

occurred on the River Barrow, at and upstream of Graiguenamanagh, in the autumn of 1999 (Lucey, 1999a).



Fauna (Animals)

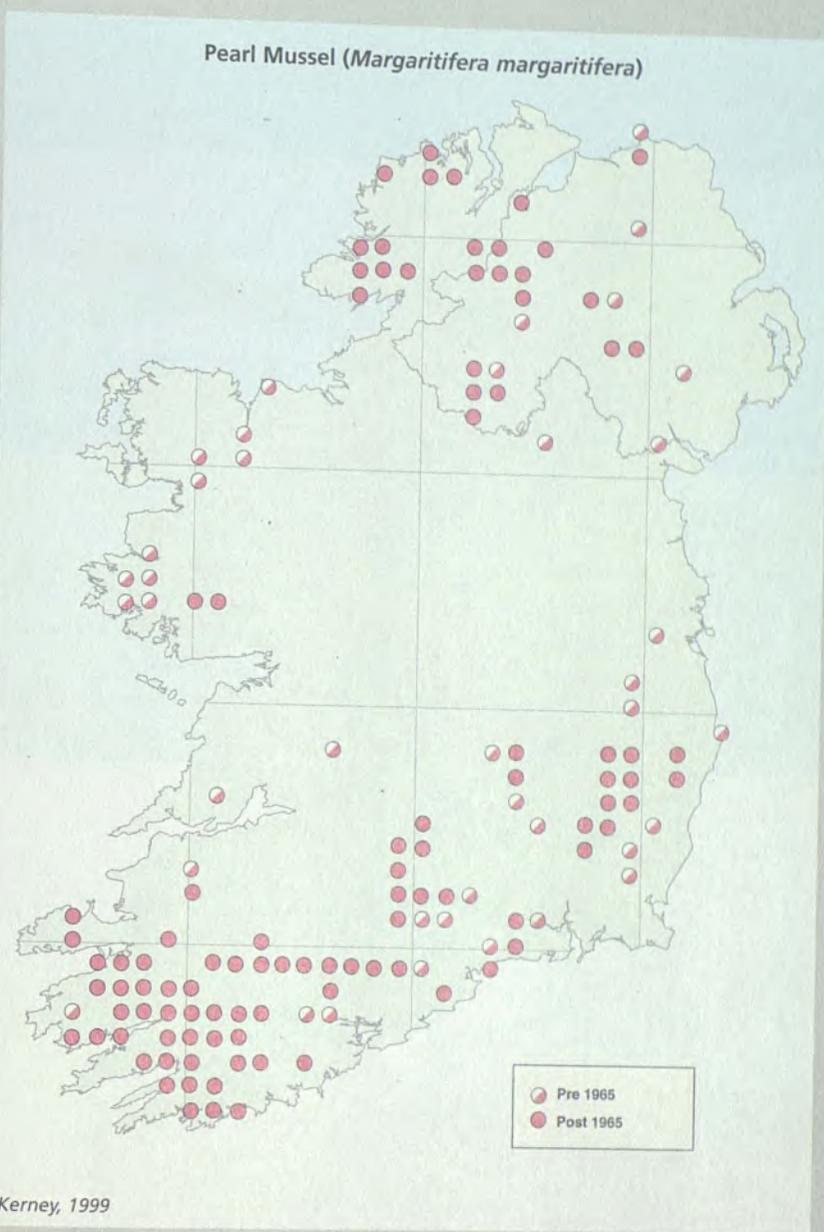
While efforts have been made to determine Ireland's entire fauna, from protozoans and sponges to mammals, further work is needed to provide a reasonable estimate of the total number of species. The insect component alone is thought to comprise some 16,000 species of which 1,499 are recorded as aquatic (Ashe *et al.*, 1998). The elements of the country's fauna that remain to be discovered chiefly comprise invertebrate animals.

Invertebrates do not have a high profile when it comes to conservation. The Irish invertebrate species listed in the habitats Directive are: the freshwater pearl mussel (*Margaritifera margaritifera*); the white-clawed crayfish (*Austropotamobius pallipes*); the Kerry slug (*Geomalacus maculosus*); three marsh snails (*Vertigo* spp.) and one butterfly, the marsh fritillary (*Euphydryas aurinia*). The crayfish,



Box 12.6 Freshwater Invertebrates

Pearl Mussel: Unlike many other molluscs this mussel requires clean, cool, well-oxygenated water free from mud and suspended matter. Also unusual for a mollusc, it is found chiefly in soft water. It is a declining species throughout Europe and has become extinct in some places in Ireland. The causes are various and include destruction by pearl fishers, physical changes to the habitat and pollution. The species is particularly vulnerable because of its unusual longevity (one hundred years or more) and slow reproduction (Lucey, 1993; Kerney, 1999) The hard-water form which occurred in the main channels of the Suir and Barrow up until relatively recently is now restricted to a 10 km stretch of the Nore (Moorkens and Costello, 1994). The known distribution, based on 10 km squares, is given below.



Freshwater Crayfish: The crayfish, which is not native to Ireland, is relatively common and widely distributed in limestone rivers and lakes but is under threat from a lethal fungus (*Aphanomyces astaci*) disease which has devastated stocks throughout Britain and Europe and which may have been responsible for the collapse of some Irish lake populations. The Irish crayfish populations, however, probably constitute the largest reservoir of the species in Europe.

Lucey, 1999b; Lucey and Nolan, 1996



pearl mussel and Kerry slug are large invertebrates which are protected in Ireland through national and international law. Of the three species, the mussel is the most vulnerable (Box 12.6). The Kerry slug is common over a considerable area in the south-west where it lives among rocks, in heather moorland and rough pasture or more rarely in oak woods on moss-covered timber. There is no evidence that it is declining (Platts and Speight, 1988). Four species of the Vertiginidae family of tiny land snails, which show strong affinities for wetlands or marshy ground, are listed in the habitats Directive. Three of these occur in Ireland *Vertigo angustior* (a declining species, considered vulnerable in Ireland), the rare *V. moulinsiana* and the endangered *V. geyeriis*. *V. lilljeborgi* is also quite rare in Ireland but is not listed in the Directive. The main threats are from drainage, afforestation or other changes in land use which reduce the size of their habitat (Cawley, 1996; Kerney, 1999; O'Sullivan, 1999). Twenty three SACs are being proposed for these species by Dúchas. A survey of butterflies was carried out in the summer months between 1995



and 1999. In order to get an accurate true representation of butterfly numbers monitoring needs to be carried out for several years as some species are affected by weather conditions: lower than normal numbers of the small tortoise shell (*Aglais urticae*) were found in the summer of 1999. As well as the known resident butterfly species, three more migrant species usually arrive from abroad each year giving a total of 28 species. Loss of habitat due mainly to agricultural practices is thought to be causing a decline in their numbers in Ireland (D. Nash, pers. comm.).

Of the resident species, six may be considered vulnerable due to their very limited and fragmented geographical distribution or their dependence on restricted specialised habitats. The six species (the large heath *Coenonympha tullia*, the pearl bordered fritillary *Boloria euphrosyne*, the marsh fritillary *Eurodryas aurina* - an Annex II species under the habitats Directive - the brown hairstreak *Thecla betulae*, the dingy skipper *Erynnis tages* and the small blue *Cupido minimus*) are, as is the case elsewhere in Europe, under threat from changes and trends in land use (B. Aldwell, pers. comm.). These changes include loss of traditional meadows, major drainage of bogs and wetlands, intensive sheep grazing, loss of sand dunes, the removal or severe cutting of field hedges and scrub and the use of chemicals in agriculture. The large heath butterfly occurs on wet peat moors and bogs and has suffered major habitat loss (D. Nash, pers. comm.) (Fig 12.5).

Modern world-wide plant material movement has resulted in the introduction and establishment of several exotic invertebrate pests to Ireland including the New Zealand flatworm (*Artioposthia triangulata*). The movement of honeybees has also led to the establishment of the parasite *Varroa jacobsoni*. These pest

species have mainly been introduced from other EU countries, where they have become established and not from their native areas. Other exotic insect and mite introductions encountered in recent years include the serpentine or Florida leafminer, the South American leafminer, the western flower thrips, the sweet potato whitefly, the lupin aphid and the Colorado beetle (R. Dunne, pers. comm.).



