping routes, military activities, offshore extraction interests, telecommunication cables and pipelines and noise levels.
- BIM has assessed the potential for wind power, as well as other forms of renewable energy, as a power source for aquaculture (*Aquaculture Newsletter*, 2001). The study was conducted nationwide, although no pilot projects have been initiated as yet (D. Toner, BIM, pers. comm., 2001). If the integration of this source of power with the aquaculture industry is successful, it would provide a more cost-effective source of power, while increasing the environmental credibility of the aquaculture sector.
- *Absence of baseline data and information:* Wind farm development, both on and offshore, is a highly contentious issue. As such Ireland has no real baseline from which to work in terms of assessment of potential impacts. The Irish Government has for this reason advocated an evolutionary policy in relation to wind energy developments. Additional measures including consultation with experienced nations are essential. Appropriate measures need to be implemented to offset concerns. The Irish Government is advocating the inclusion of local communities and other stakeholders in the marine environment in formulating the policy for offshore wind farm development (Renewable Energy Strategy Group, 2001).
- *Statutory concerns:* The absence of a statutory link between Irish Local Authorities and the DoMNR needs to be addressed to avoid potential planning conflicts and inconsistencies in future offshore developments. The potential for wind farm development should be incorporated into County Development Plans and Unitary Development Plans as well as the EIA framework; recent steps indicate that this practice will be established.

#### *Data Sources and Potential Future Requirements*

Research on the use of wind as a renewable energy source is ongoing. Information sources on renewable energy within Ireland include the Department of Public Enterprise, Irish Energy Centre and to a lesser extent the DoMNR and the DoELG. The Irish Wind Energy Association provides information on all aspects of wind energy and its application. The British Wind Energy Association provides a comparable level of information for wind energy in Wales. There is an absence of information on the cumulative effects of wind farms in the study area. There are no fully operational wind farms in the coastal Irish/Welsh INTERREG II area as yet; any estimates on their eventual impacts are not at an advanced stage.

## 4.8 Offshore Resources

### 4.8.1 Oil and Gas

Oil and gas exploration is not a significant activity within the study area. The Dublin-based exploration and development company, Providence Resources Plc., carried out oil exploration work 36km off the coast of Waterford in the Helvick oil field. The Helvick field was estimated to contain seven million barrels of recoverable oil and associated gas. However, the field was too fragmented to make extraction commercially viable (Parliamentary Question Ref. No. 3353/01).

Currently, all production activity is undertaken in blocks that lie to the northeast of Anglesey and south of Cork, i.e. outside the INTERREG II area. There are, however, blocks licensed for exploration within the INTERREG II boundaries. Hydrocarbon exploitation, involving mainly preliminary seismic surveys and limited drilling, occurred in several blocks off the west coast of Wales during the 1990s. To date, no significant quantities of oil or gas have been identified within the area (Cleddau/Pembrokeshire LEAP).

#### *Trends*

- In *Ireland's Environment: A Millennium Report* (EPA, 2000a), the EPA comment that much emphasis in the years ahead will be placed on switching from power-generating fuels to natural gas, to reduce emissions in accordance with the Kyoto Protocol. Greater use of renewable sources of energy is required in the long term. In terms of total primary energy requirement, Ireland's *Green Paper on Sustainable Energy* projects that by the year 2010 requirements for oil will increase by approximately one third, and that requirements for natural gas will more than double (Department of Public Enterprise, 2000).

#### *Issues*

- *Intensification of oil exploration:* To date, levels of offshore oil and gas exploration in the area between Cardigan Bay and Wexford have been relatively minor. Accordingly, any possible effects associated with these activities are mostly undocumented. However, the potential for any future intensified search or exploitation within the region could cause harm to the coastal environment, wildlife, and perhaps the tourism industry, depending on the location of such activity.
- *Accidental inputs* of hydrocarbons and chemicals to the marine environment from exploration and or production (and subsequent oil transportation) are of particular concern, whilst disturbance caused by seismic surveys or drilling, in particular to marine mammals, could become problematic if levels of activity increase.

### 4.8.2 Sand and Gravel

Land-based sources of aggregates are becoming scarce, and the construction and quarrying industries are seeking to exploit marine sources. The increase in prices for quarrying on land contributes to the increased interest in offshore aggregates. A DoMNR briefing document noted that: *It is clear that land-based extraction for aggregates cannot indefinitely cope with such increased demands*, and goes on to report that the Irish Sea does not offer an inexhaustible supply of aggregates (DoMNR, 2000h).

Roadstone Ltd. and Readymix Plc. have both expressed interest to the DoMNR in exploring the extent of gravel reserves off the east coast of Ireland. Bilberry Shipping and Stevedores Ltd. have made an application to the DoMNR to extract gravel from a 655ha area at the mouth of the River Suir. It proposes to remove one metre from the top of the 6-7m deep bed. Impacts on spawning

fish and salmon migrations are unknown, while the change in the shape and structure of the gravel bed may affect the hydrodynamics of the area.

A recent report to the Marine Institute provides a summary of Irish seabed resources (Sutton *et al.*, 2001). Much of the information in the report is sourced from the British Geological Survey (BGS) and the Geological Survey of Ireland (GSI), which to date, appear to have completed the only comprehensive survey of the area. There are significant offshore aggregate deposits within the study region, particularly in the sand bars running parallel to the east coast from Dublin Bay to Carnsore Point.

### *Trends*

- *Increased demand:* Demand for sand and gravel is escalating with increased activity in construction and road building, and also for beach nourishment and infill. Between 1900 and 1994 the per capita use of aggregates in the UK increased 80 times. Irish 1999 estimates for aggregates were 102 million tonnes per annum; an increase of 37% over the previous two years.
- *No commercial extraction:* No extraction off the Irish coast has yet taken place on a commercial basis. This is partly due to insufficient information about the nature of the deposits, as well as the absence of a coherent policy. County councils have used some nearshore sandbanks in Wexford and Wicklow for beach replenishment and harbour infill. Between October 1994 and January 1995, dredged material was pumped ashore to Rosslare Strand to address the erosion problems on the beach. The material, mainly sand, acted as a source of beach nourishment for the eroding strand. After the material was pumped ashore the pipeline was moved progressively along the beach and the material bulldozed to the specified profile (ECOPRO, 1996).

### *Issues*

- *Habitat loss:* Removal of sand banks represents a loss of habitat while the associated release of large quantities of fine-grained sediment may be harmful to marine life.
- *Changes in sediment circulation and deposition:* Sand banks are often part of a larger sediment circulatory system linking offshore banks with sub-tidal inshore zones, intertidal beach and dune systems. On beaches near estuaries or river inlets, sand shoals are linked with other elements, cycling sand around the system. In any area, if the scale of sand removal is above a threshold, the morphology will readjust to the loss of sand. The resulting deepened water will output larger waves breaking closer to the shore; the pattern of focus of breaking waves may also change, increasing erosion in some areas and sediment deposition in other areas.
- *Affect on ecological balance:* Deepening estuarine channels allows salt water to penetrate further upstream, affecting the ecological balance.
- *Affect on fisheries:* Proposed sand and gravel extraction off the coasts of Meath, Fingal, Rathdown, Dublin and Wexford could cause conflict with salmon migratory routes in the rivers Boyne, Liffey and Slaney. There is scope to examine the methods that might be used to assess localised impacts from aggregate extraction on fisheries, and the means to adequately protect known herring spawning beds in the vicinity of extraction operations (Sutton *et al.*, 2001).

### *Data Sources and Potential Future Requirements*

The DoMNR in Ireland, and the Department of Trade and Industry in the UK, hold information on block licences, the number of drilling wells and active platforms of oil and gas fields within



the study area. In Ireland, the Petroleum Affairs Division (PAD) of the DoMNR is responsible for overseeing offshore oil exploration and production, including the regulation of discharges of hydrocarbons into the marine environment. The PAD works closely with the Offshore and Coastal Engineering Unit of Enterprise Ireland. Historical oil spill data for waters around the British Isles have been recorded by the Advisory Committee on the Protection of the Sea (ACOPS) since 1965. Reports of all marine oil pollution incidents in Irish waters are recorded by the Irish Coast Guard (formerly the Irish Marine Emergency Services, Department of the Marine and Natural Resources) since 1993. Requirements of the OSPAR Convention oblige operators to set up monitoring programmes to assess the impact of their activities. Amongst other items, PAD holds records of all authorisations, progress reports under authorisations, licence applications, copies of all data (particularly exploration surveys, well data and production data) arising under any authorisation, and technical reports prepared in the course of promotion and assessment of oil and gas (DoMNR, 1998).

A pollution response network or forum, with particular reference to oil pollution, should be established between Ireland and Wales. This would improve response capability in the event of an incident, such as the *Sea Empress* oil spill. A national forum within Ireland, with links to Wales, would benefit from the experience of the Welsh fora. Such a forum could build on the collaboration established between the Irish and Welsh Coast Guards and port authorities on the RACER INTERREG II project. In addition, the GIS of coastal sensitivity and vulnerability that was established for the RACER project (O'Connell *et al.*, 2000) and delivered to both Irish and Welsh Coast Guards, could be further developed.

The marine section of the Geological Survey of Ireland (GSI) and the British Geological Survey (BGS) are the main sources of information for offshore aggregate resources within the INTERREG II area. The information held by the GSI on the Irish Sea has been collected in close association with the BGS, the data are held in a GIS format. The BGS operates a metadata database, which holds information on their survey work as well as the work conducted by private surveys.

## 4.9 Dredging

Dredging can be divided into two main categories i.e. capital and maintenance dredging. Capital dredging involves dredging that is necessary to expand the overall capacity of a port, increasing the overall depth of a port or harbour to accommodate larger vessels and increase the port's economic profile. Maintenance dredging involves dredging on a continual basis as a means of maintaining a channel at a specific depth. In Wales, annual maintenance dredging at Penrhyn Dock is often dumped off Puffin Island. More recently, the site has received spoil from the construction of the A55 Conwy road tunnel (Anglesey LEAP).

Once a dredging operation has been completed a suitable dumpsite for the dredge spoil has to be located. Dumping of contaminated spoil at sea is considered as a final recourse, once all land-based disposal options and/or beneficial re-use of the material have been examined and considered unfeasible (DoMNR, 1999b). In the UK, all applicants for licences are now required to show evidence that they have considered alternative disposal options, including beneficial uses and why such alternatives are not considered practical (DETR, 2000a). In Ireland, there are strict controls on the composition and amount of dredged material to be disposed. Capital dredging accumulates large amounts of dredge spoil, whereas maintenance dredging produces smaller amounts of spoil on a more regular basis. The latter type of dredge spoil may possess high quantities of contaminants, resultant from harbour activity (EPA, 1998). In addition to the presence of contaminants, dredging activity can have further potential environmental impacts (Table 4.7). The main dredge spoil dumping sites located along the east and southeast coasts of Ireland are: Dundalk (Co. Louth), Drogheda Harbour (Co. Meath), Dublin Bay (Malahide Estuary and Dublin Port), Greystones and Arklow (Co. Wicklow), Wexford Harbour and Kilmore Quay (Co. Wexford), and Waterford (just outside the mouth of the harbour) (EPA, 2000a). Boelens *et*

al. (1999) noted cause for concern over the selection of dumping grounds for dredge spoil from major ports and harbours; they stated that effects of dumping dredge spoil on the associated biota need to be monitored and studied more closely.

Table 4.7: The potential environmental impacts of dredging and the relocation of dredge materials. (Source: Associated British Ports, 1999).

<i>Environmental Effects</i>	<i>Near-field Environmental Effects (&lt;1km)</i>	<i>Far-field Environmental Effects (&gt;1km)</i>
<b>Short term Environmental Effects (&lt;1 week)</b>	Turbidity Smothering/removal of organisms Reduced water quality	Dredging None generally expected
	Disposal Smothering of organisms Turbidity Reduced water quality Acute chemical toxicity	Disposal Offsite movements of chemicals by physical transport
<b>Long term Environmental Effects (&gt;1 week)</b>	Disturbance by shipping traffic Removal of contaminated sediment	None generally expected
	Disposal Altered substrate type Altered community structure Chronic chemical toxicity	Disposal Offsite movements of chemicals by physical transport and/or biota migration

In compliance with the OSPAR Convention and the terms of the EU Urban Waste Water Treatment Directive, dumping of industrial sludge stopped in 1994 and sewage sludge dumping ceased in 1999. Within Dublin Bay, two sludge disposal sites operated from Ringsend: one in the north of Dublin Bay, which operated pre-1990; one south of this and further offshore, which operated between 1990 and 1999 (Boelens *et al.*, 1999). No apparent impacts on benthos were evident from the discharge of sewage sludge (from Ringsend sewerage works) 14km off the east coast of Dublin in the early 1990s. This dumping stopped towards the end of 1999 (EPA, 2000a).

In Ireland, it is not permitted to dispose of heavily contaminated sediments at sea (i.e. they are not licensed for disposal at sea); they therefore have to be dumped on land (EPA, 2000a). Dumping waste material at sea is regulated by the Dumping at Sea Acts 1981 and 1996 and controlled by licensing issued by the DoMNR (Table 4.8). Consultation is mandatory and applicants have to comply with an application procedure. More than half of the total Irish dumping permits granted since 1996 are within the study area. Over the period 1996-2000, 50% of the total Irish dredge spoil dumped was located within the study area.

#### *Trends*

- *Potential pressure from reduction in landfill sites:* There is no noticeable trend in the practice of dumping dredge spoil at sea. Any future increase may be partly due to the necessity to move away from landfill as a means of disposing waste, as referred to in the Department of the Environment's Waste Management Policy Statement (DoELG, 1998).
- Currently, in Wales, dredge spoil dumping at the entrance to Milford Haven has stopped and a site near Port Talbot is now used. Milford Haven Port Authority is assessing the suitability of a new site 17 miles southwest of St. Anns Head (Cleddau and Pembrokeshire LEAP).

#### *Issues*

- *Effects of dumping on associated biota:* Inclusion of specific geographical boundaries and grid references within any application for a dumping licence can ensure that biological

monitoring can be implemented, cumulative effects observed and ultimately baseline criteria/thresholds obtained. However, Boelens *et al.* (1999) suggest cause for concern over the selection of dumping grounds for dredge spoil as the effects of dumping on the associated biota need to be monitored and studied more closely.

Table 4.8: Summary of dumping permits issued in Ireland between 1996 and 2000. (Source: DoMNR, 2000i <http://www.marine.gov.ie/>).

<i>Licence Details</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>	<i>Total</i>
No. of Irish licences issued	26	23	13	16	12	90
No. of Irish licences in Irish section of study area	15	14	8	9	6	52
Quantity issued under permit (tonnes) for all licences	5,363,800	2,474,800	1,568,000	3,273,000	1,616,032	14,295,632
Quantity issued under permit (tonnes) for Irish section of study area	2,259,800	1,404,300	1,113,000	2,013,000	937,000	7,727,100

#### *Data Sources and Potential Future Requirements*

The DoMNR in Ireland, and the Marine Environment Protection Division of DEFRA in England and Wales, are responsible for licensing marine dumping sites within the study area. Each maintains a database containing the area co-ordinates, permitted tonnage and permitted concentrations of contaminants deposited at respective dump sites. The UK Centre for Environment, Fisheries and Aquaculture Science (CEFAS), publishes (in their Aquatic Environment Monitoring Reports) monitoring results for key metal contaminants in wastes deposited in UK waters (CEFAS, 1995).

## **4.10 Coastal Industry, Ports and Harbours**

### **4.10.1 Coastal Industry**

Certain industries are particularly suited to coastal locations, benefiting from characteristics such as proximity to ports for transshipment of goods, and access to large quantities of water for cooling purposes, as in the case of nuclear and chemical industries. Large cities located on the coast can attract further industrial development because of their good transportation infrastructure, large labour markets and nearby service providers. Such scenarios exist on both sides of the Irish Sea, although the composition of coastal industry in Ireland differs from that in Wales. In Ireland, the absence of coalfields meant that the majority of industry was traditionally port based. In Wales, heavy industry was traditionally associated with the Swansea/Neath/Port Talbot complex. Coastal ports such as Cardiff and Swansea emerged as major ports for the transshipment of coal when the Welsh coalfields were actively mined in the 1800s and early 1900s. Throughout Wales many docks and harbours are currently being rejuvenated to support economic regeneration. These include both large scale developments, such as the Llanelli Coast Venture, and smaller projects such as those at Aberystwyth and Cardigan (DETR, 2000a).

#### *Trends*

- *Concentration of manufacturing industries in eastern Ireland:* In Ireland, employment in manufacturing industries is concentrated in the eastern region. Dublin employs nearly half of those involved in the manufacturing and service industries: 92,727 employees in 1996.

The southeast region of Ireland employs over 26,000 people, mainly in the agri-food sector (DETR, 2000a).

- *Integrated Pollution Control licensing:* The process of IPC licensing is expected to result in a downward trend in industrial waste loads to the environment, despite the increased waste generated on site (Boelens *et al.*, 1999).

#### *Issues*

- *Destruction of natural habitats:* Uptake of coastal lands for industrial development may be to the detriment of natural habitats, both directly and through associated alterations of coastal landscapes and growing demand for housing and amenities.
- *Waste effluents:* Although few manufacturing industries are located directly on the coast, the waste effluents that they generate are generally discharged via municipal sewers to coastal waters.
- *Pressures on existing effluent disposal services:* Successful industries often attract others to the area, adding to pressures on effluent disposal services.
- *Radioactive waste:* The Trawsfynydd nuclear power station in the Eryri/Llyn area is undergoing decommissioning and has not generated electricity since 1991. Although no radioactivity is being produced, discharges of radioactive materials and waste to the atmosphere may occur (Eryri/Llyn LEAP – Action Plan Issue ER/41).



Plate 4: The Port of Waterford in the Irish study area.

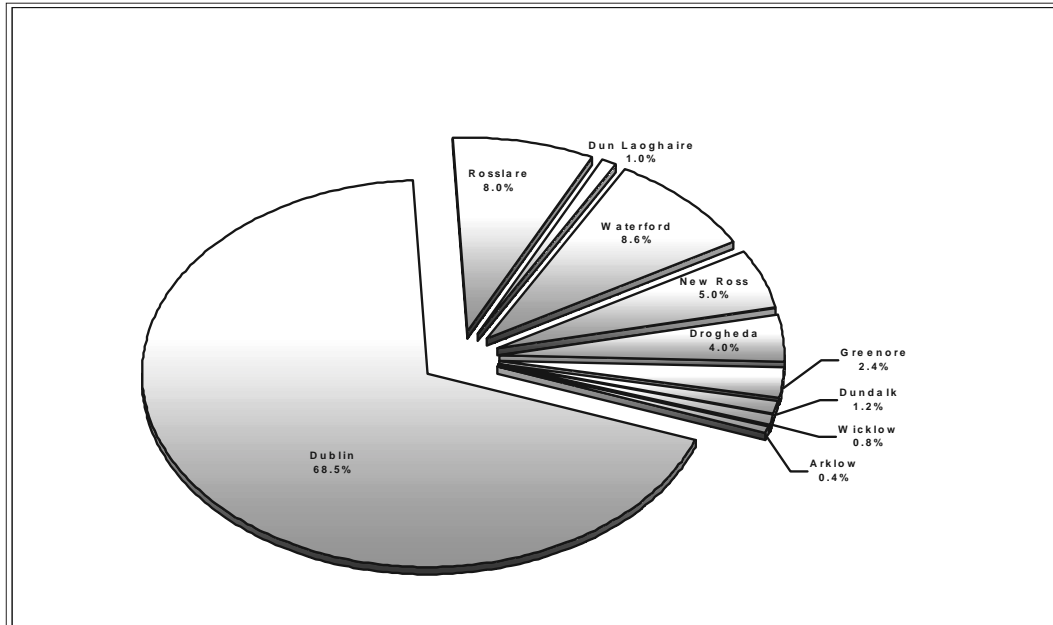


Figure 4.1: Proportion of total tonnage of goods handled by Irish ports in the INTERREG II study area in 1999.