Large heath (*Coenonympha tullia*)
Between 1995 and 1999 it was recorded from 27 of the 820 squares searched. It has suffered major habitat loss due to the exploitation of our raised and blanket bogs. Source: D. Nash, Dublin Naturalist's Field Club

Fig 12.5 Distribution of Large Heath

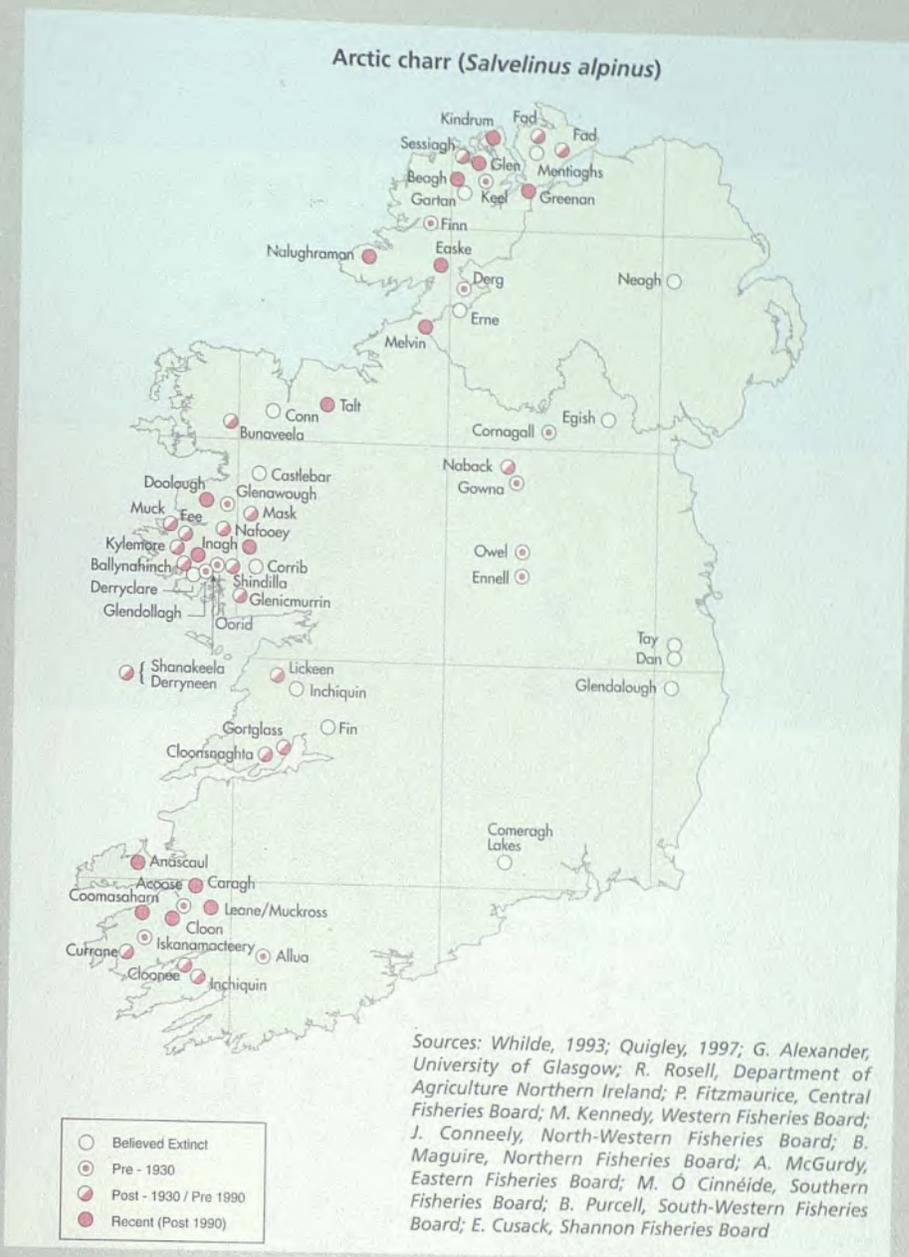
The fish species listed in the Irish Natural Habitats Regulations are the lampren or river lamprey (*Lampetra fluviatilis*), pollan (*Coregonus autumnalis*), allis shad (*Alosa alosa*), twaite shad (*Alosa fallax*) and salmon (*Salmo salar*) in fresh water.



Box 12.7 Fish

Arctic Charr (*Salvelinus alpinus*): An indigenous species which was formerly widespread and abundant but has become rare in most places. It is restricted to cool, stony, unpolluted lakes. Although considered to be endangered in Europe it is not listed in the habitats Directive. The fish has become extinct in some lakes in Ireland since the beginning of the century with the most recent extirpation, from Lough Conn in County Mayo confirmed since 1996. There has also been a collapse of populations in Loughs Corrib and Leane. The main threats are eutrophication, acidification and over-fishing. Among the conservation measures that have been proposed are control of water pollution (primarily from agriculture and forestry) as well as the possible banning of smolt-rearing and cage-rearing of other salmonids in their waters. Its current known distribution is shown in the map.

Whilde, 1993; Champ, 1998



Sources: Whilde, 1993; Quigley, 1997; G. Alexander, University of Glasgow; R. Rosell, Department of Agriculture Northern Ireland; P. Fitzmaurice, Central Fisheries Board; M. Kennedy, Western Fisheries Board; J. Conneely, North-Western Fisheries Board; B. Maguire, Northern Fisheries Board; A. McGurdy, Eastern Fisheries Board; M. Ó Cinnéide, Southern Fisheries Board; B. Purcell, South-Western Fisheries Board; E. Cusack, Shannon Fisheries Board

Lampreys: Three species of lamprey occur in Irish waters: the sea lamprey (*Petromyzon marinus*), the river lamprey (*Lampetra fluviatilis*) and the brook lamprey (*Lampetra planeri*). All three species are known to spawn in Irish rivers or streams and are listed in the habitats Directive.

Lampreys were once widespread in Europe but stocks have declined in recent years although this has not been quantified for Irish populations. Water quality is implicated in the demise of populations as well as the impediment by weirs and dams to upstream and downstream migration. Nevertheless, Irish populations appear to be still widespread and are in a position to make an important contribution to the conservation of European stocks. To conserve Irish lamprey populations, however, the known spawning grounds and larval habitats need to be protected and maintained. Nine SACs have been proposed for these species.

Kurz and Costello, 1999; F. Marnell, pers. comm.

Basking Shark (*Cetorhinus maximus*): This shark is known to occur off the coasts of Antrim, Dublin, Waterford, Wexford, Cork, Kerry, Galway, Mayo and Donegal. It was hunted off the Irish coast for hundreds of years mainly for its oil. Between 1947 and 1975 some 12,400 were killed off Achill Island. Thousands (4,442 in 1984) were taken by Norwegian shark fishermen off the south-east coast during the 1980s. The Achill fishery closed in 1975 after annual catches had dropped to less than 100. A national survey, carried out in 1993, showed little sign of recovery of stocks in the heavily fished areas. Since 1998 basking sharks in UK waters have been given full protection under legislation. As yet no such protection has been afforded them in Irish territorial waters.



Maitland (1996) concluded that active conservation management was needed for the arctic charr (*Salvelinus alpinus*) and smelt (*Osmerus eperlanus*) in addition to the pollan and shads.

Two amphibian species, the natterjack toad (*Bufo calamita*) and the common frog (*Rana temporaria*),



are listed in the Irish Natural Habitats Regulations (1997). The smooth newt (*Triturus vulgaris*) is the only tailed amphibian found in Ireland and has received less attention. Unlike these other two amphibian species, whose origins in Ireland are unclear, the newt is considered an old native. A detailed survey, carried out between 1993 and 1995, showed a widespread distribution although it was not found in Donegal, Fermanagh or Tyrone and except for a location near Bantry in Co. Cork was apparently absent from the south-west. Newts



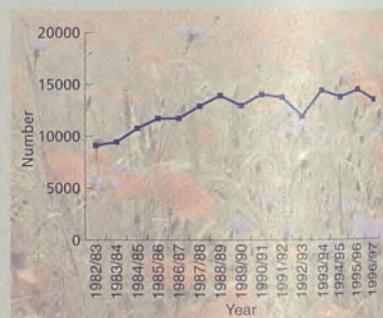
appear to be widespread but uncommon in Ireland and require suitable ponds as well as undisturbed terrestrial habitats for their continued survival (Wilson, 1986; Marnell, 1996; 1998a; 1998b).

The two reptile species, the common lizard (*Lacerta vivipara*) and slow-worm (*Anguis fragilis*), occurring in Ireland have been little studied and details regarding their status are lacking. From anecdotal evidence it would appear that the lizard is less common than previously. The slow-worm, which is a legless lizard, appears to have been introduced into the Burren in Co. Clare relatively recently where it was first recorded in the 1970s but it is not known if it has become established in other areas or how successfully it has become naturalised. Another species the green lizard (*Lacerta viridis*), which occurs naturally in southern Europe and the Channel Islands, was introduced also to the Burren in 1958; eight males and seven females were released and one was found in 1962. It appears to have died out thereafter and has not been seen since (Cabot, 1965; F. Marnell, pers. comm.). Some species of marine turtles occur in Irish waters from time to time.