#### 4.10.2 Commercial Ports and Harbours

Analysis of Irish Central Statistics Office (CSO) data for port traffic during 2000 revealed that Dublin handled almost 70% of the total cargo passing through ports in the Irish INTERREG II region, while Rosslare and Waterford (Plate 4) together accounted for a further 16% (Figure 4.1). Rosslare and Dun Laoghaire are predominantly roll on roll off (RoRo) terminals handling passengers and freight, while the other ports handle a variety of goods. Greenore (Co. Louth) handles up to 40% of Ireland's livestock trade; the remainder is shipped from Cork and Waterford (G. MacGeraghty, Greenore Shipping, Co. Ltd., pers. comm., 2001). Dry bulk and liquid bulk goods constitute the greatest proportion of cargo handled by the smaller ports.

Factors currently restricting port capacity include insufficient depth of water, berths, storage warehouses, cargo handling technology and port access. As ships become progressively larger, berths and access channels require regular dredging to maintain adequate depths.

The Irish Government responded rapidly to a key report which identified a shortfall in port capacity of almost nine million tonnes by the end of 2007 (Baxter Eadie Ltd., 1999). Under the seaports measure of the NDP (2000-2006) the Irish Government has allocated €119 million (out of a total €142 million) for infrastructure and capacity development of ports in the south and east regions.

#### Trends

- Increased tonnage of goods handled by Irish ports:* CSO shipping traffic statistics for the ports of Dublin and Dun Laoghaire for the period 1989-1999 show increases of 66% and 61% for the tonnage of goods imported and exported respectively, with an overall increase of almost 65% in the tonnage of goods handled by Irish ports in the study area. From 1992 to 1999 similar trends were apparent for most cargo types (CSO, 2000).
- Port waste management plan:* The Merchant Shipping (Port Waste Reception Facilities) Regulations 1997 came into force in the UK in 28 January 1998. These regulations make it mandatory for all UK ports and terminals of any size to prepare and submit a port waste

management plan, which will ensure that adequate reception facilities are provided at all ports for reception of dry wastes and oily wastes from ships (SAR, 1998).

- *Port reception facilities:* In November 2000, the EU Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues was adopted. This Directive requires all harbours to have waste management plans in place by December 2002 (<http://europa.eu.int>) This will impact on procedures and facilities at ports and harbours throughout the INTERREG II region.
- *Port management:* In Ireland, many ports are in the process of corporatisation or proposed corporatisation (DoMNR, 1999c). The involvement of Local Authorities in running smaller ports and integrating any port development into overall county development is one alternative, as is port amalgamation.
- *Port expansion:* Developments in Irish ports are shown in Table 4.9.



Table 4.9: Current port development issues in the main ports in the Irish study area.

<i><b>Port</b></i>	<i><b>Related Development</b></i>	<i><b>Environmental Issues</b></i>
Drogheda	€17.8 million investment in 2000. New Gest Ireland Ltd./Norfolklane Containers shipping service to Rotterdam, 40% increase in throughput expected within 12 months.	Controversial dredging operations at Tom Roe's Point.
Greenore	Current investment programme of €8.9 million to increase water depth at berths (to accommodate vessels of 10,000 dwt) and to upgrade the quay walls.	Improvements in handling of animal-feed cargoes to improve air quality.
Dublin	Dublin Port Tunnel project. Permission granted for reclamation of 21ha of foreshore for port expansion. Proposals for tidal barrage across the Tolka estuary.	Environmental designations protect most of Dublin Bay. Shoreline under serious threat from reclamation to satisfy demand for development land. Fears of increased siltation of the bay, restriction of water exchange.
Dun Laoghaire	Phase 3 of new marina development to be completed.	
Wicklow	2001 - €15 million sanctioned for new port access route and town relief road.	
Arklow	CSO statistics show decline in port traffic. No major developments planned.	Ro Ro-jetty construction proposal south of Arklow refused due to potential environmental impacts.
New Ross	€8.9 million development (1999) to improve navigation channel. €7 million development proposal to include jetty, cranes and warehousing.	EIA stated all likely negative impacts are insignificant and have been mitigated against.
Waterford	€63.5 million investment plan incl. 2km of new quays at Belview Terminal. 106ha reserved for port development. 3.3 million tonne throughput by 2007. Extensive development plans for city quays.	Controversial groyne construction at Cheekpoint to maintain navigable channel to Belview.
Rosslare	€38 million capital investment since 1991. New Vessel Traffic System (VTS) installed. Southeast Regional Authority plans €25.4 million investment, including development of 34-acre land bank and second access route. Forecasted 8% increase in throughput by 2007.	Current public consultation process for second access route.

Table 4.10: Analysis of data on incidents at sea in the study area, taken from the SEAREM database. (Source: Owen, 1999b).

<i>Vessel Type</i>	<i>No. of Incidents Reported Jan. 1997 to Dec. 1998</i>	<i>Location of Majority of Incidents</i>	<i>Nature of Incident (decreasing order of occurrence)</i>
Pleasure	922	Holyhead, Fishguard, Dublin, off Wicklow, Arklow, Swansea and South Irish Sea.	Machinery failure, adverse conditions, strandings, capsizing.
Fishing	289	South Irish Sea, West Wales, clusters off Holyhead and Dublin.	Machinery failure, fouled propeller, leaking, injury.
Merchant	62	Fishguard, Llanelli, Dublin, clusters off Holyhead, Swansea.	Machinery failure, stranding, injury.

#### *A Case Study of Drogheda Port*

Drogheda Port is located near the head of the river Boyne estuary. The area is an important habitat for migratory birds and has SPA designation. Drogheda Port Company commenced dredging operations to provide sufficient draught (-2.5m OD) to enable ships using the new Drogheda Quay at Tom Roe's Point, to turn. The dredging generated approximately one million cubic metres of spoil, much of which is stored on the SPA for later sale. Following a court case, the Drogheda Port Company has undertaken the task of restoring an intertidal polder of 1.3 ha by 1 September 2001 at the eastern end of the estuary. The EC has ordered that compensatory feeding ground should be provided for the birds; several court cases have not yet resolved the matter (K. Dubsky, Coastwatch Ireland, pers. comm., 2001).

#### *Issues*

- *Competition for resources:* In addition to commercial port developments, many harbours and piers are located throughout the study area. These may be used solely for recreation, or for a combination of recreation and commercial uses (fishing, servicing aquaculture, ferries, etc). Potential conflicts include competition for berthing spaces, dangers of collision, congestion etc.
- *Incidents at sea, collisions, oil spills etc:* A recent review of Sea Rescues and Emergencies (SEAREM) was undertaken by Cardiff University as part of the INTERREG II RACER project, completed in 2000. Analysis of the nature of incidents revealed that pleasure craft accounted for an average of 76% of incidences of hull leakage, strandings and machinery failure. Fishing vessels accounted for the greatest proportion of reported fires/explosions, while both fishing and pleasure vessels accounted for a large proportion of the reported collisions over the period January 1997 to December 1999 (Table 4.10). Merchant vessels accounted for a comparatively small proportion of the reported incidences (Owen, 1999a & b).
- *Port expansion:* Current trends in port expansion (developments of Irish ports shown in Table 4.9) will inevitably contribute to increased demands on local road and rail networks. The available depth of water is the key factor limiting the size of visiting

vessels and thus the extent to which any port can expand commercially. The associated dredging can result in environmental impacts such as re-suspension of buried toxins, sediment build up on local biotopes, and problems associated with the disposal of dredge spoil. There are concerns that the imminent reclamation of 52 acres of the foreshore by the Dublin Port Authority may further restrict the width of the harbour, increasing the siltation around the North Bull Island. Similarly, a proposal to construct a tidal barrage across the Tolka estuary to maintain a constant depth of water could have serious impacts on the mudflats of Dublin Bay. There are indications that shipping companies are replacing their smaller vessels (e.g. coasters) with a smaller number of larger vessels (G. MacGeraghty, Greenore Shipping Co. Ltd, pers. comm., 2001). The draught of a vessel restricts its manoeuvrability, depending on the available depth of water; larger vessels may be more prone to accidents (e.g. groundings, collisions) and therefore increase risk of pollution. Any harbour development plans should identify land and areas designated for protection, so that their status could be taken into account in deciding consent for development. There should be adequate and convenient waste disposal facilities at ports and marinas, and facilities for the collection and appropriate disposal of residues from vessel maintenance.

- *Hydrological change:* The extent to which the construction of breakwaters, dredging and reclamation of land from the sea alter local hydrography depends on the scale and location of the development.
- *Ballast water and invading marine species:* The risk of invasion by introduced marine organisms transported into Irish coastal waters via the ballast water of visiting vessels is reviewed by Minchin (2000). Recent incidents include the introduction of hull-fouling organisms (such as the ascidian *Stelya clava*) and other invasive species. Larger vessels originating from overseas ports pose the greatest risk of carrying potentially invasive species. International initiatives, such as the International Maritime Organisation (IMO) Resolution A.868 (20) *Guidelines for Ballast Water Control and Management*, aim to reduce the risk of introducing exotic species. However, these initiatives are regarded as largely ineffective (Hopkins, 2001). As water quality improves under EU Directives (such as the Water Framework Directive) the risk of establishment of exotic species may increase as levels of TBT and other toxins decrease (Buckley, 2001). Any activity involving the introduction of non-native species to the coastal zone should be considered as a restricted coastal activity.
- *Habitat degradation and loss:* The sheltered nature of most ports is typically associated with nearby mudflats and soft shores. Many of these habitats are protected due to their value to shore waders and sea birds. Expansion of port facilities and reclamation of proximal areas frequently conflicts directly with environmental interests. Port authorities throughout Europe have attempted to mitigate environmental impacts of habitat loss (due to port developments) by the creation of similar habitats elsewhere. However, this is usually of limited value as it involves the loss of some other habitat and displacement of the associated fauna. The Royal Society for the Protection of Birds (RSPB) challenge to ABP's (Associated British Ports) development of Dibden Bay in Southampton is a recent example of this (Royal Society for the Protection of Birds, 2000).

#### *Data Sources and Potential Future Requirements*

Quantitative information is available for most ports in the Irish/Welsh INTERREG II region. While many ports are privately operated, as a result of the public consultation procedures required by EIA, most port development is publicised. Information sources on ports include the DoMNR, the Irish Marine Institute, the relevant local planning authorities in Ireland and individual members of port staff. In Wales, local planning authorities and the British Ports Federation (BPF) also provide useful information on ports. The COAST database, developed by the Maritime and

Coastguard Agency UK in March 1996, provides the most up to date information on ship routing in UK waters for merchant, shuttle tanker, ferry, standby and supply vessels.

The Irish Coast Guard (formerly the Irish Marine Emergency Service) of the DoMNR and the Marine Accident Investigation Branch (MAIB) of the present UK Department for Transport, publish annual marine incident statistics for Irish and UK waters respectively. Currently, information on the type and quantity of cargo carried by vessels such as cargo ships and tankers is not readily accessible from either the Irish Coast Guard or MAIB incident databases. In the UK, the DETR (now DEFRA) designated MEHRAs (Marine Environmental High Risk Areas) provide an important database identifying areas of high environmental sensitivity so that ship routing can be planned accordingly.

From a development perspective it may be appropriate for a qualified body, independent of developers or Government Departments, to undertake EIAs for port development. Monitoring environmental impacts should be conducted during and after completion of the port development. Any new port developments should be in line with EU Directives and strategies; a precautionary approach should be adopted, in keeping with recommendations by the OSPAR Convention. As ports and harbours diversify and expand their facilities to cater for the marine tourism sector, the carrying capacity of areas of high ecological value should be estimated. Where ports have a number of sectors contributing to port income, conflicts may occur if development of one sector is disproportionate to another. Therefore, any development should ideally proceed on an equitable multisectoral basis.

## **4.11 Conservation**

Nature conservation has been a key element in EU environmental policy since the early 1970s. The Birds and Habitats Directives constitute a solid legal basis for the protection of rare and endangered species and natural habitats. Natura 2000 is a network that has been put in place to prioritise the designation and protection of sites at a community level. To ensure its success, each Member State can choose its own mechanisms by which it will implement the relevant conservation measures of its territory. Scientific, economic, social and cultural requirements will be taken into account in the designation process. The success of Natura 2000 is dependent on the participation and full commitment of all of the countries involved.

### ***Ireland***

The most important pieces of legislation regarding nature conservation in Ireland are the Wildlife Act 1976, the Wildlife (Amendment) Act 2000 and the European Communities (Natural Habitats) Regulations 1997. The national, European and global designations are administered by Dúchas, the national statutory conservation body. The national designation in Ireland, the National Heritage Area (NHA), is currently a proposed designation, replacing the earlier Area of Scientific Interest (ASI). All other national, European and global nature designations overlap with and are sub-sets of the NHA designations. The Wildlife (Amendment) Act was finally enacted in December 2000, providing a legal basis for the protection of NHAs, SACs and SPAs. The geographic locations and coverages of NHAs, SACs and SPAs in the Irish INTERREG II area (and elsewhere nationwide) are available in digital format from <http://www.heritagedata.ie>.

In Ireland, the legislation and management structure for environmental protection of the coastline is often insufficient. The Irish Government is under increasing pressure from the European Commission, and from national and international NGOs, to uphold its duty to protect the environment while facilitating sustainable development.

Within the INTERREG II area there are a number of coastal designated conservation sites (see Tables 4.11 and 4.12).

Table 4.11: Summary of environmental designations in the coastal zone of the Irish study area.

<b>County</b>		<b>Louth</b>	<b>Meath</b>	<b>Dublin</b>	<b>Wicklow</b>	<b>Wexford</b>	<b>Waterford</b>	<b>TOTAL</b>
Coastal Population		Not available	9,437	798,989	76,191	61,892	76,501	>1,023,010
No. Designations in Coastal Areas	SPAs	2	1	7	0	7	3	20
	NHA	3	0			21		24
	pNHA		3	16	9		8	36
	cSAC	4	1	8	4	9	3	29
	pcSAC	1	1		2	1	0	5
No. Blue Flag Beaches/ Marinas		0		2	3	5	3	13
Total No. of Designations		10	6	33	18	43	17	127
% of Total Designations		8	5	26	14	34	13	100
Ramsar (R), Refuge for Fauna (RF), UNESCO Biosphere (UB), Statutory Nature Reserve (SNR).				R, RF, SNR, UB		SNR, R		

c = candidate      p = proposed

Table 4.12: Summary of environmental designations in the coastal zone of the Welsh study area.

<b>County</b>	<b>Anglesey</b>	<b>Eryri/Llyn</b>	<b>Meirionnydd</b>	<b>North Ceredigion</b>	<b>Teifi</b>	<b>Cleaddau/ Pembroke shire</b>	<b>Carmarth-enshire</b>	<b>TOTAL</b>
Coastal Population (1991)	69,149	99,077	25,932	36,729	36,889	105,995	80,276	454,047
SAC	5	6	6	4	5	5	2	33
SPA	3	2	1	1	1	4	2	14
NNR	4	13	7	2	3	7	2	34
ESA	1	1	0	1	1	1	1	6
SSSI	61	77	53	63	36	86	64	440
AONB	1	2	0	0	0	0	0	3
Ramsar (R), Marine Nature Reserve (MNR)		R x 2	R			MNR		

#### 4.11.1 Habitat Protection

The Irish and Welsh coastlines of the study area possess a number of EU and national designated habitats, including: SPAs, SACs, NHAs (Natural Heritage Areas in Ireland), SSSIs (Sites of Special Scientific Interest in Wales) etc. The designations mostly identify habitats that are internationally important for birds or wildlife. In Ireland, little protection has been guaranteed by these designations to date; the national legislation, which would ensure protection, was updated in 2000 (Wildlife Act 1976, (Amendment) 2000), but had not been implemented at the time of completion of this report. Wales has a number of organisations that monitor and protect designated areas (Countryside Council for Wales, BMT Cordah, The Dyfed Wildlife Trust etc.).

#### Ireland

NHAs are protected via controls on planning permission and, in theory, state and EU funding will be denied to projects that might damage habitats. Expenditure by the Department of Arts, Heritage, Gaeltacht, and the Islands (DoAHGI) on habitat protection in Ireland has increased from €8.9 million in 1993 to €31.7 million in 1998. A large proportion of this budget is for

compensation to farmers who modify or maintain their farming practices under the requirements of REPS (Section 4.2). REPS is administered through the Department of Agriculture Food and Rural Development. This scheme is applicable to all farmland; however, higher rates of compensation are payable to farms within NHAs.

The DoAHGI has submitted a list of 362 candidate SAC sites to the European Commission for approval. However, Ireland's international reputation for habitat protection is very poor. Ireland was ranked last out of fourteen European countries in a 2001 World Wildlife Fund (WWF) survey on the status of the implementation of the Habitats Directive. Denmark ranked first, the UK and Austria ranked joint third. Ireland has designated less than 5% of its national territory as SPAs or SACs in comparison to Denmark, which has designated more than 20% of its national territory (WWF, 2001).

According to the five principal Irish environmental NGOs (Coastwatch, BirdWatch Ireland, An Taisce, The Irish Wildlife Trust and the Irish Peatland Conservation Council), an absence of information on Irish habitats and species is preventing valuable areas being designated as SACs. The NGOs consider the Government's list of 362 candidate sites to be incomplete. In 2000, the aforementioned NGOs submitted a list of 621 sites to the European Commission for SAC designation, of which 143 had not been surveyed by Dúchas (*Irish Times*, 2001e).

In July 1999, the European Commission threatened to withhold Structural and Cohesion funds worth €3.7 billion in the 2000-2006 period as a result of Ireland's failure to comply with EU rules for conserving endangered animals and plants. In January 2001, the European Commission condemned Ireland for this failure to comply with the Habitats Directive (*Irish Times*, 2001f). This duly occurred in September 2001. The European Court of Justice ruling specifically refers to failure by the Irish Government to provide the European Commission with a list of sites to be designated as SACs (*Irish Times*, 2001g). The inclusion of references to habitat protection in many County Development Plans may indicate a national response to this pressure from the European Commission.

A number of plans have been developed in both Ireland and Wales to protect and manage habitats. For example, the REPS 2 Scheme, detailing conservation plans that specify acceptable practices on land, are in preparation. In Ireland, The Department of Agriculture and Rural Affairs, Dúchas and the Irish Farmers Association (IFA) have agreed on the development of Habitat Prescriptions at national level for the protection of sand dunes and machair.