All bird species are afforded protection under the Wildlife Act and the wild birds Directive.

Box 12.8 Greenland White-fronted Goose (*Anser albifrons*)

This bird breeds in the low arctic fringe of west Greenland and migrates south through west and south Iceland during September/October to winter exclusively in Ireland and Britain. Much of its winter range is associated with a landscape characterised by peatlands and low intensity farmland. These wintering areas are often remote and the flocks relatively small and difficult to locate. Reported population declines in the 1970s led to a hunting moratorium in Ireland and protection in Britain. Synchronised counts throughout the wintering range in Ireland and Britain were made from 1983 onwards. These showed that the overall population increased by 5 per cent per annum from 16,541 in spring 1983 to 33,106 in spring 1997. The Irish population was estimated in 1997 to be 13,539. The species is listed in the wild birds Directive and 35 SPAs have been designated to date on the basis of Greenland white-fronted goose use.



Greenland White-fronted Goose numbers 1983-1997

J. Wilson, pers. comm.

Conservation projects over the past decade have boosted population numbers of rare species such as the roseate tern and stabilised numbers of the corncrake. In the west, the numbers of red grouse and apparently also merlin and hen harrier, have been adversely affected by overgrazing of habitats by sheep. Surveys have also shown a recent decrease in certain local populations of wetland species, such as the redshank, snipe and the

Box 12.9 Threatened Countryside Birds

Grey Partridge: The native grey partridge (*Perdix perdix*) is now an extremely rare species which has been recorded in recent times from eight counties (Galway, Kildare, Longford, Louth, Offaly, Tipperary, Wexford and Wicklow). The remaining wild birds, appear to be split between two populations, at Boora in Co. Offaly and Lullymore in Co. Kildare. Since 1995 partridges have declined in most parts of their range in Europe and the 1998 breeding season was one of the worst on record in the UK. The decline in Irish populations is part of a world-wide trend the specific reasons for which have not been entirely established. It is believed that the removal of hedgerows together with the use of insecticides and herbicides, which have reduced the abundance of insects and the weed species, are responsible for lower chick survival. It has been shown that predators significantly affect nesting hen and chick survival rates. Dúchas is supporting a conservation strategy which involves predator reduction in the core area, habitat improvement by the creation of suitable nesting and brood rearing cover as well as monitoring the species response to the habitat measures.

Whilde, 1993; B. Kavanagh, pers. comm.; O'Gorman, 1998

Corn Bunting: This bird was classed, in the Red Data Book, as a rare and endangered resident species breeding at only a handful of sites mostly on the west coast. In 1998, the Heritage Council commissioned a survey of its status. Based on the results of this survey, during which no wild birds were located in the traditional strongholds of the species, the Heritage Council now considers this species as being extinct as a breeding species in Ireland. A single specimen was seen in north Donegal in the summer of 1999.

Whilde, 1993; Heritage Council; O. Merne, pers. comm.

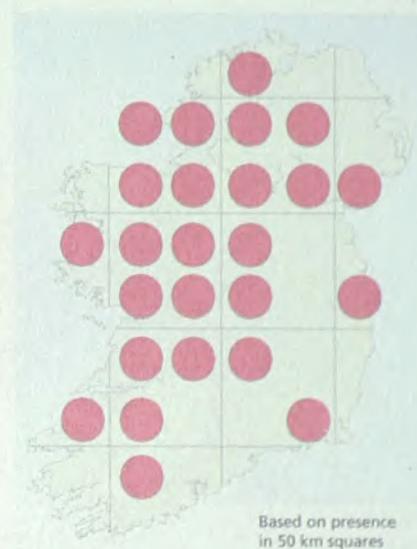
Corncrake: Corncrakes are now regarded as globally endangered chiefly due to intensification of farmland management. In Ireland there had been a long-term decline in the summering population. The Corncrake Grant Scheme (CGS), whereby landowners were paid to delay grass mowing and encouraged to do centre-out cutting, was first introduced in 1992. The aim of the programme is to conserve corncrakes in the Shannon Callows (between Athlone and Portumna), north-west Mayo and parts of the north Donegal coast and islands where mowing was already fairly late. The scheme has apparently arrested and reversed the long-term decline in numbers. The number of calling males has increased or stabilised in all the areas with Inishbofin and Tory Islands doing particularly well (Table 12.4).

Source: Dúchas

curlew but in particular, and unexpectedly, the lapwing. Although this collapse may have been caused by four consecutive years of April flooding, the chief factors for overall wader population declines are the loss of wetlands and nest predation (D. Norriss, pers. comm.). D'Arcy (1999) includes the following species

among the threatened wild birds: corn bunting, corncrake and partridge (Box. 12.9), quail, grouse, roseate and little tern, twite, chough, barn owl, nightjar, merlin and hen harrier.

Ireland, including its inshore waters, is home to 42 mammal species. Those listed in Annex II of the



Based on presence in 50 km squares

Pine marten (*Martes martes*)

Believed to be an old native species this carnivore has suffered greatly at the hands of man: it was hunted for its pelt in the 16th and 17th centuries when the destruction of its habitat, the natural forests, was also occurring. Its numbers are now increasing and its recent expansion in range has been such that it is considered to be secure particularly since the laying of the poison strychnine has been banned.

Sources: Whilde, 1993; Mitchell-Jones et al., 1999; T.J. Hayden, pers. comm.

Fig 12.6 Distribution of Pine Marten

habitats Directives are the otter (*Lutra lutra*), bottle-nosed dolphin (*Tursiops truncatus*), lesser horseshoe bat (*Rhinolophus hipposideros*), grey seal (*Halichoerus grypus*) and common seal (*Phoca vitulina*). Examples of two mammals are given in Box 12.10.

In Irish waters, to date, 23 species of cetaceans have been recorded, 11 of which are regularly sighted. These include harbour porpoise, common dolphin, striped dolphin, bottle-nosed dolphin, white-sided dolphin, white-

Table 12.4 Corncrake Numbers in Certain Areas

Area	1994	1995	1996	1997	1998
Inishbofin Island	12	27	15	12	15-17
Tory Island	8	12	21	18-20	19
Donegal, Mayo, Shannon Callows	129*	174*	184*	148-150*	149-153*
Total	149	213	220	178-182	183-189

Based on counts in 1994-98 period
*Core area totals
Source: Dúchas

Box 12.10 Mammals

Lesser Horseshoe Bat (*Rhinolophus hipposideros*): Ireland has nine bat species, the rarest being the lesser horseshoe which is confined to an area along the west and south-west coasts. Its Irish population is estimated to be 12,000 bats which is thought to exceed the total known population from mainland Europe. It is already rare in much of Europe, reduced by disturbance during hibernation, loss of habitat and chemical treatment of roof timbers. The largest maternity roost in Europe (428 counted in 1998) is in an old building adjacent to Dromore National Nature Reserve in Co. Clare. The Heritage Council purchased the building in 1998 to protect this roost and to promote pride in Ireland's heritage. It is proposed to develop a management plan for the site and to restore the building, as a model for bat conservation in Ireland.

Whilde, 1993; McAney, 1994; O'Sullivan, 1994; McGuire, 1998

Otter (*Lutra lutra*): The otter is also listed in the habitats Directive. Ireland has the densest populations of otters in western Europe and these occur in freshwater and coastal habitats. Otters are widespread throughout Ireland and appear to be thriving. Unlike in other countries they live within city limits and an increase in numbers is evident for the Greater Dublin area. Dúchas has proposed 37 SACs for the protection of otters.

Whilde, 1993; Lunnon, 1996; F. Marnell, pers. comm.

beaked dolphin, Risso's dolphin, killer whale, pilot whale and minke whale. Although the Worldwide Fund for Nature (WWF) has included the harbour porpoise among its 10 most endangered faunal species it is by far the most common cetacean in Irish waters and is usually found close inshore. South-west Ireland is considered to be a breeding ground (Berrow, 1990; Rogan and Berrow, 1995). The Shannon estuary hosts a resident population of bottle-nosed dolphins; one of only five known resident populations in Europe.

The impact of the fishing industry on cetacean populations, notably harbour porpoises in the Celtic Sea, has been referred to in Chapter 10. Impact, both directly through entanglement and from competition for resources, is one of the most sensitive issues affecting the management of a cetacean sanctuary. There is concern within Europe that bottle-nosed dolphin numbers have declined considerably in the last few years and studies have suggested that calves are being born infertile in the Irish Sea due to contamination with organochlorines (Berrow, 1990; Rogan and Berrow, 1995).

DISCUSSION

No terrestrial landscape has remained unaltered or unaffected since the arrival of humans in Ireland. The physical and biotic world has been so strongly modified by human agency that the resulting landscape is a synthesis of natural and cultural elements (Aalen, 1997). With few exceptions, the bulk of the native terrestrial fauna has suffered range contraction and population fragmentation due, in large measure, to habitat loss and to the impacts of an increasingly mechanised agricultural system (Purcell, 1996). Over the centuries various species have been introduced by humans to Ireland. While the extinction of species can occur as a result of climatic changes (e.g. lemmings, the



Based on presence in 50 km squares

Red deer (*Cervus elaphus*)

One of six species occurring and the only one present before the last Glacial maximum but it may have become extinct and also have been introduced by man. It was relatively abundant and widespread in the middle ages but was hunted almost to extinction by the middle of the 19th century. Since then reintroduction to Donegal, from Britain, and escapes from deer parks have led to a number of distinct populations, which can be shown scientifically to differ from a Co. Kerry wild population. Sources: Mitchell-Jones et al., 1999; T.J. Hayden, pers. comm.

Fig 12.7 Distribution of Red Deer

giant Irish deer and the reindeer), human influence can be cited as the main cause in the recent past. Some examples of extinctions and introductions are given in Fig. 12.8

Human influences, such as fire and grazing by livestock, have also helped to shape the landscape. Paradoxically this has been in part responsible for creating one of the jewels in the Irish landscape, the Burren in Co. Clare,



which would revert to scrub if winter grazing by cattle of the pavements ceased (Nelson, 1991).

Not all grazing effects, however, have benefited the Irish landscape. Overgrazing caused by the gross overstocking of sheep has been identified as one of the most important threats to habitats and biodiversity in Ireland. As discussed in Chapter 11, the effects of overgrazing have been most marked along the western seaboard, but no upland area has escaped and it can be said that sheep are inappropriate on the dwarf shrub communities in nearly all upland areas (R. Harrington, pers. comm.). The original Rural Environment Protection Scheme (REPS) was not successful in redressing the overgrazing problem. It is anticipated that the modifications to REPS combined with the introduction of the SAC programme, Commonage Framework Plans and the introduction of further cross-compliance controls in 1998 should greatly assist in alleviating the serious overgrazing problem (DAHGI, 1999).

The European Commission has decided to make an application to the European Court of Justice against Ireland for non-respect of the European Union's wild birds Directive. The decision concerns the failure to curb sheep overgrazing, particularly in the west of Ireland,

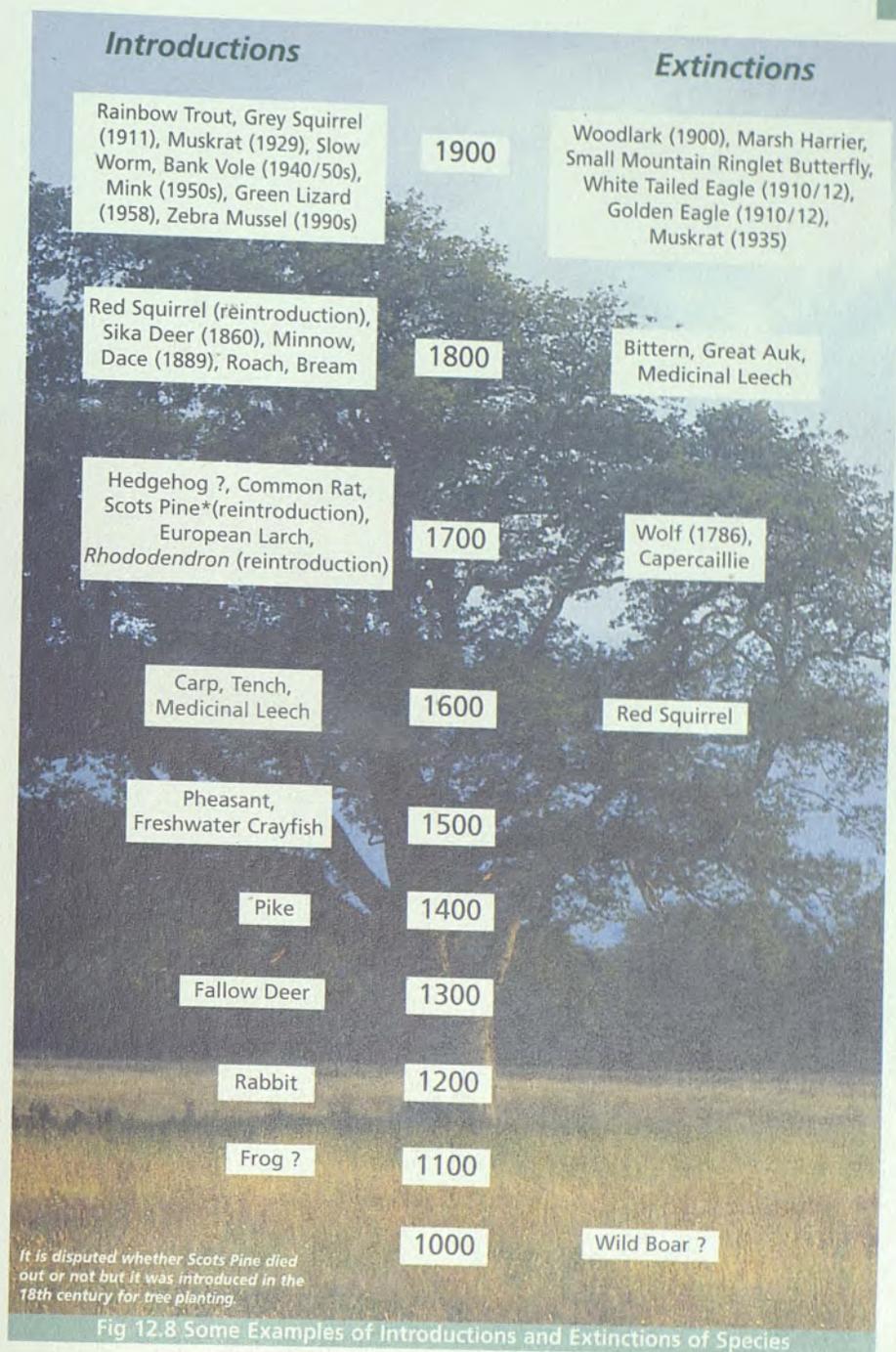
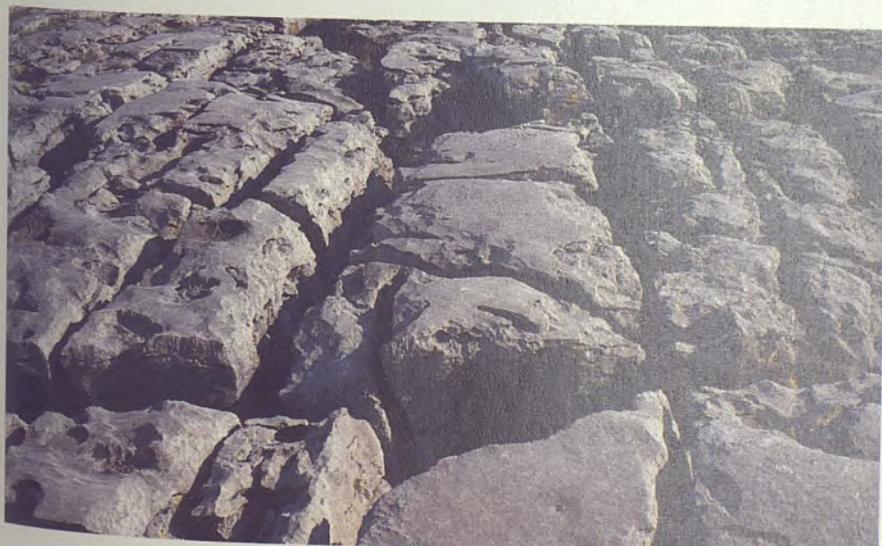


Fig 12.8 Some Examples of Introductions and Extinctions of Species



leading to serious damage to Ireland's largest SPA, the Owenduff-Nephin Beg Complex in Co. Mayo, as well as wider loss of the habitat of the red grouse.

REPS has provision for payments to farmers and landowners where areas fall within NHAs, SACs or Commonages (DAF, 1999). Among the objectives of REPS are to establish farming practices and production methods that reflect the increasing concern for conservation, landscape protection and wider

Table 12.5 Damaging Activities in Coastal Protected Areas

Activity	Impact (per cent)*		
	NHA	SAC	SPA
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/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

*Percentage of proposed designated coastal sites subject to impacts
Neff, in press

environmental problems as well as to protect wildlife habitats and endangered species of flora and fauna (Box 12.11).