### **Wales**

SPAs and SACs are identified by the Countryside Council for Wales (CCW) in conjunction with the Joint Nature Conservation Committee (JNCC). The CCW has a responsibility for the ongoing protection of designated areas. There are eleven coastal National Nature Reserves (NNRs) in Wales and a Marine Nature Reserve (MNR), one of only two in the UK, at Skomer Island (JNCC, 2000). Under the Habitats Directive (92/43/EEC) candidate Special Areas of Conservation (cSACs) and SPAs have been selected throughout the UK for the development of Marine SAC (SPA) Management Schemes. The relevant Local Authorities and CCW, with the involvement of other interested groups, are required to prepare non-statutory management schemes for each site. At the time of completion of this report only one cSAC management plan, namely *Cardigan Bay SAC Management Plan -- Consultation Draft 2000*, was available for scrutiny.

In addition, 500km of the Welsh coastline has been identified as having Heritage Coast status. These areas were identified in response to widespread concern about the loss of unspoiled coastlines to sensitive developments, including caravan sites, industry and urban expansion. While their status does not carry legal protection, local planning authorities must take the designation into account before making decisions on matters that could affect the area. The Local Authorities also play a role in the protection of the designated areas. Heritage Coast officers work with local volunteers to implement management plans.



In the UK, English Nature, the Environment Agency and the Centre for Coastal Management conducted the Living with the Sea project under the EU LIFE Programme. This initiative aims to establish Coastal Habitat Management Plans (CHaMPs) to identify best practice methods necessary to achieve the creation of new habitats and the protection of designated habitats from coastal erosion (English Nature, 2000). These are intended to provide a framework for managing European sites that are located on or adjacent to dynamic coastlines in circumstances where the conservation of all of the existing interests within a site complex *in situ* is not possible. The first six CHaMPs for England and Wales are under development by a consortium including Posford Duvivier, University of Newcastle and University of Portsmouth (English Nature, 2000).

#### **4.11.2 Biodiversity**

Maintenance of biodiversity is central to the conservation of the natural environment. The International Convention on Biological Diversity was established at the 1992 World Summit in Rio de Janeiro to guide signatory nations towards achieving sustainable management of biodiversity in their respective countries. The DoAHGI has submitted reports for the Convention in 1998 and 2001 entitled *National Report on the Implementation of the Convention on Biodiversity by Ireland*. The report outlines Ireland's habitats, flora and fauna, human impacts and current statutory management structures and responsibilities. Further to this the *Review of the Current Status of Biodiversity in Ireland* (Hickie, 2000) outlines the legal responsibilities for the protection of the various designated areas. *The Draft National Biodiversity Plan 1998* is under review by the various Government Departments and it is hoped that it will be enacted soon (P. Buckley, Dúchas, pers. comm., 2001). The plan recognises the need for increased protection of Ireland's designated areas.

The Irish Wildlife (Amendment) Act 2000, related to the Biodiversity Plan, was enacted on 18 December 2000. The Act aims to, *inter alia*:

- Provide the legal basis for setting up the NHAs; NHAs are now protected; many of these are also SACs (90% nationally);
- Bring certain species within the scope of the Act though not necessarily provide them with protected status. For example, hunting with mechanised vehicles is not permitted; this would prohibit shooting of ducks from boats;
- Include provision for protection of fish and invertebrates.

#### *Trends*

- There is increasing pressure on the Irish Government from the EU and NGOs to uphold its duty in the designation and protection of sites.
- The number of environmental designations in both Ireland and Wales is expected to increase in order to abide by the habitats and species protection requirements of the EC Habitats and Birds Directives.
- Increased responsibilities will be placed on farmers to facilitate sustainable agricultural practices, e.g. REPS.
- There is increased awareness of the need for sustainable development of the coastline and the importance of comprehensive coastal management plans which aid in the protection of designated areas.

## Issues

- *Pressures on dune systems:* Sand dune systems are particularly sensitive and vulnerable habitats exposed to increasing recreational pressure. Private ownership of dune systems is common in both Ireland and Wales. Dunes are commonly rented for sport or tourism purposes. Renting sand dunes for grazing is uncommon, but does occur at Ballyteigue, Co. Wexford. Grazing and increased human activity in sand dunes, have a negative impact on the vegetation, destabilising the structure of the dune systems and exacerbating erosion problems. The authors reviewed infra-red aerial images from the National Coastline Survey (Marine Institute, 2000) and identified some damaged dune systems and some dune systems that are under threat in the study area. These included dunes at the following locations:

<i>Brittas Bay:</i>	Under threat from recreational erosion and blow outs;
<i>West of Carnsore Point:</i>	Extensive pathway erosion;
<i>South of Cahore Point:</i>	Under threat from erosion;
<i>Curraclloe</i>	Extensive pathway erosion and blow outs.

- *Agricultural practices:* Year-round grazing has a particularly detrimental impact on the coast. In Ireland, grazing impacts on about 50% of NHAs and threatens 75% of coastal SACs (Table 4.13). Grazing reduces the soil's protection from the elements, increasing soil erosion and sediment loading in rivers and reducing biodiversity. Concentrated trampling by livestock on coastal lands can lead to localised landslides, further accelerating the natural and problematic process of coastal erosion (Neff, 1998). Unrestricted livestock access is also a problem throughout the Dyfi and Leri catchments. It causes impoverishment of riparian habitats, bank degradation and affects local water quality (Meirionnydd LEAP – Action Plan Issue ME/6).
- *Detrimental activities:* Within the Irish INTERREG II region, grazing, fertiliser applications and scrub-clearance impact on 17% of the protected areas, while a further 34% are impacted by related activities such as land reclamation, drainage and water pollution. Construction, dumping, land reclamation and drainage together impacted on almost 50% of the areas within the study area (Neff, 1998).
- *Planning applications:* A 1999 report by the Irish Wildlife Trust showed that 70% of planning applications within SACs were successful. The National Parks and Wildlife Service receives only 48% of all planning applications in SACs, of which they review 24% and object to 8% (Irish Wildlife Trust, 1999).
- *Introduced species:* Certain coastal conservation measures have negative impacts on the environment. Planting of the introduced species *Spartina anglica* as a means to stabilise dune systems is such an example, and has resulted in the uncontrolled spread of the plant along the coastline. Spread of *Spartina* gives rise to sediment accretion, which leads to a reduction in mudflats and loss of habitat for waders and wildfowl.
- *Development pressures:* Areas designated for nature conservation are also of landscape value; as such, these areas are under pressure from development of holiday homes, aquaculture etc. Eighteen nature and amenity designations are applicable to Irish coastal areas in the study region. Many sites have overlapping designations; for example, the North Bull Island (Co. Dublin) has nine, including designation as a Biosphere Reserve, yet it still suffers from visitor-development pressures and inappropriate use. In the Meirionnydd area, the Dyfi estuarine complex, designated a Biosphere Reserve, is a

particularly important conservation site. However, land reclamation through drainage and agricultural intensification in the Dyfi estuary has resulted in losses of wading birds (Meirionnydd LEAP).

- *NGOs:* The Irish NGOs are largely voluntary bodies with a small number of people employed for administrative purposes. In the UK, NGOs such as the RSPB have significant influence with regard to advising authorities on the environmental consequences of developments. This is largely facilitated by the funding they receive from an extensive public membership. Membership of equivalent NGOs in Ireland is much lower (BirdWatch Ireland has a membership of approximately 5,000 of which 1,500 are in the Dublin region); this restricts their activity and capacity for involvement in development issues.
- *Coastal sewage discharge:* In Wales, key coastal sites on the Eryri/Llyn peninsula include Pen Llyn a'r Sarnau and the Morfa Harlech dune system. Management and coastal sewage discharge are key issues in the area (Eryri/Llyn LEAP – Action Plan Issue ER/5).
- *Inappropriate management:* Along the Welsh INTERREG II coastline some coastal protected sites, such as Penmaenpool, have been badly damaged as a result of inappropriate management (Meirionnydd LEAP – Action Plan Issue ME/7).
- *Cumulative effects:* Neff's (1998) overview of impacts on designated conservation areas in coastal locations concludes that apart from large scale impacts such as grazing, designated coastal habitats are suffering a "death by a thousand cuts", i.e. activities of the kind that tend to be ignored because of their small, perhaps local scale. The cumulative effects of these activities pose a massive threat to a large section of the coastline.

Table 4.13: Percentage of coastal designated areas in Ireland subject to impacts. (Source Neff, 1998).

<i>Impact</i> ↓	<i>NHA</i> %	<i>SAC</i> %	<i>SPA</i> %
Grazing	46.0	73.0	35.5
Dumping	40.2	56.2	35.5
Water polluting activities	28.9	37.5	42.0
Littering	26.6	35.9	63.0
Agricultural improvement	26.0	39.0	26.6
Natural spread of unwanted species	25.4	32.8	42.2
Building/civil engineering	21.8	37.5	26.6
Drainage	18.9	31.0	24.4
Infill/reclamation	18.3	21.8	44.4
Fertiliser application/drift	17.0	29.0	11.1
Camping and caravanning	16.5	34.0	6.6
Other recreation	16.5	29.0	15.5
Removal of beach material	15.9	23.4	15.5
Aquaculture	13.6	14.0	20.0
Golf	13.0	29.0	17.7
No observable impacts	5.9	1.5	0.0

### *Cetaceans and Seabirds at Sea Study*

Since July 1999, the Cetaceans and Seabirds at Sea team of the Coastal Resources Centre (CRC), University College, Cork, have been performing at-sea surveys in the waters around Ireland. Although the study effort has concentrated in the shelf waters to the west of Ireland and the deeper waters of the Rockall Trough and Porcupine Basin, a limited number of surveys have been conducted in the Irish Sea. The distribution and abundance data resulting from this study, the first of its kind in Irish waters, will form the baseline from which all future studies will be compared. This study (funded by the Rockall and Porcupine Studies group of the Petroleum Infrastructure Programme) will enable possible future effects of the oil and gas industry on cetacean and seabird populations to be assessed. The surveys in the Irish Sea, together with cetacean stranding data (Rogan and Penrose, 2000), show that a total of 26 seabird species and 15 cetacean species have been recorded in the INTERREG II region of the Irish Sea (M. Mackey, Coastal Resources Centre, pers. comm., 2001).

### *Data Sources Potential Future Requirements*

Data sources relating to conservation within the INTERREG II area include various Government Departments, statutory bodies, research centres and NGOs (DoAHGI, DoELG, EPA, JNCC, An Taisce, English Nature, CCW etc.). Identifying human impacts is not difficult; quantifying them and assessing the significance of the impact is more problematic. The quantification of human impacts as a consequence of the environment/development interface is insufficient, particularly along the Irish INTERREG II coast. Data relating to the spatial extent of conserved areas are freely available but information on species and habitats is often less accessible.

Measures required to address these information gaps could include studies to establish the carrying capacity of coastal environments to assist in planning for future sustainable development of housing, marine tourism, industrial expansion, sewerage infrastructure etc. In Ireland, supplementary measures in addressing the issues outlined could include the establishment of an independent environmental monitoring body, similar to English Nature in the UK. Such a body would also: undertake independent reviews on the quality of the Environmental Impact Statement (EIS) submitted by developers; ensure that post-development monitoring was conducted, and ensure that mitigating measures were adopted where deemed necessary. The absence of a biological records centre for Ireland increases the difficulty in assessing the status of national biodiversity and the impact of human activities upon biodiversity.

Other possible forms of integration between both sides of the Irish Sea could involve the formation of efficient national monitoring systems established to assess the status of designated coastal habitats. Groups such as the Irish Sea Forum and ECONET (Erosion Control Network) should be promoted, linking relevant Government Departments, state agencies and recognised NGOs to co-ordinate and monitor coastal developments in the Irish/Welsh INTERREG II area. Provision of funding and resources to the state agencies tasked with monitoring and protecting the natural environment, should be increased. Ireland should examine how the UK CHaMPs initiative could be applied to the management of sensitive coastal habitats. Habitats that are not afforded official EU designation as SACs or SPAs should be considered for national or local designations. Provision should be made for the protection of habitats and species that are important for recreational, traditional, cultural or commercial purposes in the coastal zone.

## 4.12 Coastal Erosion and Flooding

### 4.12.1 Climate Change

It is now recognised that the regional impacts of climate change, such as flooding in Europe, are becoming more severe. There is also stronger evidence that most of the observed global warming over the last 50 years of the 20th century is attributable to human activities (IPCC, 2001).

Relative sea level rise, resulting from a combination of isostatic recovery (crustal uplifting after overlying ice sheets melt) and climate change, will potentially have significant effects on the coastal zone. Effects of sea level rise will be exacerbated by stronger waves, more powerful storms, and more storm surge activity, resulting in large changes to our coastlines and increased erosion and wave related damage. This has implications for development (present and future) on the east coast of Ireland and the west coast of Wales. The capacity of natural as well as artificial coastal defences to respond to these changing circumstances will be an important management issue in the future. The biological effects of climate change on the coastal zone include: a shift in species ranges; introduction of species which may out compete native species for resources, and a negative impact on biodiversity due to habitat loss.

The Coastal Defence Survey in Wales identifies the dynamic nature of the complete coastline of Wales, as well as existing coastal protection works, their condition, and any eroding lengths of coastline lacking defences (Welsh Office, 1999).

Coastal erosion has been estimated to cause a loss of land at a rate of 160 to 300ha per year around the Irish coast (Brady Shipman Martin, 1997). The National Coastal Erosion Committee carried out a survey in Ireland following severe winter storms in 1989 and 1990 and identified approximately 1,500km of Irish coastline as potentially susceptible to erosion, 492km of which is in the Irish study area. The Committee's 1992 report identified the need for a national coastal management policy that included plans for coastal protection measures within an holistic multidisciplinary approach (National Coastal Erosion Committee, 1992). The later ECOPRO (1996) study identified 237km of coastline within the Irish INTERREG II area to be at risk (Table 4.14).

#### *Trends*

- *Greenhouse gas emissions:* The main contributory factor to the problem of climate change is greenhouse gas emissions. In Ireland, by 2000, greenhouse gas emissions were already 13% above 1990 levels. A reduction of 20% in emissions by 2010 is required to meet the target set under the 1997 Kyoto Protocol Agreement. However, projections based on current patterns of energy use suggest that the reverse is likely; Ireland's emissions are set to increase by 30% between 1990 and 2010 (EPA, 2000a).
- *Sea level rise:* The sea level on the Irish southeast coast appears to be rising by about 0.3mm per year, while sea level is falling on the north coast. The Intergovernmental Panel on Climate Change (IPCC) has predicted a global sea level rise of about 20cm by the year 2030 and 65cm by 2100 (IPCC, 2001). In Ireland, the next 30 years are expected to see a rise of 17 to 31cm in relative sea level around the coast (DoELG, 2001a).
- *Erosion rates:* Much of the east coast of Ireland is low-lying and susceptible to inundation and flooding as well as being vulnerable to erosion. Erosion rates of up to 5m per year have been recorded on the east coast (Devoy, 2000). Sandymount in Co. Dublin, with sea defences dating from the 19th century, is regarded as particularly vulnerable to flooding caused by sea level change. County Wexford has been identified as Ireland's main area of concern with regard to long term erosion problems (1-2m per year) attributable to increased storm frequency and rising sea levels. Other areas at risk along Ireland's east

coast include the coastline from Killiney to Bray, Dundalk, Malahide and behind natural coastal barriers between Wicklow and Bannow Bay (DoELG, 2001a).

#### *Issues*

- *Erosion exacerbated by development and livestock trampling:* Increasing development on the coastline has further exacerbated the erosion problem at many coastal locations. Concentrated trampling by livestock on coastal lands can lead to localised landslides, further accelerating the natural and problematic process of coastal erosion.
- *Threat to designated areas:* Coastal erosion was identified by Neff (1998) as the single most important physical threat to designated areas along the Irish coastline.
- *Flood risk:* Elevated water levels during storms may inundate low-lying sections of the coast. Planning restrictions should be imposed on areas prone to flood risk. Aside from the direct personal impact of flooding, the infrastructure of many areas has been severely disrupted or damaged in the recent past. Córas Iompar Éireann (CIE, the Irish Public Transport State Agency) has hired consultants to consider measures to combat flooding and erosion.

Table 4.14: Length of coastline at risk from erosion, for each county within the Irish INTERREG II area. (Source: modified from ECOPRO, 1996).

<i>County</i>	<i>Length of Coast (km)</i>	<i>Length of Soft Coast (km)</i>	<i>At Risk (km)</i>	<i>Percentage of Soft Coast at Risk</i>
Waterford	170	88	22	25%
Wexford	264	211	100	47%
Wicklow	61	43	43	100%
Dublin	99	54	12	22%
Meath	21	21	21	100%
Louth	90	75	39	52%
<b>Total</b>	<b>705</b>	<b>492</b>	<b>237</b>	<b>48% (Average)</b>

#### **4.12.2 Coastal Defence**

Coastal defence combines protecting the coast from erosion with safeguarding low-lying land from sea breach or flooding. The level of coastline protection warranted at any specific location is dependent on: (1) the nature of the coast; (2) its degree of exposure; and (3) the scale of past and present human activities.

#### ***Ireland***

The cost of protecting Ireland's vulnerable coastline was estimated at €49.5 million in 1992. Substantial funding of €158.7 million for coastline protection was identified as necessary in Ireland's draft policy on coastal zone management (Brady Shipman Martin, 1997). The report also highlighted the general ignorance and lack of awareness associated with existing coastal management and protection practices.

Unlike Wales, there are no regionally co-ordinated plans for coastal defence in Ireland. However, the issue of coastal protection is gaining political importance in Ireland with increased concern about the economic and social cost of recent flooding and erosion events. This concern is reflected in the level of Government funding allocated for coastal protection, which has increased from €127,000 per year prior in 1995 (Brady Shipman Martin, 1997) to €12.7 million in 2000 (Marine Institute, 1998; DoMNR, 2000j). Almost €8.9 million of this €12.7 million was spent on projects at Killiney, Bray, Rosslare, and Tramore amongst others (CEED UK, 2000a). However, this is still substantially less than the estimated €49.5 million recommended in 1992. Funding will



continue under the National Development Plan until 2006, with €22.9 million designated for the southern and eastern coasts (NDP, 2000). A further €6.4 million has been allocated nationally for research. Good planning and management will be required to ensure that impacts are minimised in new development areas; this issue is addressed in the National Spatial Strategy (DoELG, 1999).

Research by the ECOPRO project (1996) into environmentally friendly methods of coastal protection identified a number of solutions to erosion problems. Planting marram grass in tandem with fencing at Brittas Bay in Co. Wicklow proved successful in stabilising the existing sand dune system and reducing disturbance from other related human pressures (ECOPRO, 1996).

### *Wales*

Along the west Wales coastline, the generally hard geology has reduced the need for artificial coastal works. In general, natural features such as sand dunes, beaches and estuaries afford protection. In Wales and England, coastal protection measures including flood defence are set out in the Coast Protection Act 1949, the Land Drainage Act 1991, the Water Resources Act 1991 and the Environment Act 1995.

The Coastal Defence Survey in Wales (Welsh Office, 1999) identifies the nature of the complete coastline of Wales, existing coastal protection works, their condition, and eroding lengths of coastline lacking defences. Complementary information is contained in the Environment Agency Sea Defence Survey (1992) and the survey by Railtrack of their defences. The Environment Agency is currently extending its survey to cover estuary and tidal flood defences as well as river flood defences.

In Wales, Shoreline Management Plans (SMPs) were drafted in response to coastal erosion and associated impacts. SMPs are being drafted, on a coastal sediment cell basis, for the entire coastline of Wales by the non-statutory coastal engineering groups. They provide a co-ordinated approach to coastal defence, taking account of natural processes, current and future land use, and protection needs. The sea defences of the Welsh INTERREG II coastline include a variety of natural defences and traditional engineered responses (both hard and soft). The 1992 EAW Sea Defence Survey Report showed that coastal defences around Anglesey and Eryri/Llyn were generally in good condition (Anglesey and Eryri/Llyn LEAPs). Despite these findings, further concern over tidal and fluvial flooding in the Eryri/Llyn area has resulted in the proposal for a formal flood warning scheme in the area (Eryri/Llyn LEAP – Action Plan Issue ER/20). Flooding problems are also common on the floodplains, as well as on the coast; tidal flooding is particularly evident in the North Ceredigion area. Tide-locked conditions also occur; Clarch Bay and Llanrhystud caravan parks are particularly at risk from these conditions (North Ceredigion LEAP – Action Plan Issue NC/16). Similar conditions occur along the coast of Carmarthenshire at Laugharne, Ferryside, Kidwelly and Llanstephan (Carmarthenshire LEAP – Action Plan Issues CA/23 and CA/24).

### *Trends*

- *Investment:* While increased investment in coastal defence has occurred in both Ireland and Wales, further investment is required.
- *Change in engineering practices:* There has been a move away from hard engineering solutions towards the reinforcement of natural defences.
- *Management plans:* Shoreline management plans in Wales have facilitated prioritisation of stretches of coastline for coastal defence.

- *Increased awareness:* The increase in public awareness of climatic change, increased storminess and sea-level rise has led to increased demand for effective flood warning systems.

#### *Issues*

- *Impacts on natural processes:* There is concern regarding the impacts of hard man made protection works on natural processes. The focus is now on programmes that reinforce natural defences, with the aim of creating more environmentally acceptable protection.

#### *Data Sources and Potential Future Requirements*

Climate change and the associated impacts of sea-level rise, flooding, erosion and increased storminess are priority issues in the INTERREG II area. Both UK (DEFRA) and Irish (DoELG) Government Departments have published climate change strategies in response to recent events and the need for future projections. Since the floods of 1998, when there was little or no warning, the UK Environment Agency (which has responsibility for flood warning in England and Wales) has made considerable efforts to improve the effectiveness of its flood forecasting and warning services. The Environment Agency has recently launched a flood warning website. Residents in England and Wales are now able to access online flood warning information 24 hours a day; the information is updated every 15 minutes. Research efforts on both sides of the Irish Sea are ongoing and there is already an existing literature base with reference to erosion, and sea level change. In Ireland, the Office of Public Works (OPW) is responsible, under the National Arterial Drainage Programme, for implementing measures such as the Priority Flood Relief Programme.

Sea level rise will impact the urban developments of the greater Dublin area. In addition, the increase in hard structures will result in coastal squeeze, which will be most notable during flooding. Local Authorities and national agencies should liaise with scientists and insurers in assessing the risk to populated areas. The Shoreline Management Plans used in Wales provide a successful framework that could be adopted elsewhere. Networks such as ECONET (Ireland/Wales INTERREG II), which facilitate interaction on coastal erosion issues between authorities and interest groups in Ireland and Wales, should be consolidated. As a result, Ireland would benefit from the experience of the Welsh authorities in the development of shoreline management plans.

Within the INTERREG II area, strict development controls should be used in the coastal zone, particularly in erodable, soft coast areas. A policy of setback to restrict development within a certain distance from the shore (as used in Denmark and other EU Member States), should be adopted and adhered to by each coastal Local Authority. Future research should target priority areas where available information is insufficient and information gaps exist. This would increase confidence in current predictions and facilitate and augment strategic management of the coastal zone. In Ireland, the development of flood prediction and management tools as well as coastal climate modelling should be furthered. A new LACOAST-type project to document the percentages of agricultural land and developed land in the coastal area would provide comparison with the results of the 1990 study, and allow identification of trends and areas at risk. More attention should be given to aerial surveys and new survey techniques such as laser altimetry. This is of particular importance on the east coast, where sea-level rise, increased storminess, and associated flooding are likely to cause further erosion and inundation.

### 4.13 Marine Archaeology

In Ireland, Dúchas and the National Museum are the primary holders of archaeological datasets. In Wales, the distribution of archaeological and historic sites is recorded in the regional Sites and Monuments Records by the Welsh Archaeological Trusts, and as Scheduled Ancient Monuments by the Royal Commission on the Ancient and Historical Monuments of Wales. The Dúchas wreck inventory has identified thousands of wrecks on the seabed off the Irish coast. The greatest proportion of these (up to 75%) occurs in the south, off Cork and Wexford. The majority of wrecks date from the latter half of the 19th century. Seabed archaeological remains and shipwrecks are disturbed by various human activities such as mineral extraction, navigational dredging, pipe laying, trawling, salvage operations, treasure hunting, sports divers and pollution.

A Foreshore Licence for any development will not be granted if the project developer has failed to undertake adequate archaeological assessment as stipulated by Dúchas. Extensive EISs have been returned to major companies because of DoMNR dissatisfaction with the quality of the archaeological assessment.

At the time of preparation of this report, the main focus of archaeological investigations associated with coastal developments and activities within the Irish INTERREG II area include:

<i>Dredging:</i>	Drogheda Port, Dublin Bay (for the Dublin Bay Project);
<i>Port development:</i>	Waterford Port (major expansion);
<i>Renewable Energy:</i>	Several studies examined suitable sites for the establishment of offshore wind farms (off Arklow, Co. Wicklow and Clogherhead, Co. Louth).

#### *Trends*

- While the only way of dealing with active erosion of maritime archaeological sites in the past has been to either ignore the problem or excavate the site, more informed methods of on-site management are being introduced (Breen, 1998).

#### *Issues*

- *In situ* preservation of sites is not always practicable as many sites underwater are not stable and are actively undergoing erosion.
- *Archaeological surveying* in Ireland is limited to a small number of academic teams and commercial consultants.
- Dúchas' archaeological diving unit has helped enforce the comprehensive national legislation but effective *coastal policing* is reliant on local community education and vigilance.

## 4.14 Landscape and Seascape

Methodologies recently developed for carrying out landscape and seascape assessments have great potential as tools to help guide responses to coastal pressures. The need for landscape evaluation was highlighted at the European Landscape Convention (2000), held by the Congress of Local and Regional Authorities under the auspices of the Council of Europe, and with the support of the European Environment Agency and the IUCN (World Conservation Union). (<http://www.nature.coe.int/english/cadres/conv.htm>).

The Heritage Council (Ireland) (2000) defines landscape and seascape as the following:

*Landscape:* includes areas, sites, vistas and features of significant scenic, archaeological, geological, historical, and ecological or other scientific interest.

*Seascape:* includes areas and sites of coastal water including estuaries, bays and lagoons of significant scenic, geological, ecological or other scientific interest.

In Ireland, the approach to landscape assessment has to date centred on designation. Policies are heavily concerned with the protection of individual features or sites, not with the landscape as an entirety (DoELG, 2000b). However, this situation looks set to change with the introduction of the DoELG's *Landscape and Landscape Assessment Consultation Draft of Guidelines for Planning Authorities* (2000) in which an holistic view of the landscape is promoted. Under the guidelines, it is proposed that all Local Authorities should assess and classify the landscapes in their area according to character, values and sensitivity. The sensitivity of a landscape will determine its environmental sustainability and its ability to absorb and accommodate development. The guidelines note the need for wide consultation, and the importance of consensus. The outcome of landscape assessment will facilitate communities and planners to understand and attribute values to their local landscape and environment.

The potential use of GIS to inventory the many datasets relevant to landscape assessment and to assist in the compilation of landscape characterisation profiles is recognised. If properly planned and integrated at the outset, a series of GIS-based landscape assessments for coastal counties would be invaluable for monitoring change in the coastal zone, particularly if assessments were repeated regularly and used in conjunction with other national digital datasets, such as the National Coastline Survey using aerial digital photography (Marine Institute, 2000).

Research has recently been carried out under the INTERREG II Programme to develop a methodology for seascape assessment (Hill *et al.*, 2001). Seascape assessment and evaluation is similar to the landscape counterpart, now that the jurisdiction of planning authorities extends across the MHW in Ireland (MLWM in Wales), the DoMNR and harbour authorities have a vital role in partnership with local councils in seascape assessment and management. The study (undertaken by the Brady Shipman Martin consultancy, University College, Dublin and University of Wales, Aberystwyth) proposed a methodology for seascape assessment in Ireland, drawing upon experience in Wales and the UK. Potential end-users were identified amongst Government Departments, planning authorities, developers, coastal communities, conservation organisations and agencies with a role in promoting development in coastal and marine settings. The approach recommended involves the assessment of the coast in units, defined as appropriate at national, regional and local level. A variety of characteristics are recognised as contributing to the seascape of a region, including: commercial activities, geomorphology and physical processes, aesthetic value, current uses, designations and historical and cultural aspects. The report definition for seascape evaluation gives an insight into what is required under such assessments.

Seascape evaluation is defined as the judgement and ranking of seascapes according to their quality, value or capacity to accommodate change. This will focus a decision maker's attention on the issues affecting seascape character as well as on the characteristics themselves, and can be used as a basis for grouping seascapes with similar quality, value or capacity to accommodate change (Hill *et al.*, 2001). The issue of seascape assessment is likely to become more prominent in the future, particularly with the predicted increase in aquaculture and wind farm installations along the Irish INTERREG II coast.

#### *Trends*

- *Landscape assessment in planning*: Until recently, the approach to landscape assessment in Ireland centred on designation. However, under *Landscape and Landscape Assessment Consultation Draft of Guidelines for Planning Authorities* (2000) landscapes will be assessed by Local Authorities according to character, values and sensitivity which will help determine environmental sustainability.
- *GIS*: There is increased recognition of the advantages of GIS as a tool in landscape assessment.

#### *Issues*

- *Increased need for seascape assessment*: With the predicted increase in aquaculture and wind farm installations along the Irish INTERREG II coast it is likely that seascape assessment will become more prominent in the future.

#### *Data Sources and Potential Future Requirements*

Landscape and seascape assessments are relatively recent phenomena in Ireland and Wales. Awareness of the issue is growing significantly, particularly as the coastal landscape comes under increasing pressure from development, e.g. wind farms, housing developments, aquaculture installations etc. Potential use of GIS to inventory the many datasets relevant to landscape assessment and to assist in the compilation of landscape characterisation profiles is recognised. If properly planned and integrated at the outset, a series of GIS-based landscape assessments for coastal counties would be invaluable for monitoring change in the coastal zone, particularly if assessments were repeated regularly and used in conjunction with other national digital datasets, such as the Irish National Coastline Survey (Marine Institute, 2000).

Policy statements and plans should identify scenic, recreational and historic areas, and also scientific and landscape features and habitats in the coastal environment. Policy statements and plans should give such areas protection from inappropriate sub-division, use and development.

## 4.15 Overview of Issues Identified in County Development Plans

Issues relating to human activity in the coastal zone of the Irish study area become apparent when the County Development Plans of each coastal county are reviewed. To enable a county-by-county comparison, the issues mentioned in the development plans are summarised in Table 4.15.

*Table 4.15: Overview of issues recognised in County Development Plans from the Irish study area.*

<b>County</b>	<b>Issues Recognised</b>
Louth	<ul style="list-style-type: none"> <li>- A steady increase in population has led to an increase in housing demands.</li> <li>- The 70-mile coastline was identified in the Tourism Action Plan as an undeveloped tourist asset that requires sensitive development to protect the amenity value of the coastline.</li> </ul>
Meath	<ul style="list-style-type: none"> <li>- Areas identified most at risk from flooding generated from sea-level changes.</li> <li>- Population increase results in increased housing demand.</li> <li>- Sensitive coastal areas need to be protected from development.</li> </ul>
Dun Laoghaire	<ul style="list-style-type: none"> <li>- The areas of coastline from Dalkey to Killiney have been recognised as outstanding landscapes by An Foras Forbatha in their Inventory of Outstanding Landscape in Ireland (1977). Improvement schemes to upgrade areas of poor environmental quality are encouraged by the Local Authority.</li> </ul>
Fingal	<ul style="list-style-type: none"> <li>- The coastal fringe of Donabate is the most sensitive to development. It is crucial that the woodland areas are retained.</li> <li>- Lambay Island is an important offshore landmark; development of any kind would have a negative impact on the character of this area.</li> <li>- The golf course and agricultural land at Malahide should be retained as a balance between built development and open land; further expansion of recreational marine activity in the outer estuary would have detrimental effects on the area.</li> <li>- Portmarnock: any further development around the estuary would have an adverse effect on the semi-natural character of the area.</li> <li>- Reclaimed land around estuaries may become increasingly waterlogged.</li> <li>- Many areas vulnerable to storm surges and flooding (within Dublin Bay).</li> <li>- Coastal retreat evident around Killiney.</li> </ul>
Wicklow	<ul style="list-style-type: none"> <li>- Destructive impact of reclamation on estuarine and marsh lands and unstable nature of soft sandy shorelines.</li> <li>- The entire coastal area of the county has been identified as a landscape zone of outstanding beauty of very high vulnerability. The outstanding natural beauty zone encompasses those areas which are most vulnerable and sensitive and which are considered to be of greatest scenic value. These areas tend to be under severe development pressure.</li> </ul>
Wexford	<ul style="list-style-type: none"> <li>- Demand for second homes in Wexford (mainly from those with primary residences in Dublin) has been escalating since the early 1990s.</li> <li>- Growing pressure to use old farm buildings for tourism and leisure developments.</li> <li>- The scale and widely dispersed nature of modern housing, infrastructural, agricultural and tourism development is perceived as detrimental to the viability of the county's environment.</li> </ul>
Waterford	<ul style="list-style-type: none"> <li>- Contamination of aquaculture species by sewage e.g., oysters with viral infection in Dungarvan.</li> <li>- Pressure to develop the county to serve commuting populations of Waterford and Cork.</li> <li>- There has been significant construction of holiday homes during the last County Development Plan period.</li> <li>- Inadequate sewerage systems are preventing coastal resorts from achieving the Blue Flag Award.</li> <li>- With regard to its valuable coastline, Waterford Council is faced with two conflicting aims: control development in the coastal zone to protect its environmental integrity; or provide the necessary facilities in the coastal zone to support the major development of coastal tourism.</li> </ul>



## 4.16 Local Measures for Coastal Zone Management

### 4.16.1 Ireland

As a result of the absence of a single body with responsibility for directing and integrating coastal zone management in Ireland, the relevant Local Authorities come closest to managing coastal areas through their remits for spatial planning, engineering, waste management and pollution control. The type of response to coastal zone management varies with each authority, according to awareness, local trends and issues, levels of resources, and other priorities and commitments. The individual County Development Plans give an indication of local circumstances, and are reviewed in this section (the level of reference to coastal issues for each County Development Plan is shown in Table 4.16).

#### *County Development Plans (CDPs)*

The County Development Plans (CDPs) for each of the Irish counties in the study area are reviewed with regard to approaches taken by each Local Authority to minimise impacts of development on the coastal zone. All of the plans referred to the need to ensure sustainable development along the coast, in accordance with the recommendation made in *Coastal Zone Management – A Draft Policy for Ireland* (Brady Shipman Martin, 1997). Details of coastal aspects of each plan are contained in Table 4.17.

Achieving sustainable development and integrated management are common aspirations amongst the CDPs reviewed. European regulations and commitments such as the Habitats Directive, the Bathing Water Directive, and Local Agenda 21 have had a significant influence on national development strategies, and are reflected in the CDPs.

The following trends are evident:

- *Local Agenda 21*: Local community involvement in the planning process via public consultation is becoming increasingly important. Local authorities realise that thorough public consultation avoids possible future delays due to objections;
- *Habitats and Birds Directives*: Coastal habitats identified for designation as SACs, SPAs and NHAs etc. are provided with an increasing level of protection against development pressures and tourism activities;
- *Bathing Water Directive*: To achieve and maintain the required level of water quality Local Authorities are investing in new and upgraded waste management infrastructures. Sewage effluent discharges to the sea are monitored and some counties have established special task forces to liaise with the agriculture industry to minimise effluent discharges to rivers, which impact coastal waters. Local authorities realise the added value of achieving European Blue Flag status for their beaches.

The coastlines of the counties in the Irish study area are under development pressure, especially from housing developments (Section 2.3). All Local Authorities have a general policy of restricting coastal developments. Trends in planning policy show a desire to avoid uncontrolled sprawl, concentrating developments in urban centres where they can be serviced by the existing or upgraded infrastructure. Planning restrictions on one-off constructions in rural areas are increasing, especially where they will have a visual impact on scenic coastal areas.

In counties with high urban populations, there is a desire to upgrade and develop road and rail networks while investing in public transport systems to reduce the intensity of traffic. If successful, these actions could have the effect of reducing coastal pollution by airborne polycyclic aromatic hydrocarbons (PAHs) and waterborne heavy metals and other toxins, many of which have been traced to vehicle emissions and urban surface runoff.

#### *Common Trends Evident in County Development Plans*

- An increasing population, leading to rising demand for housing and employment;
- Housing policies restricting development to areas with existing settlements;
- Demand for coastal sites for holiday home development;
- Recognition of the value of the coast as a resource for sustainable development of the lucrative tourism and leisure industry;
- Recognition that the environmental value of the coast must be protected;
- Prevention of ribbon development along roads;
- The aims of National Sustainable Development Strategy (1997) (Section 3.1.7) to be incorporated into all County Development Plans.

The focus on coastal issues varies from county to county, as does the response of Local Authorities in dealing with coastal issues. The level of focus appears to be dependent on the willingness of the local community to protect the coastal environment and the presence or absence of a proactive policy by the Local Authority towards achieving sustainable coastal development. Wexford County Council is making particular efforts in this regard, with a dedicated chapter in its County Development Plan on coastal zone planning policies.

Table 4.16: Percentage of each County Development Plans within the study area that had reference to coastal issues.

<i>County</i>	<i>Length of Coastline (km)</i>	<i>Date (D) = draft</i>	<i>% of Document - Coastal T = text, M = map</i>
Louth	90	1999 (D)	T = 1.6%
Meath	21	2000 (D)	T = 0.7%
Dublin	99		
Dun Laoghaire		1998	T = 1.8%
Fingal		1999	T = 5.0%
Dublin City		1999	T = 0.2%
Wicklow	61	1999	T = 3.9% M = 6.4%
Wexford	264	2000 (D)	T = 6.1% M = 5.5%
Waterford	170	1999	T = 4.1% M = 2.7%

#### **4.16.2 Wales**

In Wales, under the Town and Country Planning Act 1990 (and Local Government (Wales) Act 1994), Local Authorities are required to produce Unitary Development Plans (UDPs). Within local government, coastal matters (among other services including health, economic development, recreation and tourism) are principally the province of planning or technical service departments. Where designated as coastal defence authorities, planning must also include coastal defence policies for these areas.

Within the boundaries of the INTERREG II study area, there are seven Local Authority county councils and two national park authorities with responsibilities along the coast of Wales.

Development planning is undertaken in the context of national planning policy guidance, as well as the National Assembly's Sustainable Development Scheme, and its economic, environmental and transport programmes. Plans follow a structured and transparent process, with a right to appeal by the Secretary of State for Wales. Public participation through a consultative process is a key part of this system. The UDPs also include proposals set out within Local Agenda 21, Local Biodiversity Action Plans, and countryside and coastal management strategies.