In the period between 1960 and 1990 the production of silage became widespread (Chapter 3). The indoor wintering of cattle and the need to conserve fodder, particularly silage, and the change from hay to silage making have led to a loss of both plant and animal diversity from hay meadows.

Dúchas has initiated an inter-sectoral resource management project including restoration ecology and the reinstatement of habitats. Restoration ecology projects are underway to develop economic alternatives to existing upland use and overgrazing problems through the use of traditional cattle breeds and reinstatement of native woodlands. The issue of extensive cattle grazing in particular the overwintering of cattle on standing crop vegetation is part of this initiative (R. Harrington, pers. comm.).

Ecological corridors (which can vary from a 5 metre-wide roadside strip to

a kilometres-wide landscape) have been recommended as a solution to the fragmentation of European habitats and their potential for habitat and species conservation in Ireland has been reviewed (Good, 1998). Examples of man-made ecological corridors are the canals and railways.

A study of coastal sites, carried out on behalf of the Heritage Council (Neff, in press), showed that not only were many non-designated areas virtually beyond recovery but that many of the proposed designated areas already had significant impairment. Table 12.5 shows the percentage of sites subject to the 15 most common damaging activities in coastal NHAs, SACs and SPAs as a whole. The study found that agricultural practices account for the major impacts with grazing effects the most significant.

There have been success stories in the last decade such as the conservation of the remaining peatlands and the stabilisation of corncrake numbers. Yet in both of these examples some, or all, of the financial support came from outside Ireland.

Ongoing Dúchas projects and programmes relate *inter alia* to a wide variety of species and habitat surveys, management plans for sites, including SACs and SPAs, zoning estuarine SPAs for aquaculture, database development, monitoring and remote sensing in the terrestrial, freshwater and marine environments. The Heritage Council, as well as carrying out its own work programme, sponsors research work on all aspects of the national heritage including the natural environment. One of the

Box 12.11 Rural Environmental Protection Scheme and Biodiversity

The objective of the measure in REPS covering the natural heritage is to retain certain listed habitats and to control commercial farming practices on these areas in the interests of wildlife (flora and fauna) and conservation generally. The habitats to be retained are: callows, turloughs and other seasonally flooded areas; marshes and swamps; peatlands (including raised bog, cut-over bog, blanket bog or moors and fens); sand-dunes, foreshore and sea-shore; machairs; eskers; natural or semi-natural vegetation; woodlands; scrubland; lakes, ponds, rivers and streams; field boundaries/margins, hedgerows and stonewalls; old buildings inhabited by protected species such as barn owls and bats; disused quarries and such workings which have become habitats.

Under the scheme the following practices cannot be carried out in such areas:

- afforestation;
- land improvement works including drainage;
- ploughing and re-seeding;
- interference with the free-flow of waters to "swallow holes" in turloughs;
- removal of sand and gravel from foreshore and sea-shore;
- commercial turf cutting on unexploited bog;
- burning of growing vegetation on land between April 1st and August 30th.

Source: DAF, 1999



Government's millennium projects has included the planting of a million oak trees throughout the country and the enhancement and conservation of native woodlands.

One further aspect of natural heritage and biodiversity is genetic diversity. Little is known about genetic variation in the wild in Ireland and genetic diversity below the species level has received little attention. The exceptions, of course, are in plant and animal husbandry where species and varieties have been changed over the years to increase yield. This should not be confused with DNA manipulation in farmed situations. There is much concern among the public regarding genetically modified organisms (GMOs) as discussed earlier in Chapter 7.

Ireland's booming tourism industry (Chapter 3) poses a threat to the island's natural heritage and biodiversity. What were regarded as remote places some 50 years ago have now become accessible to the tourist and tripper. Most tourists are attracted by the landscape and there must be a case for at least one natural World Heritage Site designation in the Republic of Ireland. Prospective candidates could include the Burren in Co. Clare and Valentia Island in Co. Kerry to accompany Newgrange in Co. Meath and Skellig Michael in Co. Kerry which were designated as cultural sites, in the UNESCO World Heritage List, respectively in 1993 and 1996.

CONCLUSIONS

It has not been possible, except in general terms, to assess Ireland's biodiversity. We do not know precisely what it entails. Inadequate data is a serious problem in Ireland. Among the main problems faced by researchers is how to measure biological diversity and there is an urgent need to define a common methodology to evaluate the various forms of biodiversity. Furthermore, in the Republic of Ireland there is no biological records centre. There is a strong case for a centrally co-ordinated approach to the collection and collation of species records in Ireland, particularly for lower plant groups such as fungi and algae (Neff, 1996). A properly resourced central records database for all plant and animal groups is essential if species diversity is to be properly monitored.

The absence of a standard approach to habitat classification has been identified as a key area for concern in relation to co-ordination of data collection on wildlife and the natural environment. The Heritage Council has been endeavouring to develop a standard approach to habitat classification and to provide standard guidelines for recording, classifying and describing Irish wildlife habitats (Heritage Council, in prep).

The putting in place of the structures for protection of the natural heritage and biodiversity in Ireland has been slow to progress. However, what has

been achieved here in the past was with much less resources, pro rata, than in most other EU Member States. Although it should have been anticipated, an additional factor leading to delays in, for example, the notification of SACs to the European Commission, is the due process of appeals. Perhaps the best barometer on which to judge the extent of commitment to conservation is by the amount of monies allocated. Direct spending by Dúchas on nature conservation was under £7 million in 1993 but by 1998 the allocation was almost £25 million (DAHGI, 1999). While a large portion of the budget is currently used to compensate landowners the increase in spending does reflect the seriousness with which the natural heritage and biodiversity are now regarded. Equally to be welcomed is the more transparent and open approach adopted in recent years to nature protection in which the public is being better informed. It could therefore be concluded that aspects of the natural heritage are, at the beginning of this new millennium, being better resourced than in the past.





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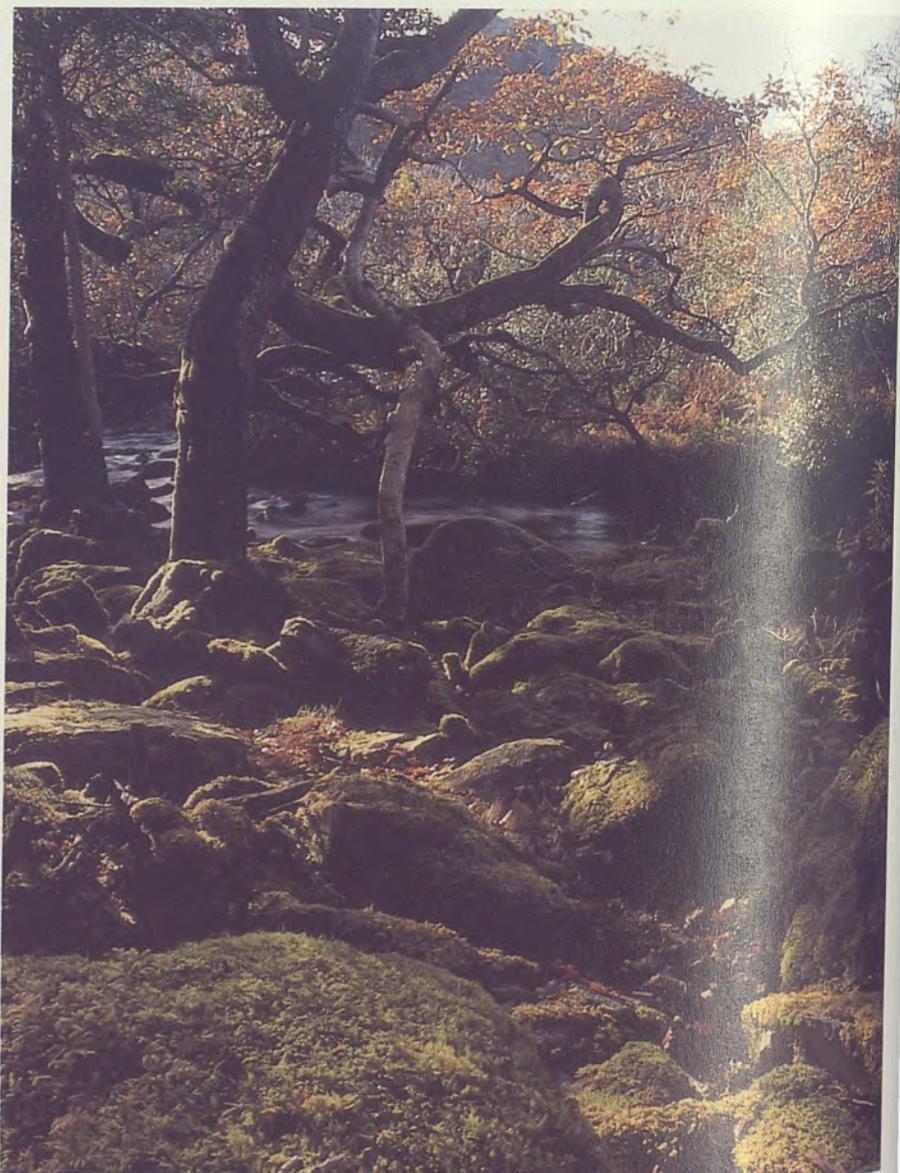
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PART V

Environmental Protection and the Future



IRELAND'S ENVIRONMENT: THE MAIN ISSUES

The main environmental issues in Ireland are eutrophication of inland waters, the increase in the amounts of waste, the deterioration of the urban environment and allied transport problems and the need to reduce emissions of greenhouse gases. Depletion of natural resources is a further matter of concern. These problems are a product of the increased economic activity of the last thirty years and mirror similar though earlier changes in other countries. However, the scale of the problems here is still moderate and, in general, the quality of the Irish environment remains relatively good and compares favourably with that of other EU States.