#### *Welsh Development Plans*

First deposit versions of UDPs in Wales, by each of the seven local planning authorities identified, were in production at the time of preparation of this report. Existing Structure Plans for Dyfed and Gwynedd including Local Plans (which together comprise the statutory Development Plan) were extant until this time (Ballinger, 1997). They reflect the general scope of land-use planning concerns, covering issues such as housing, employment, transport and tourism. They also set out proposals for development of specific sites. There was similar regard to the need to protect and enhance the marine, coastal, terrestrial and atmospheric environments of both former counties. More recently, available information on coastal activities and environmental quality has been summarised in the Local Environment Agency Plans (LEAPs), prepared by the Environment Agency Wales (EAW). In most cases, therefore, the LEAPs are the most up to date strategies that cover existing coastal problems and issues for the entire Welsh coast. The LEAPs that apply in the study area are reviewed in this section.

#### ***4.16.3 Local Environment Agency Plans (LEAP): Local Activities, Uses and Impacts on Coastal Resources around Wales***

Information on coastal activities and environmental quality in Wales is summarised in the LEAPs. Additional information on social and economic issues relevant to current coastal policy will become available when the Local Authority UDPs are issued for public consultation. Information on coastal coverage in Local Authority Structure Plans and District Local Plans was summarised in Ballinger (1997).

#### *Introduction*

Seven LEAPs fall within the Welsh study area. Their focus reflects the Environment Agency's catchment-wide responsibilities, particularly in relation to water quality. However, broader issues relating to fisheries, flood and sea defence, water-based recreation and shoreline access are also reviewed. There is strong coverage of issues on coastal habitats, biodiversity and landscape conservation. The most apparent gaps in coverage include economic and social concerns facing coastal communities, and coastal dynamics including issues relating to climate change.

For each catchment/sub-catchment division Consultation Reports were prepared in early 1999. Following public consultation these plans were replaced by an Environmental Overview and a final Action Plan in 2000, outlining the management responses required within the catchments for the next five years.

The scale and type of coastal activities and operations considered within the LEAPs can vary from area to area, both within individual LEAP boundaries and between adjacent areas. There are, however, certain coastal issues that apply to large parts of the coastal zone and inshore waters. Topic areas have been identified addressing coastal issues, and these are detailed below.

Table 4.17: Actions taken/to be taken by the Local Authorities in Irish study area as identified in the County Development Plans.

<i>County Development Plan</i>	<i>Action</i>
Louth	<ul style="list-style-type: none"> <li>• It is the policy of the planning authority to protect the visual and recreational amenities of the coastline by restricting residential development to within 200 metres of the shore, a grant for planning permission will be considered only when a number of criteria are met.</li> <li>• In considering development proposals for caravan parks, in addition to meeting the normal planning requirements, e.g. access, water, drainage etc., individual proposals should not be harmful to the natural environment and particular account will have to be taken to protect Areas of High Scenic Quality.</li> <li>• Planning applications, which may affect public rights of way of the shoreline, shall be required to preserve public access to the shoreline or beach.</li> <li>• It is the Council's objective to prepare a Coastal Zone Management Plan on a phased basis subject to prioritisation and funding.</li> </ul>
Meath	<ul style="list-style-type: none"> <li>• The plan aims to protect designated cNHAs, SACs and SPAs and protect, where appropriate, catchments from development that would endanger these sites, and to ensure that drainage proposals are consistent with the protection of such sites.</li> <li>• Designation of centres for mixed-use purposes such as residential, business and leisure.</li> <li>• Excellent bathing facilities ensured by providing high quality disposal of wastewater.</li> <li>• The Council recognises the need for a coastal zone management strategy to ensure sustainable development.</li> </ul>
Dun Laoghaire	<ul style="list-style-type: none"> <li>• It is the Council's plan to conserve existing High Amenity and Coastal Amenity Zones and to seek to expand these and other areas to absorb further recreational use without damaging their amenities. They intend to designate and conserve areas of outstanding natural beauty and/or recreational value. Such areas include the sea and coast.</li> <li>• To implement the provision of both water and air pollution legislation in conjunction with other appropriate agencies, in implementing this policy the Council endeavours to maintain the quality of sea water adjoining the county to the necessary standards, with particular reference to areas of the coastline where bathing takes place. Special emphasis will be devoted to beaches designated under the Quality of Bathing Water Regulations.</li> <li>• To severely restrict new development between the coast road and the sea.</li> <li>• To preserve all existing public rights of way and to create new or enhance existing ones in the interest of amenity as opportunities or needs arise.</li> <li>• To prepare a coastal zone management plan to maximise economic, recreational and amenity benefits of the coastline and to ensure that the long term integrity of this prime natural asset is protected.</li> <li>• To improve recreational and tourism-related amenities in its public parks, along the coastline and at the harbours for access by the general public.</li> </ul>
Fingal	<ul style="list-style-type: none"> <li>• Any built development must be handled with care (e.g. around Rogerstown Estuary).</li> <li>• The golf course and agricultural land at Malahide should be retained as a balance between built development and open land,</li> </ul>

Wicklow	<p>further expansion of recreational marine activity in the outer estuary would have detrimental effects on the area.</p> <ul style="list-style-type: none"> <li>• Retain woodland areas.</li> <li>• No further reclamation of estuary land or coastal marshland occurs which could damage coastal habitats.</li> <li>• Any new building or development (including caravans and temporary dwellings) is prohibited within 50m of soft shorelines.</li> <li>• No new habitable structures permitted below 3m (Ordnance Datum Malin) in the interest of public safety and the protection of property and residential amenity.</li> <li>• The Council recognises the damage done to the coastline by coastal erosion and the urgent need for remedial measures - it will undertake coastal defence works where it is considered appropriate and where finances allow and also ensure that all coastal defence measures are assessed for significant environmental impacts.</li> <li>• The Council will seek to preserve SACs and pNHAs and will consider the making of Special Amenity Area Orders and Conservation Orders in respect of these areas.</li> <li>• The Council will control development in the coastal zone in accordance with the objectives set out in the coastal zone management plan (the county is divided up into coastal zone cells and a development policy has been established for each cell).</li> </ul>
Wexford	<ul style="list-style-type: none"> <li>• Coastal zone planning strategy in place since 1993.</li> <li>• Conservation and renewal of the built and natural environment is considered.</li> <li>• Ensuring appropriate development of settlements in open countryside and coastal areas resulting from the requirement to protect heritage resources and the landscape.</li> <li>• Continued development of national roads as key transport corridors providing linkages within the county, to the rest of Ireland, UK and Europe.</li> <li>• Pursuing a zonal policy to concentrate development in built-up areas.</li> <li>• The Council will encourage further development of the aquaculture industry taking into account environmental and habitat protection. Encourage fishing and aquaculture developments that are compatible with existing land/coastal uses such as tourism; support the development of the processing sector and tourism.</li> </ul>
Waterford	<ul style="list-style-type: none"> <li>• The Council aims to achieve sustainable development, particularly within the coastal zone, based on the principles of Local Agenda 21 and the National Coastal Management Strategy. Development will generally be confined to current settlement areas; to prevent pollution of coastal waters and the highly vulnerable groundwater, development will be dictated by the quality and capacity of the local sewerage system.</li> <li>• New wastewater treatment schemes are under tender at Dungarvan and Tramore.</li> <li>• Access to coastal and riverine recreational areas will be preserved and promoted.</li> <li>• The Council aims to maintain a balance between the demand for the construction of holiday homes and stabilising local populations. Development of holiday homes in coastal areas will be carefully controlled, with clusters of sites being encouraged over isolated sites.</li> </ul>

### *Analysis of LEAPs*

A matrix is presented in Table 4.18 illustrating the extent of coverage of coastal issues identified within each LEAP.

Key coastal activities, uses and pressures identified are as follows:

#### ***Development***

Development pressures leading to unacceptable sewage discharges to the coastal environment were found to be an important concern within all of the LEAPs reviewed. Consequently, new housing and other developments contributing to a poor coastal environment are formally opposed by the EAW. As an emerging issue, several LEAPs emphasised the importance of promoting sustainable economic and community development in rural Wales. The economic viability brought to these areas by the tourism and leisure industry was emphasised within all of the strategies as a key concern, as was the need for consideration of the environmental implications of promoting such facilities. In contrast, coastal regeneration and wider coastal economic concerns were attributed more limited coverage.

#### ***Flood Management***

All of the LEAPs analysed identify tidal inundation and flooding problems in relation to low-lying areas and land reclaimed from the sea. Hence, provision for flood-warning systems on statutory rivers and coastal areas appears as a key issue within all of the strategies. In turn, development in areas of tidal flood risk and on vulnerable floodplains is not advocated. The need for strengthening and/or providing additional sea defences, however, are issues raised within only the Anglesey and Eryri/Llyn plans.

#### ***Industrial Activity***

##### *Heavy and Complex Industrial Processes*

Of the industrial activities affecting the coast, more regionally specific issues were highlighted within individual LEAPs. In particular, the Cleddau and Pembrokeshire Coast plans prioritise concerns over the perceived environmental impacts from the operation of the Elf and Texaco Oil Refineries at Milford Haven and Pembroke Dock respectively. In relation to these concerns, the potential effects arising from the closure of the Gulf Oil refinery and National Power's Pembroke Power Station have also been stressed, whilst continued monitoring of migratory salmon stocks following the *Sea Empress* oil spill was a concern raised in the North Ceredigion and Carmarthen area LEAPs.



Table 4.18: Local Environment Agency Plans matrix illustrating the extent of coverage of coastal issues identified within the Welsh LEAPs for the INTERREG II coastline.

<i>Topic Areas</i>	<i>Anglesey</i>	<i>Eryri/Llyn</i>	<i>Meirionnydd</i>	<i>North Ceredigion</i>	<i>Teifi</i>	<i>Cleddau Pembrokeshire Coast</i>	<i>Carmarthenshire</i>
<b>COASTAL ENVIRONMENT</b>							
Coastal Dynamics							
Patterns of Erosion and Accretion			•				
Climate Change							
Flood Risk	•	•	•	•		•	•
Biodiversity/Nature Conservation							
General Conservation							
Designations	•	•	•	•	•	•	•
Improvement/Enhancement							
Fisheries							
Sea Fishing	•	•	•	•	•	•	•
Shellfisheries	•	•	•		•	•	•
Sustainable Harvesting		•	•			•	•
Landscape Quality							
Landscape Character		•		•		•	
Designations, incl. AONBs etc.	•	•	•	•	•	•	•
Landscape Improvement							
Coastal Habitat Protection	•	•	•	•	•	•	•
Mineral Extraction/Aggregates							
Onshore Extraction	•						
Offshore Extraction							
Dredging/Disposal	•				•	•	
Coastal Pollution							
Air						•	
Visual, incl. Light						•	
Litter – Offshore and/or Onshore	•						
Odour						•	

<i>Topic Areas</i>	<i>Anglesey</i>	<i>Eryri/Llyn</i>	<i>Meirionnydd</i>	<i>North Ceredigion</i>	<i>Teifi</i>	<i>Cleddau Pembrokeshire Coast</i>	<i>Carmarthenshire</i>
Noise							
Radioactivity	•	•					
Waste Disposal – Offshore/nr Shore	•					•	
Water – Sewage, Agriculture etc.	•	•	•	•	•	•	•
Public Health							
<b>COASTAL COMMUNITIES</b>							
Built Environment and Heritage							
Quality of the Built Environment							
Design Considerations in Coastal Areas							
Maritime Built Heritage							
Archaeology	•						
Regeneration of Coastal Communities							
Population Change							
Coastal Resorts							
Ports/Harbours	•			•	•	•	
Industrial Communities							
Rural Communities	•	•	•	•	•	•	•
Towns							
Coastal Defence							
Existing Coastal Defences	•	•					
Managed Retreat		•					
Emergency Response Systems	•	•	•	•	•	•	•
Flood Risk	•	•	•	•	•	•	•
Climate Change							
<b>COASTAL ECONOMY</b>							
Competitiveness of Coastal Communities							
Demographic Structure							
Security of Employment		•					•

<i>Topic Areas</i>	<i>Anglesey</i>	<i>Eryri/Llyn</i>	<i>Meirionnydd</i>	<i>North Ceredigion</i>	<i>Teifi</i>	<i>Cleddau Pembrokeshire Coast</i>	<i>Carmarthenshire</i>
Research and Development							
Training and Education			•				
Information Technology							
Transport and Accessibility							
Protecting Coastal Sites for Coastal Uses	•	•	•	•	•	•	•
Coast Related Development							
Alternative Energy, including Wind Power and Tidal Power							
Oil and Gas		•				•	
Conventional Energy	•						
Pipelines and Telecommunications							
Port Expansion and Regeneration	•			•	•	•	
Navigation and Dredging	•				•	•	
Wastewater Treatment	•	•	•	•	•	•	•
Housing and other Development	•	•	•	•	•	•	•
<b>RECREATION</b>							
Land Based	•	•		•		•	•
Water Based	•	•	•	•	•	•	•
Public Access	•	•	•	•		•	•
Coastal Tourism							
Development of Existing Facilities	•	•	•	•	•	•	•
Creation of New Facilities						•	
Improvement of Infrastructure		•		•		•	
Marketing and Promotion							
<b>COASTAL ACCESSIBILITY</b>							
Transport and Communications							
Airport Development							
Bus etc. Network Improvement							
Rail Infrastructure	•	•	•	•	•	•	•
Road Infrastructure	•	•	•	•	•	•	•

### *Processes Involving Radioactive Substances*

The Eryri/Llyn LEAP was the only strategy where concerns over the disposal of nuclear waste were raised as a specific issue requiring management. This particularly referred to the decommissioning of the Trawsfynydd Nuclear Power Station, and the need to ensure compliance with the UK Government's radioactive waste management policy in order to minimise any potential discharges of radioactive waste into the Glaslyn catchment.

### *Mineral Extraction (mining, dredging and quarrying)*

Concerns about the impacts on the environment from maintenance dredging and/or spoil dumping around harbours and estuaries were highlighted in the Anglesey, Teifi and Cleddau and Pembrokeshire Coast LEAPs.

The problems associated with abandoned mines from which discharges of mine water and acidic runoff pollute streams and rivers are raised in all of the LEAPs analysed. However, the effects cited relate to localised impacts, mostly of low significance, in the upper reaches of catchments. Hence, the potential effects posed to coastal water quality from former mining activities throughout much of upland Wales are rarely, if at all, discussed.

### *Commercial Activity*

#### *Agriculture*

Within all of the LEAPs under review, the predominant land use activity is agriculture, predominantly stock rearing of sheep and cattle, and dairy farming. Of the cited coastal related issues, diffuse inputs and nutrient enrichment leading to oxygen depletion in waters and the development of estuarine algal blooms are commonly referred to. Perhaps more important, is the potential damage also indicated to watercourses, and therefore coastal habitats, as a result of increased use of organophosphate and synthetic pyrethroids in sheep dips.

#### *Fisheries and Shellfisheries*

Concerns about a number of fisheries issues were identified in the LEAPs. For example, most rivers have seen a decline in migratory salmon and sea trout stocks, as well as showing signs of sub-optimal spawning in recent years. The need for improved salmon management plans and support for restocking schemes have been emphasised as necessary to maintain fishing levels important to the local anglers and tourism industry.

Over-exploitation of sea trout and salmon by commercial sea fisheries and the impacts of inshore drift and fixed netting have, in turn, been linked as contributory causes of the decline in numbers and/or late running of salmonids. Consequently, reviews of Net Limitation Orders (NLOs), the enforcement of Sea Fisheries Committee bylaws restricting netting during specific periods, and stricter controls over illegal fishing are all addressed within the LEAPs mentioned.

In relation to these concerns, the Meirionnydd, North Ceredigion and Carmarthen LEAPs identify the importance of bylaws that set seasonal closures and prohibit the use of mechanical gatherers in attempts to maintain sustainable shellfish harvesting in their respective areas. Indeed, the plans for the Cleddau and Pembrokeshire Coast also highlight a scheme under evaluation by the South Wales Sea Fisheries Committee (SWSFC) to enhance natural lobster populations by restocking with juvenile lobster using native brood stock.

### *Waste Processing and Disposal*

The most common issues raised in the LEAPs relate to the threat to coastal waters posed by sewage effluent. The LEAPs highlight the need for improvements to sewerage treatment works, and combined sewer overflows, by Dwr Cymru Welsh Water. There are cases where untreated sewage is still discharged into coastal waters, which inevitably leads to aesthetic and

bacteriological concerns. Good bathing-water quality is particularly important to the tourism industry and is therefore intimately linked to further capital investment in these issues.

Regionally specific concerns were also raised within individual LEAPs. High concentrations of organochlorine pesticides (PCBs) and their potential effect on porpoises, dolphins and grey seals in Cardigan Bay have been highlighted in the North Ceredigion LEAP. A key concern emphasised in the Anglesey plan is the potential impact of discharges of bilge water and waste from boats using the Menai Strait.

### ***Recreation and Amenity***

Of the recreational issues covered in all the LEAPs, the need to maintain or improve coastal access, notably footpaths, was raised as an important issue. In terms of the increasing types and scale of water sport activities, the LEAPs also highlighted potential conflicts of use and in relation to this, the need for recreational strategies. The problems associated with seasonal increases in tourist traffic were identified as a particular topic of concern in the Eryri/Llyn plan. Adequate road and rail networks are seen as vital to the long term development of the tourism industry in all of the respective areas.

Other general concerns indicated in the LEAPs reviewed for this project include: improving the standards set by EC and other bathing waters, and the better provision of information and improvements to existing facilities.

### ***Conservation of Wildlife and Heritage***

Of the LEAPs reviewed, all commented on the conservation importance of coastal habitats and species. These comments fall into two categories: (1) those relating to protected or designated sites such as candidate Special Areas of Conservation (cSACs), Environmentally Sensitive Areas (ESAs), Marine Nature Reserves (MNRs), Areas of Outstanding Natural Beauty (AONB) and National Parks etc.; and (2) those referring more generally to the wildlife and landscape character of their area.

### ***Conclusions on LEAPS***

The appraisal above identifies broad categories within the LEAPs that cover coastal-related issues. While there is consistency in approach between the plans, the degree of coverage of coastal issues across the main topic areas varies according to the nature of the area they encompass. In so doing, a review of the LEAPs is helpful in identifying places where particular issues and problems require action. In addition, the LEAP process allows for an annual review of actions undertaken by EAW, together with the production of a new LEAP Consultation Report after five years. In this respect, it is clear that these plans provide a very useful resource to coastal managers, which is freely available on the website: <http://www.environment-agency.wales.gov.uk/leaps/index.htm>

There is however an overall absence of socio-economic considerations within the LEAPs (Ballinger, 1997). In this context the current and forthcoming UDPs produced by the Local Authorities should provide an important opportunity to address the current needs of coastal communities.

## **4.17 Additional Information Sources**

A DEFRA-sponsored workshop held in Lowestoft in June 1999 provided an insight into the various coastal zone mapping projects that have been carried out in the UK. The workshop dealt primarily with the theme of integrating marine and coastal area information; its main aim was to help determine a future direction for marine and coastal area mapping in the UK. Some of the projects that were discussed included:

- The *Coastal and Regional Seas Directories Project*, which consists of publications collating information on national and regional overviews of the natural resources and human activities of the North Sea coastal margin, the UK and the Isle of Man coastal zones. It includes software providing a map-based interface into the coastal directories through which dot maps, contextual data and the full text of the directories can be accessed;
- *UKDMAP* (United Kingdom Digital Marine Atlas Project), which aims to provide a wide-ranging and easily updated reference work on the marine environment around the UK, of use to the scientific, educational and commercial sectors, and also to assist in determining data availability;
- *MarLIN* (Marine Life Information Network), a system which provides comprehensive information about marine habitats, communities and species around Britain and Ireland.

Additional mapping projects covering the Irish and Welsh coastal zones and parts of the UK include:

- *RACER* (Risk Assessment and Collaborative Emergency Response in the southern Irish Sea), a Maritime INTERREG II project completed in 2000. This project, co-ordinated by the Nautical Enterprise Centre (NEC-CIT), included assessment of coastal sensitivity carried out by the Coastal Resources Centre (CRC-UCC). The CRC produced a GIS, mapping coastal habitats of the east and southeast Irish coast and the Welsh coastline. The information collected pertained to sensitive species, habitats and resources that could be vulnerable in the event of an oil spill.
- *SensMap* (Sensitivity Mapping of the Coastal Marine Environment in the Southern Irish Sea) was funded under INTERREG II. This was a sensitivity mapping project providing information on the sensitivity of marine communities and identifying the main marine biotopes (communities) in the Southern Irish Sea with the aim to develop a model for assessing and mapping the sensitivity of marine life to maritime activities (Cooke *et al.*, 1998). This project intended to support the implementation of SACs under the 1992 EC Habitats Directive, and contribute to sustainable marine and coastal management.
- *BioMar*, a project funded by the EU LIFE programme, involved surveys of marine habitats and biotopes in Britain and Ireland and the subsequent development of a marine biotope classification. Computerised systems for data storage, analysis, presentation and dissemination were also developed. The project also put forward suggestions for candidate sites for nature conservation. (<http://www.ecoserve.ie/biomar/biomar.html>).
- *ERIS* (Emergency Response Information Systems), an INTERREG II project whose aim was to help co-ordinate and improve existing marine emergency planning and response in the Southern Irish Sea.
- *Irish Sea MIS* (Marine Information System), an INTERREG II project which developed a website for the Wexford and Pembrokeshire coasts. It demonstrated a need for readily available and easily disseminated coastal and marine information. (<http://www.irishsea-mis.org>).



## 5 Conclusions

### 5.1 Management of the Coastal Zone

Since the 1990s, there has been an increasing necessity for the management of coastal and marine resources in Ireland and Wales. This necessity has arisen locally, regionally and nationally, as well as from the EU, in response to the increased pressures from human impacts. There are also increasing demands to provide greater amenity and recreation access to coastal and marine resources; such access may contribute to the degradation of the coastal and marine environment. This is in tandem with concern for the widespread loss of coastal and estuarine habitats and wetlands from development.

#### *National Scale*

In Ireland, the County Development Plans (up to MHW) and the newly emerging River Basin Management Plans address Integrated Coastal Zone Management (ICZM) (up to one nautical mile offshore). In Wales, a range of management plans exist: County Development Plans (CDPs), Unitary Development Plans (UDPs), marine Special Areas of Conservation (SACs) management plans, heritage management plans, LEAPs, shoreline management plans, estuary management plans, and Coastal Habitat Management Plans (CHaMPs). Commercial harbours also have harbour development plans. However, there is still scope to include more detail in CDPs in Ireland, and in UDPs in Wales, on policies and procedures for coastal development and resource management.

The EU guidelines on ICZM should be incorporated into the development of an ICZM strategy in both Ireland and Wales. In Ireland, the sectoral approach to the management of the coastal zone still persists. Impacts on the coastal zone may be of concern to an organisation with no authority over the activities driving this impact. Progress is evident in the response to the forthcoming demands of the Water Framework Directive (WFD). The requirements for implementation of the WFD in Ireland focus attention on the need for more cohesive integration between Local Authorities and the DoMNR. Recent changes in the government structures of both England and Wales, following the Government of Wales Act 1998, have led to the transfer of many statutory responsibilities to the National Assembly for Wales (former Welsh Office). To date, there is no national strategy for ICZM in Wales. There is, however, a review prepared by English Nature that focuses on an implementation framework, within which national marine conservation measures might be applied UK wide (Laffoley *et al.*, 2000).

#### *Regional Scale*

Within any national response to ICZM there is also scope for regional measures to be implemented. The Irish Sea Forum addressed the concept of regional management at their Conference 2000 – An Environmental Review of the Irish Sea. The forum concluded that the management of the environment and the resources available in the region require the participation of the public, the users of marine resources and local and regional government in decision making. This participation would be easier to achieve if the management were locally based and not remote (Irish Sea Forum, 2000). A regional approach would also involve integrated management and it would promote greater co-ordination. Such a framework would maximise available resources and research capabilities.

There is a large corpus of information and knowledge on ICZM, yet those to whom it applies, namely Local Authorities and Government Departments, do not appear to be adequately informed, nor do they have the capacity to implement management strategies. Coastal fora at a regional level would allow integration between various interest groups. In a questionnaire-based survey of research activity and key issues relating to sustainable coastal zone development in Wales (undertaken by the Welsh team) the co-ordinated approach to coastal zone management

was highlighted by the almost unanimous participation of all of the respondents on various fora, including Afordir, the Green Sea Partnership, and the Wales Coastal Forum (see Appendix II).

## **5.2 Data Acquisition and Data Management**

The European Environment Agency (EEA) has identified the use and implementation of Geographic Information Systems (GIS) in the marine and coastal environment as a priority objective for the future. Other priority areas in the coastal environment include data flow and indicator development (EEA, 2001). Boelens and O'Sullivan of the Irish Marine Institute also highlighted the use of GIS as a means of achieving increased efficiency for assessment of impacts and developments (see CEED UK, 2000a). Throughout the present study the lack of data relating specifically to the study areas, and more specifically to their coastal zones, became apparent. The majority of datasets relating to the specific themes addressed in the study were developed on a national scale without the capacity to extrapolate regional data. Similarly, wherever data are collected, they are not always categorised or available in a format compatible with assessing relevance to activities in the coastal zone. Another fundamental problem is that datasets are not always collected over comparable time periods, resulting in difficulties in establishing trends or correlations.

Priority areas in which quantitative data, particularly at a regional level, are regarded as absent or inadequate include:

- Tourism and recreation pressure impact assessment;
- Climate change and the subsequent impacts of sea level rise, flooding and erosion;
- Pressure of development, particularly housing and port development;
- Biodiversity (the absence of a records centre inhibits the compilation of data, and the tracking of habitat loss) and the enforcement of protection;
- Impacts on ecologically sensitive coastal sites;
- Data on water quality and indicators for the entire waters of the INTERREG II area;
- Environmental impacts of fishing, particularly investigations into by-catch and health of stocks.

### **5.2.1 Development of Indicators**

The marine environment is under constant pressure from human activities. These anthropogenic pressures vary in magnitude from local (e.g. litter on beaches) to international (e.g. climate change) problems. The difficulty associated with assessing these impacts and predicting the cumulative effects of such pressures was evident over the course of the present study. The use of environmental indicators for monitoring environmental change and producing quantitative data is becoming more prevalent. Assessments in international fora are also moving towards indicator-based reporting systems.

Research into the development of indicators is at an early stage in Ireland and work is ongoing in many policy fields by a number of organisations (e.g. Environmental Protection Agency, Marine Institute, Central Statistics Office). Indicator research conducted by the Environmental Protection Agency includes some refinements to the traditional DPSIR (driving force, pressure, state, impact and response) framework, which is advocated by the Organisation for Economic Co-Operation Development (OECD). In Ireland, evaluating the impact of Structural Funds is hampered by the lack of comparable and comprehensive data. In the UK, the Centre for Environment Fisheries and Aquaculture Science (CEFAS) has conducted research on environmental indicators.

The quality of any specific indicator developed will depend on the quality of data available, and it is obvious that in a number of areas the availability of data is limited. While indicators cannot be assumed to provide an objective measure of sustainability, they can be used to measure trends.

The complexity, particularly in Ireland, involved in establishing trends in human activity conveys the potential significant role of indicators.

### **5.2.2 GIS**

The significant advances made in the development and application of GIS technology at an academic level should be applied where possible by statutory agencies to the management of environmental resources. The range of GIS applications available includes GIS for monitoring land-use change, optimal site selection for development/protection, oil spill response co-ordination, etc. While use of GIS within Local Authorities is increasing, they still largely use GIS as a visualisation tool. Thus, GIS is not exploited to its full potential, for example for carrying out complex spatial analyses.

### **5.2.3 Research**

The findings of many environmental management R&D studies rarely project beyond the lifetime of the research. For a combination of reasons recommendations from the reports produced by research projects are not implemented, or considered, by the relevant authorities. As a result, the finance invested in generating the research is not recouped via implementation of recommendations by agencies and authorities. These shortfalls in implementation deprive the country's environment of the benefits to be gained by applying the results, recommendations and tools developed from investment in research.

### **5.2.4 Access to Funding**

In Ireland, neither the DoMNR nor the DoELG provide specific funding for ICZM. However, in its strategy for the period 2001-2003, the DoMNR has highlighted that it will use the development of proposals for marine and coastal zone management as a performance indicator. INTERREG III is particularly directed towards funding ICZM pilot schemes in both Ireland and Wales.

## 6 Recommendations

### 6.1 Management of the Coastal Zone

- Recognise and implement the recommendations of the *EU ICZM Strategy* with the aim of developing national ICZM strategies. Implementation of a national coastal zone and marine resource management strategy is required to assist Local Authorities, harbour authorities and development agencies to include ICZM in their work.
- Participate in the proposed EU wide *ICZM Observatory*, to be established as a focal point for collection and administration of good practice and advice in relation to ICZM.
- Under the *precautionary principle*, categorise activities as permitted, controlled, discretionary, non-compliant or prohibited to aid the prioritisation of intervention.
- Analyse the multiple uses of particular coastal areas; such analyses would include an *assessment of conflicts and possible solutions*.
- Re-appraise *coastal zone management responsibilities* and initiatives within Wales and Ireland.
- Develop *co-ordination and co-operation* between agencies and authorities. Throughout the consultations with groups in both Ireland and Wales, representatives of various agencies reported that they would welcome the opportunity to learn more about the issues involved in ICZM. Ireland could examine the Welsh approaches to the management of marine and coastal areas.
- Consider the adoption of the *INTERREG II area as a regional entity*, and its management as such. This is in line with European practice in other regions, e.g. the Baltic and Mediterranean Seas.
- Establish *coastal and marine fora* to facilitate vertical and horizontal integration. They could advise on approaches to ensure adherence to EU policies and the OSPAR Convention. It would be appropriate for a pilot coastal forum to be established in the INTERREG II area; this would allow Ireland to liaise closely with the Welsh initiatives.
- Encourage the development of *local groups and organisations* such as the Bannow Bay Coastal Zone Management Group (BBCZMG) and the Bantry Bay ICZM Charter along the Irish coastline. These groups require financial support to ensure continuity; a national focal point is also desirable. *Community involvement* ensures careful consideration and consensus-based planned management of the coastal zone. This works towards reducing the magnitude of future human impacts on the coastal zone and closer monitoring of associated activities.
- Develop strategies for the maintenance and enhancement of *public access* to the coastal zone. The right of public access to the coastal zone should be consolidated by documenting (as far as is practicable) the location and extent of public access areas. Exclusive occupation of the coastal zone should be restricted if it prohibits public access, except where such restriction is required in commercial port areas for reasons of public safety or security or for conservation. The demand for recreational space should also be addressed by any future strategy.

- It may be necessary to limit access to certain areas, particularly those that are environmentally sensitive. Such restrictions should only be proposed to: protect areas of significant indigenous vegetation and/or significant habitats of indigenous fauna; protect areas of cultural/archaeological heritage; protect public health or safety; and ensure a level of security.
- Address Ireland's poor record in *enforcing European environmental Directives* (notably the Habitats and EIA Directives). A greater respect for and adherence to designations for protection of habitats is required. Habitats that are not afforded official EU designation as SACs or SPAs should be considered for national or local designations. Provision should be made for the *protection of habitats and species* in the coastal zone that are important for cultural, recreational, traditional or commercial purposes within the coastal zone. Monitoring measures need to be increased to fully assess the cumulative impacts of a number of activities on the coastal zone. The concept of retaining a buffer zone to control development within a certain distance of designated areas should be considered.
- Develop an updated *inventory of status of coastal land and habitats* around Ireland and Wales. This would allow comparison with the LACOAST project and others, and produce a profile of the changes in morphology of coastal areas. This would in turn provide an indication of development pressures and threats to vulnerable areas. Aerial photographic surveys could also be used to profile changes in habitats and areas.
- *Codes of conduct* should be developed for eco-tourism activities and for the general public, particularly in environmentally sensitive areas. The *carrying capacities* of areas of high ecological value should be established.
- Adopt a more adequate *approach to EIA review procedures* in Ireland. The use of a statutory body to review EIAs should be initiated, as is the case in Wales. The process whereby the developer appoints the consultant to carry out the EIA is at risk of bias or inappropriate interpretation of results.
- Increase vigilance by *Local Authorities to monitor proposed development* works. Each coastal development should have an evaluation of the vulnerability, temporal sensitivity and recovery potential of the receiving environment, and the geographical extent of its effect. Despite the existence of well-established coastal legislation to control development (e.g. the Foreshore Act, in Ireland) the coast continues to be impacted by unlawful and often controversial developments. In certain instances both the Irish and Welsh coastlines have been physically damaged before intervention has occurred.

## 6.2 Data Acquisition and Data Management

- Establish a scientifically rigorous approach to the development of sound and meaningful *indicators* of the status of coastal and marine environmental quality; only then will trends be accurately identified, allowing for more strategic planning.
- Improve the *monitoring* of trends by further developing appropriate indicators. Ireland needs to develop indicators to track environmental impacts and to identify the environmental dimensions within various operational programmes (EPA, 2000a).
- Accommodate the *collection of data* in a consistent manner. Common methods of collecting statistics allow for meaningful comparisons, in terms of analysing trends in human activities in the coastal zone. It may be possible to agree on common methods for

data collection in some cases, but it would not be practicable to achieve agreement across all the relevant agencies.

- Develop a *central repository for datasets* associated with marine and coastal resources and socio-economics in both Ireland and Wales. A central repository would ensure that trends would be adequately monitored; and issues documented. Such a database should also be capable of disseminating information at a regional level, therefore satisfying national and regional demands. A policy on types and format of data to be collected should be developed. There should be clear information paths to assist in the location of relevant data. Agreement on national metadata standards for coastal spatial datasets would also facilitate sharing of data in different formats, projections etc. between different agencies. Typical metadata for geographic data would include: ownership details, lineage details, availability, cost, coverage, scale and update frequency etc.
- *Maintain and update GIS systems.* Where coastal and marine GIS initiatives have been generated from research projects with funding limitations, there should be a national capacity to maintain and update the GIS. This would ensure that the valuable information held within the system continues to be available and of relevance to responsible agencies and authorities. The GIS developed for INTERREG II projects such as RACER, ERIS and SensMap are of particular importance in this context. An overview of existing data sets and information should be compiled. This would prevent future duplication of effort.
- Develop tools that *allow data holdings to be interpreted* to suit a variety of users. The existing sources of data are numerous, and often collected to suit particular purposes. Difficulties arise when the spatial extents of existing datasets are not compatible with the needs of a particular user. For instance, estimates of percentage population living in the coastal zone quoted by Boelens *et al.* (1999) vary from 45% (1972) to 33% (1992), depending on how the coastal zone is defined as well as the date of estimation. However, in practice institutional and physical boundaries in coastal areas are rarely contiguous.
- Agree across agencies at a national level on the selection of standard parameters to use in geostatistical methods of interpreting coastal data. Standard *methods of spatial data manipulation*, based on, for example, tessellation or interpolation, could be agreed for a number of defined coastal zone boundaries to suit a variety of users. Many agencies with responsibilities in the coastal zone make use of GIS. Agreed standard parameters and methods could be incorporated into their systems as part of their present analytical practices.
- Establish a *forum to address the issues of data standards*, indexing, transfer and storage. This forum would provide a focus for increased co-ordination and co-operation between agencies and authorities.
- Acknowledge that a relative *lack of knowledge* about coastal processes and the effects of activities on coastal processes necessitates a precautionary approach towards proposed activities, particularly those whose effects are as yet unknown or poorly understood.
- Enhance communication between administration and the research community as this would facilitate the development of more *applied research*. Research should be more issue led, not data led. Issue-led research may consolidate future funding and maintain datasets.
- Consider the development of a *researcher exchange programme* for future Maritime INTERREG projects to maximise the benefits of integrated collaboration.



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## Appendix I Legislation of Relevance

As members of the European union, Ireland and the UK adhere to a number of environmental policies and Directives covering aspects of environmental quality, protection and conservation.

### *Ireland*

Gibson (1999) detailed the legal jurisdiction of relevance to coastal areas throughout Europe, while Crosbie (1995) summarised the situation in Ireland.

The DoMNR is the main Government Department responsible for the coastal environment of Ireland, and has executive functions in the coastal zone. The Department of the Environment and Local Government (DoELG), through the Local Authorities, has responsibility at the local level. The jurisdiction of the Local authorities traditionally extended to MHW. New powers granted under the Planning Act 2000 ensure jurisdiction over any development on the foreshore that adjoins the functional area of the Local Authority. The Department of Arts, Heritage, Gaeltacht and the Islands (DoAHGI) has two constituent services which have direct responsibility in the coastal area, namely Dúchas, the Heritage Service, and the National Parks and Wildlife Service, a division of Dúchas, with responsibility for the conservation and management of the natural heritage (DoAHGI, 1998).

In Ireland, the functions of the Government Departments are governed by a large number of enactments, most of which deal separately with issues such as planning, coastal protection, fisheries, mineral exploration and water quality. This sectoral approach does not promote the development of integrated policy, and there is an obvious division between terrestrial and marine measures. In addition, there is a lack of adequate statutory provision for consultation. Regulatory authorities are frequently at odds in their prioritisation of issues of the coastal zone. For example, a local planning authority may adopt a conservation approach to the area behind the MHW, while the Department of the Marine and Natural Resources (DoMNR) may promote an industrial development on the adjacent foreshore.

The law controlling development on the foreshore was regarded by Gibson (1999) to be significantly outdated and due for review. State foreshore (between mean high and low water marks, based on common law) and the territorial seabed are under the jurisdiction of the DoMNR. The Foreshore Acts 1933-1988 regulate their use and empower the DoMNR to grant leases and licences for developments and activities in these areas. However, there are no time limits for processing applications, there is little opportunity for public participation, and up until the enactment of the Planning Act 2000, the procedure was not integrated with the landward planning system

In an attempt to harmonise the activities of the DoMNR and local planning authorities, in 1999 the Minister for the Marine and Natural Resources stated that future foreshore licences and leases would be granted only to those developers who obtain planning permission from the appropriate Local Authority for the entire development, including areas below the MHW. As stated above, harmonisation was further addressed under the Planning Act 2000.