INTRODUCTION

Ireland is favoured by a number of circumstances which mitigate or lessen the potential impacts of environmental pressures. These include the predominance of westerly winds originating as clean air masses over the Atlantic, a high rainfall and a population density that, in European terms, is still relatively low. To these natural advantages one might add the poorly developed industrial and agricultural activities that obtained until the 1960s. It is not surprising, therefore, that the health of the natural environment became a matter of public concern in Ireland only in recent decades and that systematic monitoring and other investigations on a national basis commenced as late as the 1970s. Since that time, developments in the agricultural and industrial sectors, in particular, as well as increases in population and urbanisation have created a greater potential for environmental damage. As has been shown in the preceding chapters, this potential has been realised in several cases and parallels, to some extent, that which happened at an earlier stage of the twentieth century in most other European States.

A further factor that changed the status of environmental matters in Ireland was the accession of the State

to the then European Economic Community in 1972. This not only led to the acquisition of financial aids for economic development, particularly in the agricultural sector, but also required the State to adhere to various directives dealing with environmental quality and allied matters. This in turn prompted further investigation and monitoring and, in addition, fostered a public interest in and concern for environmental quality. It is possible that Ireland would have suffered greater damage to its environment, comparable to that which affected some other fast developing states in

the same period, were it not for its membership of the European Union.

While much play has been made about the State's currently high rate of development, it must not be forgotten that this largely reflects the relatively low base from which it commenced. In terms of infrastructure such as roads and public transport, the wealth of the State still lags behind many of its European neighbours while the scale of industrial development, the overall intensity of agriculture and the population density also remain moderate compared to the position in the latter countries. Consequently, the threat to the environment that such factors generate also remains relatively modest. It is worth noting too that the late development of much of the industrial sector here, as well as the lack of those basic resources, such as coal and iron, which facilitate the more polluting types of industrial activities, has greatly reduced the importance of that sector as a threat to the Irish environment when compared to its



past impact in most other EU States. However, industrial development is still a controversial matter in many areas of the country and many are not convinced that it can operate in a benign manner, especially in rural areas (see Box 13.1).

In general, therefore, the pressures on the Irish environment, while increasing significantly in the last thirty years, have not reached and perhaps are now not likely to reach, the intensity that they had already achieved in the first part of the

twentieth century in many other countries of Europe. Thus the requirement for many aspects of the Irish environment is the maintenance of existing high quality conditions or the elimination of the relatively minor degree of deterioration that has occurred. In some cases, the latter aim may be as difficult to achieve as the restoration to an acceptable condition of highly polluted or otherwise disturbed environments and may not be justifiable on cost grounds. It is worth noting that environmental monitoring and

investigations commenced in the State before pressures increased significantly from the relatively low level characteristic of the first part of the century. Thus, Ireland may have documented those initial phases of environmental deterioration that occurred much earlier in the more industrialised and heavily populated areas of Europe and which have, perhaps, gone largely unrecorded. This is particularly the case for inland surface waters where there has been a notable decline in quality over the last 30 years but where conditions remain, in general, better than those in most of the other Member States of the EU.

Box 13.1 Industry and the Rural Environment

Compared to most other Member States of the EU, Ireland is still largely a rural country with a relatively small fraction of the land surface given over to urban and industrial activities. Apart from the processing of agriculture produce, the extent of industrial activities in the rural areas was limited up to recent decades. This has changed since the 1960s with the locating of a variety of manufacturing plants in areas previously devoted solely to farming. While the scale of such development remains modest compared to the situation in the more heavily industrialised states of the EU, it has changed the perception of the areas involved in respect of environmental purity. Often, this perception is not helped by industrial accidents which, while not having a significant impact on the environment, may lead to a lack of confidence among the local population in the management of the plant. The following are examples of the several investigations undertaken in recent years to address such concerns.

Askeaton Animal Health Investigations: These investigations were carried out between 1995 and 1998 to determine the causes of serious animal health problems on two farms in the Askeaton area of Co. Limerick. There were reports of similar problems on 25 other farms and, in addition, concerns were expressed regarding human health. An opinion had formed locally that environmental pollution was involved and the main focus, in this respect, was on the nearby alumina production plant. While the final report on the investigations is not available at the time of writing, interim reports (EPA, 1995, 1997a, 1998a) state that evidence has not been found which would substantiate the suggestion that environmental pollution is involved. Arising from this investigation, a protocol was drawn up to ensure an early and structured response to investigating similar situations in future (EPA, 1997b).

Farm at Clonmel: The owner of a farm in the vicinity of a pharmaceutical plant near Clonmel, Co. Tipperary, reported animal and human health problems on his property in the early 1980s. Investigations carried out by various agencies did not establish a clear connection between emissions from the factory and the effects described. Subsequently the farmer sought damages in the courts against the owners of the plant. The case was rejected by the High Court but won on appeal to the Supreme Court and substantial damages were paid. The Supreme Court, in considering evidence that certain waste containment practices at the plant had been defective, took the view that, on the balance of probability, its emissions were implicated in the health problems on the farm.

Sentinel Herd Scheme, Cork: In view of the build up of industrial activity in the Cork Harbour area in the 1970s and 1980s, the local authority instigated a scheme to monitor key animal health indicators in a number of local dairy herds. The scheme has now been taken over by the EPA following the introduction of the Integrated Pollution Control licensing system which is required for the types of industries involved. To date, there have been no indications from the monitoring of any adverse impacts on animal health arising from the industrial activity.

The following sections review the main issues of current concern in the environmental area, based on the material presented in the foregoing chapters. These concerns have been identified by McCumiskey (1998) as follows: the eutrophication of inland surface waters; the disposal of waste; the urban environment and transport; and the reduction of greenhouse gas emissions. To these might be added the depletion of natural resources which is starting to emerge as a significant environmental issue. Future perspectives in relation to these matters are dealt with separately in Chapter 16. Firstly, however, the question of human health must be addressed as this will always be the chief concern where the integrity of the environment is threatened, especially by pollution.

HUMAN HEALTH

Public health in Ireland, like that in other developed states, is greatly improved compared to the situation even 50 years ago, and the main threats now come from personal habits in regard to factors such as diet, use of cigarettes and alcohol and exercise. In general, environmental pollution would not now be viewed as a major threat to health although modern life has brought some potentially new threats, the risks from

which have yet to be fully evaluated. However, where direct impacts of environmental pollution on human health do occur, they are still likely to arise mainly from contamination of waters and air.

Contamination of water supplies caused major problems for public health in many European countries in the past and continues to do so in large areas of the developing world today. In Ireland, incidents in recent years involving the water supplies to Naas in Co. Kildare and Nenagh in Co. Tipperary illustrated the severe disruption to daily life that arises when such vital services are rendered unfit for use. These were localised events and, in view of the general abundance of clean water in Ireland, it is somewhat unexpected that recent reports on the quality of drinking water in the State have recorded significant breaches of the EU limits, in particular that for faecal coliforms. This is largely a problem with the privately operated group schemes and reflects contaminated source waters or poor treatment or a combination of these factors. The sources for most of these private supplies are groundwaters and, as has been shown by the monitoring programmes undertaken in recent years (Chapter 9), the presence of faecal coliform in such waters is not uncommon and indicates a risk of illness in consumers. It is noted that co-ordinated efforts are presently in train to address this problem, the solution to which involves the protection of sources and proper maintenance of draw-off and treatment facilities.

The quality of the public supplies is much more satisfactory and clearly there would be advantages in having a greater proportion of the population served by the public system, wherever this is feasible. However, even the public supplies may be affected by emerging problems such as the presence of algal toxins in waters drawn particularly from eutrophic waters or the



formation of potentially carcinogenic substances, such as chloroform, in the treatment of water from similar sources. In addition, there are new risks arising from micro-organisms such as the protozoan *Cryptosporidium* which have caused major episodes of human illness in the UK and USA. Large sales of bottled water and other anecdotal evidence suggest that there is a measure of distrust in some segments of the population regarding the wholesomeness of the public supplies, perhaps arising in part at least from the publicity surrounding the defects in the private supplies. Protection of sources and the provision of rigorous treatment will, therefore, be increasingly important considerations in the supply of this basic service.

The health risk from air pollution arises mainly in the larger urban areas and here the bans on the sale of bituminous coal in a number of these areas, introduced in the 1990s, have had a major impact in reducing the levels of particulate matter in the air, especially in Dublin. There was some evidence prior to the ban that increased morbidity and deaths were occurring at times of high pollution levels in the Dublin area, as had been recorded in many other large European cities earlier in the century, most notably in London in the 1950s. Similarly, the potential threat from lead in air, to children in particular, has been greatly reduced by the phasing out of leaded petrol. The EU Framework Directive on

ambient air quality assessment and management, introduced in 1996, is now setting additional and more stringent standards for air quality and, as shown in Chapter 8, there are indications that some of these limits would not be achieved under existing conditions in the urban areas. Of particular note in this context is fine particulate matter (PM₁₀); research indicates that it is particulates of this size and smaller which are most likely to cause the respiratory and related illnesses associated with air pollution. Fuel combustion in vehicles is a major source of these pollutants and any improvements required will have implications, therefore, for road traffic (see below).

Other common risks to human health arising from environmental pollution are bathing in natural waters and consumption of shellfish. The bathing waters of the State appear to present little risk, based on current EU criteria (see Chapter 10) although there has been some questioning of the efficacy of the faecal coliforms as indicator organisms used to assess the likelihood of the presence of pathogens. The risk from the consumption of shellfish arises mainly where live organisms, such as oysters, are eaten. Shellfish waters appear to be in a less satisfactory state than bathing waters as, for most of the production areas, prior purification of the molluscs must be provided before they are offered for sale (see Table 10.1, Chapter 10). There have been some cases of sickness in consumers in recent years involving

oysters taken from Irish waters, a development which is clearly inimical to the promotion of the shellfish rearing industry as one for which Irish waters are particularly suited. Conditions in some of these shellfish areas, and bathing areas, will be improved by the sewage treatment plants presently under construction in all of the major coastal towns (see Chapter 5).

The importance of other forms of environmental contamination for human health is less well understood so that it is difficult to assess the risks they present. Concern has been expressed regarding the large number of synthetic chemicals now in use and the lack of information on the toxicity of many of these substances (EEA, 1999a). A particular concern has arisen in recent years regarding the apparent capability of certain chemicals to influence the activity of the hormones controlling the reproductive system or to induce cancers (see Chapter 7). While such effects have not yet been clearly demonstrated in humans there are suspicions that certain trends, e.g., decreasing sperm counts reported in some countries, may be a manifestation of the phenomenon. Besides pollutants, other aspects of the environment, particularly noise and odours, may create nuisance for sensitive individuals and this in turn can induce stress with adverse implications for personal health.

In general, the role, if any, of these and other environmental disturbances



in public health problems remain to be assessed in any detail in Ireland but it is reasonable to assume that as the State approaches the level of development of its European partners they will become matters of increasing concern. However, it may be difficult to identify any links between environmental quality and human health due to confounding factors and the length of time needed for some adverse effects to develop (EEA, 1999b).

EUTROPHICATION OF INLAND WATERS

The eutrophication of rivers and lakes probably represents the most serious environmental pollution problem currently affecting the State. This assessment is a recognition of the relatively large proportion of the surface waters affected and the fact that the position is continuing to worsen. While the intensity of the effect, as pointed out in Chapter 9, is moderate in many cases, the resulting changes in the aquatic ecosystem are inimicable to the game fish populations endemic in most Irish waters. The presence of healthy populations of these fish is an important indicator of the overall quality of the surface waters and the suitability of these resources for various uses.

Eutrophication of waters is, perhaps, a classic example of the impact of economic development on the environment. In most cases, excess phosphorus is the primary cause of the

problem and is contributed to, in this respect, by nearly all sectors of economic activity, domestic, public, industrial and agricultural. Besides the main sources, such as discharges of sewage and industrial wastes and the losses from agricultural land, fish farming, forestry development and even road building and other types of land disturbance may lead to phosphorus enrichment of waters on a local level. As the scale of economic activity increases, the potential sources of phosphorus loss to waters also increase, e.g., through increased use of detergents and fertilisers.

Estimates (see Chapter 5) suggest that agriculture is responsible for by far the largest input of phosphorus to inland waters, accounting for 73 per cent of the total (Fig. 13.1). This is not surprising in view of the fact that the amount (96,000 tonnes) of phosphorus generated annually in livestock manures and silage wastes is over 30 times greater than the equivalent amount in the combined municipal and industrial waste loads. The impact of the residual agricultural load that enters waters may be mitigated to some extent by the fact that much of it is likely to be discharged from the land during the periods of high rainfall in winter and spring and flushed relatively rapidly from the river systems. In addition, the forms in which the phosphorus is lost from agricultural land may not all be immediately available for

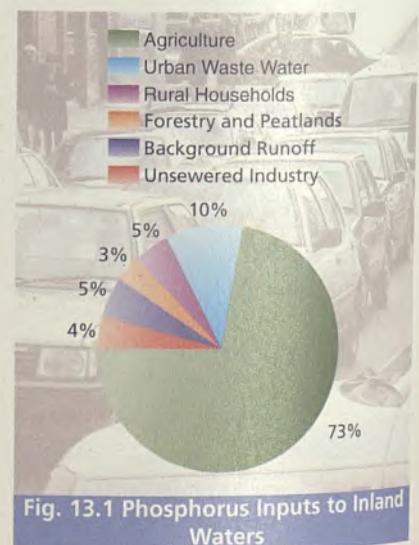
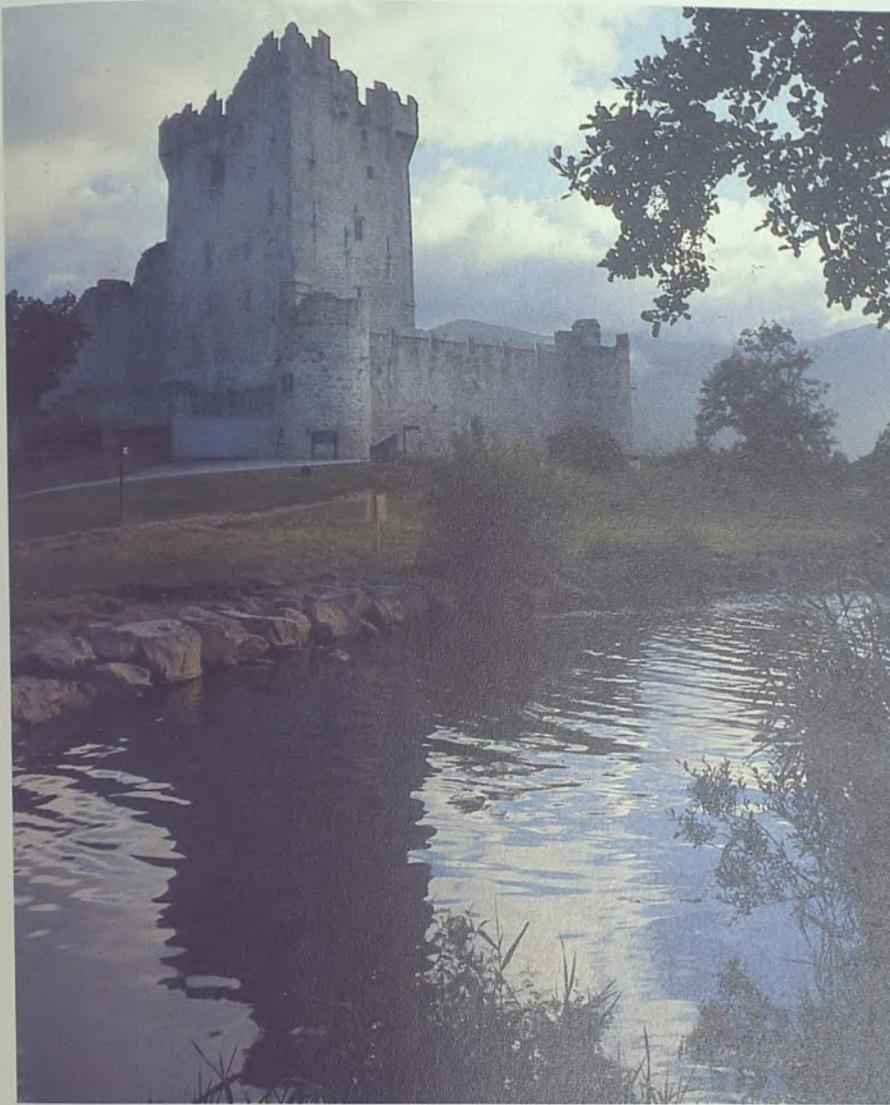


Fig. 13.1 Phosphorus Inputs to Inland Waters



uptake by algae and other aquatic plants. There is a need for investigations to determine the fate of this phosphorus and its full significance as a potential stimulator of plant growth in rivers and lakes.