***International Conventions of relevance to the coastal zone in Ireland and Wales***

Ramsar Convention on Wetlands 1971 and Protocol 1982;  
Convention on Biological Diversity 1992;  
UN Convention on the Law of the Sea (UNCLOS) 1994;  
Washington Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (UNEP) 1995;  
UNESCO World Heritage Convention 1972;  
Bonn Convention on the Conservation of Migratory Species 1979;  
Bern Convention on the Conservation of European Wildlife and Natural Habitats 1979;  
UN Agreement on Straddling and Highly Migratory Fish Stocks 1995;  
UN FAO Code of Conduct for Responsible Fisheries (1995);  
Convention for the Protection of the Marine Environment of the Northeast Atlantic (OSPAR) Convention 1992.

***EU Directives of relevance to the coastal zone in Ireland and Wales***

***Habitats and the Environment***

Directive on the Conservation of Wild birds (97/49/EEC) – Special Protection Areas (SPAs);  
Habitats Directive (92/43/EEC) – Special Areas of Conservation (SACs);  
Directive on Other Substances: Protection of the Aquatic Environment of the Community (76/464/EEC);  
Directive on Waste Disposal (75/442/EEC);  
Directive on Disposal of Waste Oil (87/101/EEC);  
Directive on Disposal of Polychlorinated Biphenyls and Polychlorinated Terphenyls (96/59/EEC);  
Strategic Environmental Assessment (SEA) Directive (pending);

***Shipping***

Council Directive 96/82/EC, the Control of Major Accident Hazards Involving Dangerous Substances (COMAH);  
Council Directive 93/75/EEC, minimum requirements for vessels bound for or leaving community ports and carrying dangerous or polluting goods.

***Water Quality and Management***

Directive on Urban Waste Water Treatment (91/271/EEC);  
Directive on the Quality of Shellfish Waters (79/923/EEC);  
Directive on the Quality of Bathing Waters (76/160/EEC);  
Directive on Integrated Pollution Prevention and Control (IPPC) (96/61/EC);  
Directive on Quality of Water for Human Consumption (91/692/EEC);  
Directive on Water suitable for Fish-breeding (78/659/EEC);  
Directive on Surface Freshwater: methods of measurement and analysis (79/869/EEC);  
Directive on Surface Freshwater: quality and control requirements (75/440/EEC);  
Water Framework Directive (2000/60/EC).

***Principal National legislation of relevance to the coastal zone in Ireland***

Coastal Protection Act 1963;	Continental Shelf Act 1968;
Dumping at Sea Act 1996;	Environmental Protection Agency Act 1992;
Fisheries Acts 1959-1998;	Foreshore Acts 1933-1998;
Sea Pollution Act 1991;	Water Pollution Acts 1977-1990;
Harbours Act 1996;	Minerals Development Acts 1940-1995;
Waste Management Act 1996;	Wildlife Act 1976; Amendment, 2000.
European Communities (EIA) Regulations 1989;	European Communities (Natural Habitats)
Local Government (Planning and Development)	Regulations 1997.
Acts 1963-1998;	
Planning Act 2000	

***Principal National legislation of relevance to the coastal zone in Wales***

Coast Protection Act 1949;	Continental Shelf Act 1964;
Crown Estate Act 1961;	Dockyard Ports Regulation Act 1865;
Environment Act 1995;	Environmental Protection Act 1990;
Fisheries Act 1981;	Fishery Limits Act 1976;
Harbours Act 1964;	Harbours, Docks and Piers Clauses Act 1847;
Land Drainage Act 1991;	Protection of Military remains Act 1986;
Merchant Shipping Act 1995;	Salmon and Freshwater Fisheries Act 1975;
Petroleum Act 1998;	Town and Country Planning Act 1990;
Pilotage Act 1987;	Food and Environment Protection Act 1985;
Protection of Wrecks Act 1973;	Wildlife and Countryside Act 1981;
Sea Fisheries Act 1968;	Sea Fisheries (Wildlife Conservation) Act 1992;
Sea Fisheries Regulation Act 1966;	Sea Fisheries (Conservation) Act 1967;
Sea Fisheries (Shellfish) Act 1967;	Water Industry Act 1991;
Water Resources Act 1991;	Conservation (Natural Habitats) Regulation 1994;
Merchant Shipping and Maritime	
Security Act 1997;	
Town and County Planning (EIA England and	
Wales Regulations) 1999.	

## APPENDIX II Analysis of Sustainable Coastal Zone Management Initiatives in Wales

The Centre for Research into Environment and Health (CREH) in Wales, conducted a questionnaire-based survey of research activity and key issues relating to sustainable coastal zone development in Wales. Due to time constraints the results of this survey are preliminary and should not be seen as the conclusive comment on current coastal sustainability research within the study area. Nonetheless, it was hoped that this preliminary survey would generate useful information.

The aims of the survey were:

- To highlight understanding of sustainability and current coastal zone management practice;
- To assess the public perception of the impacts of human activities on coastal systems and resources;
- And to help identify the types of data available on human-related coastal zone impacts.

### *Questionnaire analysis*

The relevant data were collected by postal survey conducted during November 2000. A total of 33 questionnaires were sent to 27 organisations with key responsibilities for the coastal zone of west Wales. Potential respondents were identified from the Joint Nature Conservation Committee (JNCC) coastal directory series for Region 12 (Barne *et al.*, 1995), typically the head or lead researcher for each organisation/authority was contacted. Ten of these organisations were planning authorities and eight were wildlife trusts. The remainder consisted of representatives from the North and South Wales Sea Fishery Committees (NWSFC and SWSFC), CCW, EAW, Welsh Development Agency, Dwr Cymru Welsh Water, Marine Conservation Society, Royal Society for the Protection of Birds and the Wales Tourist Board. Responses were received from 13 organisations giving a response rate of almost 40%. The level of response from national coastal fora as a percentage of this total response is illustrated in Figure 1. However, considering that several Local Authority departments gave a joint response, a more representative rate of around 48% has been assumed.

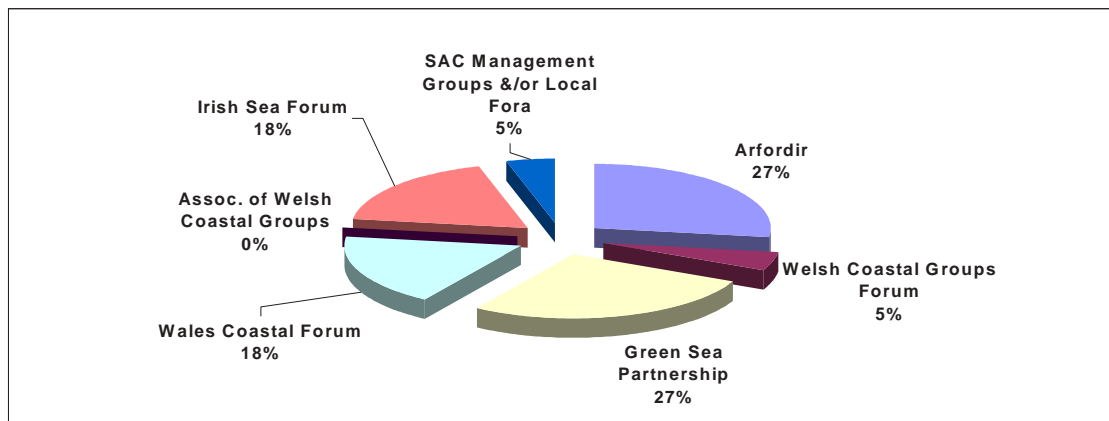


Figure 1: Level of Welsh national coastal fora consultation: frequency as a percentage of the total responses to the questionnaire.

Principal features of questionnaire included;

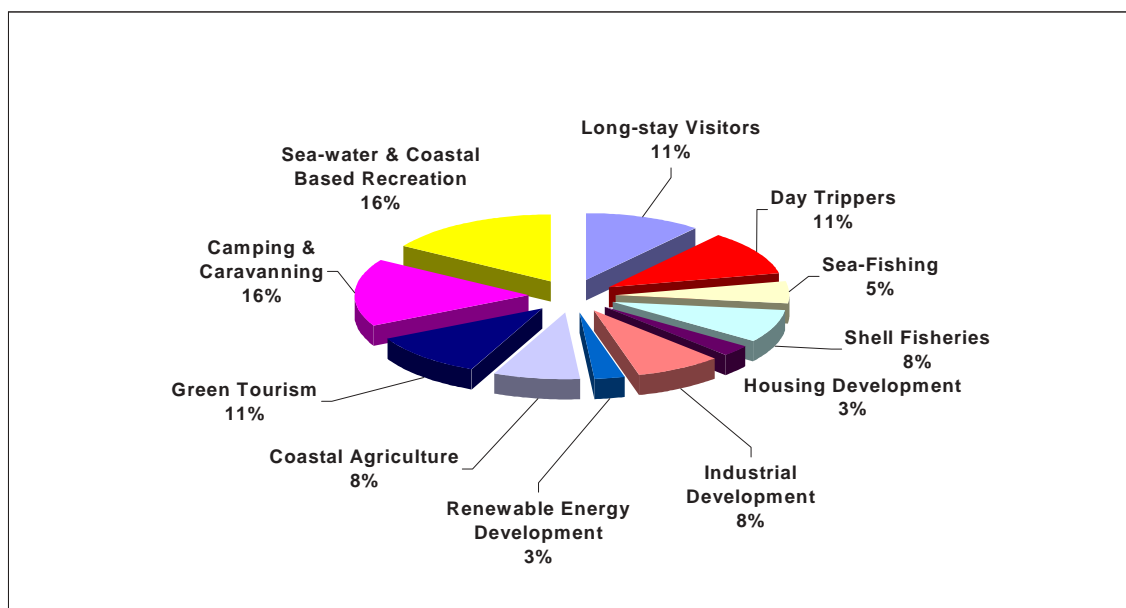
- Awareness of the recent all-Wales strategy on sustainable development;
- The scale and focus of coastal and/or marine-related research;
- The availability of resources and collaborative links between organisations;
- The cited importance of human activities and operations on the sustainable development of the coast (Figure 2 and Figure 3) and
- The identification of information needs, and hence gaps in present coast-related research.

Conclusions drawn from the analysis of the returned questionnaires are as follows:

- Respondents were in general very familiar with the recent National Assembly for Wales strategy document on sustainable development;
- For 84% of the respondents' research activity that addressed sustainable coastal zone management represented no more than 25% of their work activity over the preceding five years;
- Habitat conservation and biodiversity were highlighted as having the strongest research profile, confirming the cited importance of EU Directives, and Natura 2000, as key drivers in coastal zone research;
- Notwithstanding the Countryside Council for Wales, the issue of limited resources and funding were raised by most organisations as a principal factor inhibiting them from dealing with sustainable development.

Overall, all respondents recognised the importance of *integration* in sustainable coastal zone management. This recognition is also evident by the number of formal and voluntary collaborations identified including: intergovernmental, interagency, intersectoral and intramanagement partnerships. This co-ordinated approach to coastal zone management was further illustrated by the representation of nearly all respondents to Wales-wide coastal fora, namely: Afordir, the Green Sea Partnership and more recently, the Wales Coastal Forum.

Figure 2: Perception of major human activities on the Welsh coast: frequency as a percentage of the total responses to the questionnaire.



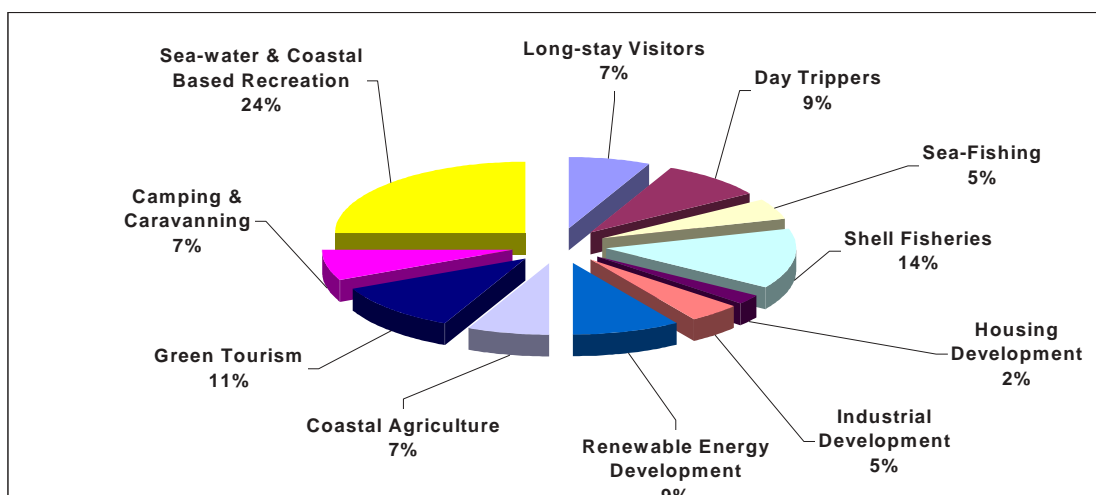


Figure 3: Perception of major human activities on the Welsh coast, increasing in importance: frequency as a percentage of the total responses to the questionnaire.

## Summary Results of Welsh Questionnaire

### Research Activity

#### Question 1:

**Q.1** How familiar are you with the National Assembly for Wales's scheme for sustainable development?

This question was an attempt to identify the level of awareness of the National Assembly's Sustainable Development scheme, as set out in the consultation document *A Sustainable Wales: Learning to Live Differently* (NAW, 2000a). The results showed a generally consistent picture between respondents, with 68% familiar with the scheme, and a further 16% being very familiar or having read it in detail.

#### Questions 2, 3, 4 and 5:

**Q.2** Over the last three years, what proportion of research activity by your department has addressed sustainable coastal zone management?

**Q.3** Where would you place the principal focus of coastal and/or offshore research within your department or organisation?

**Q.4** Is compliance with national and/or EU policies, targets and legislation a factor in your research?

**Q.5** If yes, what targets or strategies do you consider to be key incentives?

The aim of these questions was to assess the scale and direction of research activity taking place on the Welsh coast. A related issue was the importance of statutory and/or non-statutory policies etc. in determining the focus of work carried out by participants.

For some 84% of respondents, research on sustainable coastal zone development constituted less than 25% of their work activity during the last three years. Rather, monitoring and surveillance data gathered by state agencies or academic institutions is mostly used to fulfil their information needs. It appears, however, that the term "research activity" used in this survey may have been misleading. A wider interpretation had been intended, so as to identify more broadly what *work*



relevant to sustainable coastal zone management was being performed. In the remaining questions, we have ascertained that most respondents generally adopted this broader approach.

Of those organisations that responded to question 3, more than two thirds indicated that habitat and biodiversity conservation was a major focus in their work. This result is perhaps not surprising given the bias of the survey towards a number of agencies and other groups with responsibility for the protection of the environment. Next in importance was recreation and tourism, with 85% of respondents indicating this as an important focus, along with 38% noting fisheries as an important research area. Priority regarding bathing water quality was mixed, whilst coastal erosion and infrastructure development appear to have been less important to current research activities.

The above, however, may indicate sample bias, and result partly from a failure of the exercise to obtain adequate coverage of all organisations engaged in coastal research. Alternatively, the low level of focus shown towards aquaculture, which was a minor work concern for 39% of respondents, is consistent with the relative lack of this activity around the Welsh coastline. Other work related issues raised by respondents included dredging and waste disposal, and chemical pollution as well as eutrophication matters. The results suggest that most respondents (85%) consider compliance with EU legislation to be a key factor in their work. Key drivers include:

- Habitats Directive (92/43/EEC) – Special Areas of Conservation (SACs);
- Directive on the Conservation of Wild Birds (97/49/EEC) – Special Protection Areas (SPAs);
- Directive on the Quality of Bathing Waters (76/160/EEC);
- Directive on the Quality of Shellfish Waters (79/923/EEC);
- Directive on Urban Waste Water Treatment (91/271/EEC);
- EU Water Framework Directive (2000/60/EC)

Focus of coastal related work:

	<i>Major focus</i>	<i>Important</i>	<i>Minor concern</i>	<i>No response</i>
Coastal Erosion	15	23	23	39
Habitat Conservation	39	31	15	15
Loss of Biodiversity	39	31	15	15
Bathing Water Quality	23	15	31	31
Recreation	15	46	23	15
Tourism	23	39	15	23
Infrastructure	15	23	31	31
Fisheries	15	38	31	15
Aquaculture	0	31	39	31
Other	15	8	0	77

Frequency as a percentage of the total responses

 ≥ 35%

*Questions 6, 7 and 8:*

**Q.6** Are available resources adequate to meet these obligations and/or carryout research?

**Q.7** If not, what is lacking?

**Q.8** How many staff in your department were engaged in coastal-related research?

With all three questions, the results showed a consistent picture. In general, resources to carryout work on sustainable coastal zone development were considered to be inadequate, amongst all but one of the survey respondents. The major reasons cited were an absence of staff and financial

resources, insufficient guidance, and the lack of commitment from major funding bodies for sustainable coastal zone management. Consequently, the number of staff undertaking coastal-related research averaged between 1 and 5 in the organisations that responded. Again, this may be an function of the questionnaire and the apparent uncertainty over the term “research activity”. This would generally correspond with the responses that we received from some interviewees, during follow-up telephone consultations.

*Question 9:*

**Q.9** To what extent are you addressing strategic relationships between the social, economic and environmental considerations of sustainable coastal zone development?

Responses to question 9 suggest that, overall, respondents recognise the importance of integrating the three pillars of sustainability; i.e. combining a balanced approach to the protection and enhancement of the environment, economic development and social equity.

Research addressing the social, economic and environmental themes of sustainable coastal zone development:

	<i>Major focus</i>	<i>Important</i>	<i>Minor concern</i>	<i>No response</i>
Social and Environment	15	31	15	38
Social and Economic	8	23	31	38
Environment and Economic	23	31	8	38
Social, Environment and Economic	31	54	8	8

Frequency as a percentage of the total responses

 ≥ 35%

*Questions 10 and 11:*

**Q.10** To what extent do you or your organisation, address the issues of integrated coastal zone management?

**Q.11** At what level is the focus for your research on sustainable coastal issues?

The results of the survey confirm, not unexpectedly, that integrated coastal zone management (ICZM) was a common disciplinary background for most respondents. In practice, the focus of coastal research amongst those surveyed was identified to be highest at the local level, with equal attention then shown between the regional and Wales-wide dimensions. This, undoubtedly in part, is a reflection of the geographical accountability of the Local Authorities, conservation groups and other agencies surveyed in this questionnaire.

*Question 12:*


**Q.12** How long have you formally recognised sustainable coastal zone management?

Responses to this question were not particularly conclusive. The average length of time that coastal sustainability had been formally recognised by the respondents was between 5 and 10 years and for several authorities, more recently, within the preceding 3 years. This would be consistent with the view that sustainable development is currently a headline topic for policy making, through which the newly expanded definition of sustainable development to include social perspectives, as well as economic perspectives, has led to increased interest across most policy-making sectors.

Research addressing issues of Integrated Coastal Zone Management:

	<i>Major focus</i>	<i>Important</i>	<i>Minor concern</i>	<i>No response</i>
Putting people at the centre of decision making (e.g. transparency, information, participation)	38	31	8	0
Assessment processes involving (e.g. long term perspectives, precautionary and “polluter pays” principles)	54	31	0	15
Mechanisms in place to overcome institutional barriers to integrated policy making and delivery	15	46	8	31

Frequency as a percentage of the total responses

 ≥ 35%

Level of coastal research:

	<i>Major focus</i>	<i>Important</i>	<i>Minor concern</i>	<i>No response</i>
Local level	23	46	0	31
Regional level	15	38	0	46
National level	15	38	0	46
UK-wide	8	38	8	54
European level	7	8	15	69

Frequency as a percentage of the total responses

 ≥ 35%

Questions 13, 14, 15 and 16

**Q.13** With which groups/institutions do you currently collaborate to achieve sustainable development?

**Q.14** Are such consultations: regular; infrequent; or *ad hoc*?

**Q.15** What national consultation arrangements are beneficial to your department or organisation?

**Q.16** What, if any, physical or institutional boundaries affect your current management practices in relation to coastal activities?

The responses about *integration* among the authorities and agencies responsible for coastal zone management were in general poorly answered. This can be explained, in part, by the different and often complex connections, which exist between the various organisations. Some of the particular characteristics documented were linkages, including:

- *Intergovernmental Integration* – among the National Assembly for Wales, Welsh Development Agency and Local Authorities;
- *Interagency Integration* – among Countryside Council for Wales and the Environment Agency Wales;
- *Intersectoral Integration* – between non-governmental conservation groups, the Wales Tourist Board, the Royal Society for the Protection of Birds, and private sector organisations such as Dwr Cymru Welsh Water;
- *Intramangement Integration* – particularly with regard to the designation and management of SACs, jointly managed by a number of statutory bodies/competent authorities, under a system of shared responsibility.

The average interval between consultations was “every few months”, although this varied according to the organisations and subject matter in question. As for joint-funded research, the most frequently cited source of funding/joint research was with CCW and EAW, followed by university collaborations. Also mentioned was INTERREG as the principal source of EU finance supporting cross-border (Wales/Ireland) and interregional co-operation.

The results of question 15, showed the importance given to liaison through several national coastal fora, such as Afordir, the Green Sea Partnership, and the recently formed Wales Coastal Forum, which seek a co-ordinated approach to the management of the coastline and adjacent areas around Wales. One basic constraint local planning authorities identified regarding current coastal zone management, was that Mean Low Water Mark (MLWM) is the jurisdictional boundary for land-use planning. Thus, below MLWM is mostly outside the scope of the planning regulatory framework.

*Questions 17 and 18:*

**Q.17** What are the main human activities locally associated within your coastal area?

**Q.18** Is your impression of the pattern of these activities/impacts in the last five years that of: (1) decreasing; (2) static; or (3) increasing pressure on coastal resources?

In broad terms, the results from these questions indicated that coastal-based recreation and leisure are two of the most commonly recognised human activities along the Wales coast, included with associated camping and caravanning. However, coastal agriculture, housing and industrial development, shellfisheries, and sea fishing were not considered to be a major focus of activity.

In addition, certain activities appear to be more area specific. Three of the responding Local Authorities, for example, recognised separate activities of concern in their respective areas. Firstly, shipping to service oil, fishing, ferry and cargo requirements within Milford Haven, secondly, Ministry of Defence (MoD) operations along the Carmarthenshire coast, and lastly, aquaculture and concerns over the Magnox Nuclear Power Station in the Anglesey area.

A summary analysis of question 18 reveals that coastal-related recreation and tourism are the two main sectors perceived to have increased the most over the preceding five years. One implication of which, is the current lack of quantitative data and research on the potential impacts arising from their unsustainable development.

*Questions 19, 20, 21 and 22:*

**Q.19** Does your organisation/department operate its own monitoring procedures to assess human impacts on coastal resources?

**Q.20** What data and information sources has/does your organisation regularly utilise when addressing coastal zone management issues?

**Q. 21** Do you make use of GIS in your investigation of coastal zone data?

**Q. 22** In your opinion, in which areas are there gaps in the current data and information sources available for sustainable coastal zone research?

Of the respondents, 50% reported that they carry out monitoring procedures to assess human coastal impacts. This would appear to contradict the results from question 2, which suggests a lack of “research activity” by many of the organisations contacted. Alternatively, it may be that

whilst monitoring and surveillance are undertaken by several key agencies, this information is widely used by the coastal community as a whole.

The most frequently cited sources of coastal data and information was the Countryside Council for Wales GIS datasets on environmental designations, followed by the Environment Agency Wales LEAPs. Amongst Local Authorities, the visitor and tourist surveys were most cited, together with information provided in the various Countryside and Coast Management Plans. Additionally, historical data in the form of the Scheduled Ancient Monuments records was alluded to. As for published literature, most of the respondents quoted the JNCC *Coastal Directory Series* (e.g. Barne *et al.*, 1995), MNCR review for Cardigan Bay and North Wales (Brazier *et al.*, 1999), CEFAS reports, and the work of the Irish Sea Forum (established to follow up the work of the Irish Sea Study Group; see [www.liv.ac.uk/~isf1/isfhome.html](http://www.liv.ac.uk/~isf1/isfhome.html)) to be key sources. Moreover, impacts on the coasts and estuaries of England and Wales reviewed by the Environment Agency, UK (1999), was widely cited during follow-up telephone interviews.

When asked if respondents' institutions made use of GIS in their investigation of coastal zone data, responses were:

Level of GIS data usage:

Regularly	Infrequently	Not at all
33	25	42

Frequency as a percentage of the total responses

 ≥ 35%

Of those that responded MapInfo was indicated to be the most widely used GIS program, followed by ArcInfo and then Arcview.

Finally, the following comments were obtained in response to the question *where are the data and information gaps relevant to sustainable coastal zone research?*:

- Interdisciplinary work from the perspective of social sciences, which assists with competing environmental, economic and social pressures;
- Mapping current research and disseminating information to the coastal community;
- The opportunities raised by web-based metadata networks;
- Sustainability indicators and appraisal;
- Improved knowledge of marine systems and biodiversity, and changes resulting from human activities;
- Post-evaluation and monitoring of protected sites;
- The long run perspective of Holocene coastal change and environmental loss.

## APPENDIX III Glossary of Abbreviations

<b>ABP</b>	Associated British Ports
<b>ACOPS</b>	Advisory Committee on the Protection of the Sea
<b>AONB</b>	Areas of Outstanding Natural Beauty
<b>ASI</b>	Areas of Scientific Interest (Irl)
<b>BBCZMG</b>	Bannow Bay Coastal Zone Management Group
<b>BGS</b>	British Geological Survey
<b>BIM</b>	Bord Iascaigh Mhara
<b>BPF</b>	British Ports Federation
<b>CAP</b>	Common Agriculture Policy
<b>CCW</b>	Countryside Council for Wales
<b>CDP</b>	County Development Plan
<b>CEED UK</b>	United Kingdom Centre for Economic and Environmental Development
<b>CEFAS</b>	Centre for Environment Fisheries and Aquaculture Science (UK)
<b>CHaMPs</b>	Coastal Habitat Management Plans (UK)
<b>CIE</b>	Córas Iompair Éireann
<b>CLAMS</b>	Co-ordinated Local Aquaculture Management Systems (Irl)
<b>COMAH</b>	Control of Major Accident Hazards
<b>COAST</b>	Coast Shipping Traffic Database, Maritime and Coastguard Agency (UK)
<b>CRC</b>	Coastal Resources Centre, (University College, Cork, Irl)
<b>CREH</b>	Centre for Research into Environment and Health, University of Aberystwyth, Wales
<b>CSO</b>	Central Statistics Office (Irl)
<b>DoAHGI</b>	Department of Arts, Heritage, Gaeltacht and the Islands (Irl)
<b>DoE</b>	Department of the Environment (Irl)
<b>DoE UK</b>	Department of the Environment UK
<b>DoELG</b>	Department of Environment and Local Government (Irl)
<b>DoMNR</b>	Department of the Marine and Natural Resources (Irl)
<b>DAF</b>	Department of Agriculture and Food (Irl)
<b>DCWW</b>	Dwr Cymru Welsh Water
<b>DETR</b>	Department of the Environment, Transport and the Regions (UK)
<b>DEFRA</b>	Department for Environment, Food and Rural Affairs (UK)
<b>DP</b>	Demonstration Programme
<b>DTLR</b>	Department for Transport, Local Government and the Regions (UK)
<b>EA</b>	Environment Agency (UK)
<b>EAW</b>	Environment Agency Wales
<b>EC</b>	European Commission
<b>ECONET</b>	Erosion Control Network
<b>ECOPRO</b>	Environmentally friendly Coastal Protection
<b>EEA</b>	European Environment Agency
<b>EIA</b>	Environmental Impact Assessment
<b>EIS</b>	Environmental Impact Statement
<b>EMAS</b>	Environmental Management and Auditing System
<b>EPA</b>	Environmental Protection Agency (Irl)
<b>ERIS</b>	Emergency Response Information Systems
<b>ESA</b>	Environmentally Sensitive Area
<b>ESRI</b>	Economic and Social Research Institute (Irl)
<b>EU</b>	European Union



<b>FAO</b>	Food and Agriculture Organisation of the United Nations
<b>FEED</b>	Foundation for Environmental Education in Europe
<b>GNP</b>	Gross National Product
<b>GIS</b>	Geographical Information System
<b>GSI</b>	Geological Survey of Ireland
<b>ICES</b>	International Council for the Exploration of the Seas
<b>ICZM</b>	Integrated Coastal Zone Management
<b>IFA</b>	Irish Farmers Association
<b>IFAC</b>	Inshore Fisheries Advisory Committee
<b>IMES</b>	Irish Marine Emergency Service
<b>IMO</b>	International Maritime Organisation
<b>IPC</b>	Integrated Pollution Control
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>ISSG</b>	Irish Sea Study Group
<b>ISSCG</b>	Irish Sea Science Co-ordination Group
<b>IUCN</b>	World Conservation Union
<b>JMP</b>	Joint Monitoring Programme (UK)
<b>JNCC</b>	Joint Nature Conservation Committee (UK)
<b>LACOST</b>	Land cover changes in COASTal zones
<b>LEAP</b>	Local Environment Agency Plan (UK)
<b>LIFE</b>	EC financial instrument for the Environment, Nature Conservation and Third Countries
<b>LOICZ</b>	Land Ocean Interactions in the Coastal Zone
<b>MAFF</b>	Ministry of Agriculture, Fisheries and Food (UK)
<b>MAGP</b>	Multi Annual Guidance Programme
<b>MAIB</b>	Marine Accident Investigation Branch, (DTLR UK)
<b>MarLIN</b>	Marine Life Information Network
<b>MAYA</b>	Marinas and Yachting in the northwest metropolitan Area (Irl)
<b>MEHRA</b>	Marine Environmental High Risk Area (UK)
<b>MEHS</b>	Marine Environment Health and Services Division (of the Marine Institute, Irl)
<b>MFSD</b>	Marine Fisheries Services Division (of the Marine Institute, Irl)
<b>MHWM</b>	Mean High Water Mark
<b>MIS</b>	Marine Information System
<b>MLWM</b>	Mean Low Water Mark
<b>MNR</b>	Marine Nature Reserve
<b>NEC-CIT</b>	Nautical Enterprise Centre, Cork Institute of Technology
<b>NECL</b>	Nautical Enterprise Centre Ltd
<b>NDP</b>	National Development Plan (Irl)
<b>NGO</b>	Non Government Organisation
<b>NHA</b>	Natural Heritage Area (Irl)
<b>NMP</b>	National Monitoring Programme (UK)
<b>NLO</b>	Net Limitation Orders
<b>NNR</b>	National Natures Reserve (Wales)
<b>NRA</b>	National Roads Authority (Irl)
<b>NWSFC</b>	North Wales Sea Fisheries Committee
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>OPW</b>	Office of Public Works (Irl)
<b>OSPAR</b>	Convention for the Protection of the Marine Environment of the Northeast Atlantic 1992 (Oslo-Paris)
<b>PAD</b>	Petroleum Affairs Division, DoMNR
<b>PAH</b>	Polycyclic Aromatic Hydrocarbons
<b>PCB</b>	Polychlorinated Biphenyls
<b>PG(W)PP</b>	Planning Guidance (Wales) Planning Policy Notes

<b>PISCES</b>	Partnership of Irish Sea Coast and Estuary Strategies
<b>QSR</b>	Quality Status Report
<b>RACER</b>	Risk Assessment and Collaborative Emergency Response
<b>RDA</b>	Regional Development Agency (Wales)
<b>REPS</b>	Rural Environmental Protection Systems
<b>RPG</b>	Regional Planning guidance notes (Wales)
<b>RSPB</b>	Royal Society for the Protection of Birds (UK)
<b>RPII</b>	Radiological Protection Institute of Ireland
<b>SAC</b>	Special Area of Conservation
<b>cSAC</b>	candidate Special Area of Conservation
<b>SAR</b>	Seas at Risk
<b>SEA</b>	Strategic Environmental Assessment Directive (EU – pending)
<b>SEAREM</b>	Sea Rescues and Emergencies
<b>SEEEEC</b>	<i>Sea Empress</i> Environmental Evaluation Committee
<b>SPA</b>	Special Protection Areas
<b>SMP</b>	Shoreline Management Plans (UK)
<b>SWSFC</b>	South Wales Sea Fisheries Committee
<b>SSSI</b>	Sites of Special Scientific Interest (UK)
<b>TAN(W)</b>	Technical Advice Notes (Wales)
<b>TBT</b>	Tributyltin
<b>UDP</b>	Unitary Development Plan (Wales)
<b>UKDMAP</b>	United Kingdom Digital Marine Atlas Project
<b>UN</b>	United Nations
<b>UNCLOS</b>	United Nations Conference on the Law of the Sea
<b>UNEP</b>	United Nations Environment Programme
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organisation
<b>VTs</b>	Vessel Traffic System
<b>WFD</b>	Water Framework Directive (EU)
<b>WHO</b>	World Health Organisation
<b>WWF</b>	World Wildlife Fund
<b>WRAP</b>	Waste Resources Action Programme (Wales)
<b>WTB</b>	Wales Tourist Board

## APPENDIX VI Maritime INTERREG Projects

The following co-operative projects and networks are supported under Measure 1.3 “Protection of the Marine and Coastal Environment and Marine Emergency Planning”, of the Maritime (Ireland/Wales) INTERREG Programme (1994 – 1999):

### Co-operative Projects

1. **Roseate Terns - The Natural Connection - A Conservation and Research Project linking Wales and Ireland**  
Irish Wildbird Conservancy / North Wales Wildlife Trust.
2. **Marine Mammal Strandings - A Collaborative Study for the Irish Sea.**  
National University of Ireland, Cork / Countryside Council for Wales.
3. **South West Irish Sea Survey (SWISS).**  
Trinity College Dublin / National Museum of Wales, Cardiff.
4. **The Fate of Nutrients in Estuarine Plumes.**  
National University of Ireland, Galway / University of Wales, Bangor.
5. **Water Quality and Circulation in the Southern Irish Sea**  
National University of Ireland, Galway / University of Wales, Bangor.
6. **Grey Seals: Status and Monitoring in the Irish and Celtic Seas.**  
National University of Ireland, Cork / Dyfed Wildlife Trust.
7. **Sensitivity and Mapping of inshore marine biotopes in the Southern Irish Sea (SensMap).**  
Ecological Consultancy Services (Dublin), Dúchas / Countryside Council for Wales.
8. **Marine Information System: Scoping Study (Phase I).**  
Marine Institute, National Marine Data Centre/ Countryside Council for Wales.
9. **Achieving EU Standards in Recreational Waters.**  
National University of Ireland, Dublin / University of Wales, Aberystwyth.
10. **Irish Sea Southern Boundary Study**  
Marine Informatics Ltd (Dublin) / University of Wales, Bangor.
11. **Marine Information System: Demonstration (Phase II).**  
Marine Institute, National Marine Data Centre / Countryside Council for Wales.
12. **Emergency Response Information System (ERIS)**  
Enterprise Ireland, Compass Informatics, IMES / University of Wales, Bangor.
13. **Risk Assessment and Collaborative Emergency Response in the Irish Sea (RACER)**  
Nautical Enterprise Centre (Cork), National University of Ireland, Cork, University of Wales, Cardiff.
14. **Critical assessment of human activity for the sustainable management of the coastal zone.**  
National University of Ireland, Cork / University of Wales, Aberystwyth.
15. **SeaScapes – Developing a method of seascape evaluation**  
Brady Shipman Martin, National University of Ireland, Dublin / University of Wales, Aberystwyth.
16. **Ardfodir Glan – Clean Coasts/Clean Seas**  
CoastWatch Ireland / Keep Wales Tidy Campaign.

### **Co-operative Networks**

17. **Irish Sea Hydrodynamic Modelling Network**  
Trinity College Dublin / University of Wales, Bangor.
18. **CoAST - Co-operative Action - Sustainability Network**  
Dublin Regional Authority / Isle of Anglesey County Council.
19. **ECONET - Erosion Control Network**  
Enterprise Ireland / Conwyn County Council.
20. **Navigate with Nature**  
Irish Sailing Association / Centre for Economic and Environmental Development (UK).
21. **“Land Dividing - Sea Uniting” Irish Seas Exhibition**  
Irish Seal Sanctuary, ENFO / National Assembly for Wales.
22. **From Seawaves to Airwaves**  
West Dublin Community Radio / Radio Ceredigion CYF.
23. **BENSIS – Benthic Ecology Network**  
Trinity College Dublin / National Museum of Wales, Cardiff.
24. **Remote Sensing of Suspended Sediment Load in the Coastal Zone**  
National University of Ireland, Galway / University of Wales, Bangor.
25. **Paving the Information Highway**  
Ecological Consultancy Services (Dublin) / Irish Sea Forum, University of Wales, Bangor.
26. **Inland, Coastal and Estuarine (ICE) Journal**  
National University of Ireland, Dublin / Centre for Economic and Environmental Development (UK).

### **Maritime Ireland/Wales INTERREG Report Series (ISSN: 1393 – 9025):**

1. Raine, R. and LeB Williams, P.J. (2000) –*The fate of Nutrients in Estuarine Plumes*. 31pp.
2. Newton, S.F. and O. Crowe (2000) *Roseate Terns – The Natural Connection*. 66pp.
3. Kiely, O, Ligard, D., McKibben, M., Connolly, N., & M. Barnes (2000) *Grey Seals: status and monitoring in the Irish and Celtic Seas*. 76pp.
4. White, M., Gaffney, S., Bowers, D., and P. Bowyer (2000) *Water Quality in the Southern Irish Sea*. 28pp.
5. Hill, M., Briggs, J., Minto, P., Bagnall, D., Foley, K. & A. Williams. (2001). *Guide to Best Practice in Seascape Assessment*. 58pp.
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7. Feighery, L., White, M., Bowers, D., Kelly, S., O'Riain, G & P.Bowyer (2001). *Feasibility study of the use of digital cameras for water quality monitoring in the coastal zone*.
8. Rogan, E., Penrose, R., Gassner, I., Mackey, M.J. & P. Clayton (2001). *Marine Mammal Strandings: A Collaborative Study of the Irish Sea*. 53pp.
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### **Other INTERREG-II Publications**

Wilson, J.G., Mackie, A.S.Y., O'Connor, B.D.S., Rees, E.I.S. & T. Darbyshire (2001). Benthic Biodiversity in the Southern Irish Sea 2: The South-West Irish Sea Survey - - *Studies in Marine Biodiversity and Systematics from the National Museum of Wales*. BIOMÖR Reports 2 (1): 1-143.

For further information on the Maritime Ireland/Wales INTERREG-II Programme see  
[www.marine.ie](http://www.marine.ie)





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