There is little doubt, however, that, as shown by water quality surveys, agriculture is a major cause of the increasing eutrophication. It has been estimated that, on a national level, the inputs of phosphorus to farming are greater than its removal in produce and that, as a consequence, the soil content of the nutrient is in many cases above that required for plant needs. In such situations, excessive loss of phosphorus from the soil is likely to occur, especially in periods of high rainfall. In addition, there is evidence that losses directly from farmyards are

a further important source of the nutrient. Minimising such losses of phosphorus requires, therefore, a management approach that treats farm wastes as a nutrient source rather than a waste disposal problem. This means matching the amounts of waste spread on the land and the timing of the spreading with crop needs for nutrients and cutting back on the use of artificial fertilisers where these are unnecessary. In addition, it requires efficient interception and secure storage of farmyard wastes.

It is perhaps inevitable that increased productivity of farm land will lead to some increase of the productivity of the waters draining the land, and it may not be possible to maintain these waters in their pristine state in such circumstances, even with rigorous

controls on waste management. This suggests that the preservation of waters of high ecological quality will only be accomplished by restrictions on the more intensive type of farming in the surrounding catchments, a policy which seems justified, for instance, in the case of the large western lakes, such as Mask and Corrib. Failure to do so is likely to lead to situations like Lough Sheelin in Co. Cavan, a renowned trout lake which has been badly impacted by the development of pig farming, in particular, in its catchment since the early 1970s and where control measures have not been effective.

The combined discharges from urban waste water treatment plants and unsewered industry contribute some 14 per cent of the phosphorus load to inland water (Fig. 13.1). While this is a relatively small fraction, it is likely that in many cases such discharges have a relatively greater potential to cause eutrophication than do the inputs from agriculture. As pointed out in Chapter 9, the fact that such discharges enter waters directly and continuously means that, in many cases, they are likely to be major enriching factors during periods of low flow and high temperatures when plant growth is most favoured. Furthermore, run-off from land at such times is likely to be greatly reduced. There is a strong case, therefore, for the incorporation of phosphorus removal in all significant treatment plants discharging to inland waters in order to ensure that the loads are minimised at critical periods. It is arguable that this might be a more profitable use of resources than the provision of secondary treatment to all of the coastal towns and cities. It is now part of the price that must be paid if the State's rivers and lakes are to retain their status as primarily game fish waters and will be needed, in any event, if the water quality targets in the proposed EU directive on water management are to be met.

WASTE

The production of waste materials has always been an inevitable side-effect of economic activity – witness the midden heaps left by medieval communities – but has become one of the defining characteristics of the modern, consumerist society. Waste, in this context, excludes the water borne discharges from sewerage systems and industries and the emissions of gaseous and other materials to the atmosphere. The latter, if properly pre-treated, are diluted to harmless levels in the environment after discharge.

However, solid or semi-solid wastes such as domestic refuse, industrial waste materials and manures from livestock cannot be dealt with in this manner and require disposal, as appropriate, by landfilling, incineration or by land spreading. These disposal routes all carry a risk of environmental damage as well as leading to nuisance. Waste is now a major concern in all countries in Europe where it is estimated that the total amount generated increased by nearly 10 per cent in the early 1990s (EEA, 1999b).

The information given in Chapter 6 shows that some 80 million tonnes of waste were generated in the State in 1998. However, this figure is distorted by the fact that 80 per cent of the total is accounted for by agricultural wastes, mostly manures and dirty water from farmyards. These wastes are dealt with mainly at farm level and, while implicated in water pollution as discussed above, are not normally considered in the context of the waste problem as generally understood. The same might apply to the sludges from sewage and water treatment, which amounted to over 0.5 million tonnes in 1998, although much of this material is currently sent to landfills. Sewage sludge will increase in volume considerably in future years as treatment plants, for the coastal towns in particular, come on stream. Since



dumping at sea is no longer a disposal option for this material, it is now necessary to pre-treat the sludge sufficiently to allow safe application to land as fertiliser; this is already in train in Dublin where sludge from the present primary plant is being thermally dried and pelletised in preparation for application to land. Widespread application of sewage sludge to agricultural land may give rise to problems of public acceptability of the produce from such land; however, it is worth noting that the quantities of sludge requiring land disposal now and in the future are very small compared to the amounts of agriculture waste produced.

The bulk of the remaining 15.5 million tonnes produced in 1998 was made up of industrial manufacturing waste (4.9 million tonnes), mining and quarrying waste (3.5 million tonnes), municipal waste (i.e. domestic and commercial waste and street cleaning waste) (2.1 million tonnes) and construction and demolition waste (2.7 million tonnes). In all of these sectors, the main disposal method is landfill. It is now clear that this approach will not be sustainable in the longer term given the quantities of waste being generated and the difficulty in providing new facilities due to public objections. In addition, targets set by EU directives and declared national policy preclude the continuance of the current scale of reliance on this mode of disposal.

In general, efforts to date to deal with the situation in Ireland by means of minimising waste production, recycling or otherwise reducing the volume of waste have met with little or only minor success, although for some of the schemes now in operation such a conclusion may be premature. It would appear that the State, in this as in many other areas of environmental concern, is following the same trend set in other, more developed countries of Europe and that little change can be expected in the immediate future. Despite the expression of much public concern on the matter, especially resistance to the development of new landfills or to other methods of disposal such as incineration, there is little indication of a widespread attempt, either at public or private level, to reduce the amounts of waste generated. While this may be due partly to the lack of the necessary opportunities or back-up needed and to the varying economics of recycling, it is clear that the problem is not being addressed in a radical enough manner. There is a need for a national infrastructure of waste recycling and disposal facilities.

The aspects of the waste problem that probably impact most on the public mind are poorly operated landfills and litter. The former can cause much local nuisance through odours and vermin as well as pollution of ground and surface waters. Experience or reports of such impacts are probably part of the reason why

there is so much resistance to the development of landfills in new areas. Considerable improvements are now required in the operation of landfills under the scheme of licensing by the EPA introduced by the Waste Management Act of 1996 but it remains to be seen whether this will be sufficient to allay public misgivings. However, with the requirement to reduce the amounts of waste going to landfills, there will be a need to consider other forms of disposal, including incineration. While this technique is widely used in other European countries, it is clear from the response to several proposals that public resistance to its use here will be difficult to overcome. This resistance seems to be concerned mainly with the possibility of the generation of dioxins and related compounds and the consequent risk of contamination of the local environment.

While problems with the management of landfills and other facilities are the responsibility of public bodies, littering is a result of personal behaviour and it appears that a large segment of the population contributes directly to the image of the "throw away society". The extent of littering has been rightly termed a national disgrace and is one of the unfavourable features of the country raised by foreign visitors. The chewing gum spattered pavements of cities and towns do not suggest that the attitude of the younger generation will lead to any future improvement. The littering problem is largely facilitated by factors such as the widescale use of packaging for consumer goods and the proliferation of fast food outlets; it appears that those measures currently in force that might control such factors are not sufficiently stringent. Ultimately, the resolution of the problem requires a change of individual attitudes to bring about that heightened sense of civic responsibility that seems to be more

prevalent in other European countries. In order to achieve this, there may be a need for a greater use of penalties as well as an ongoing education process.

THE URBAN ENVIRONMENT AND TRANSPORT

Ireland has become an urbanised society later than most other European countries, the majority of the population still being classified as rural in 1961. However, with nearly 60 per cent of the current population now living within urban areas, the position is fast approaching that of most of our neighbours. Thus the quality of the urban environment is a matter of concern for the majority of the people living in the State. This applies particularly to the Dublin urban area, which holds nearly one third of the national population and which is the only such area in the State comparable in size to the major cities of Europe.

Urban life has many conveniences such as ease of access to services and entertainment facilities. However, increased urbanisation creates the need for the movement of large numbers of people and goods within and between cities and towns for work and social purposes, and this can be accommodated only by good public transport services and a properly designed road system. Failure to provide such facilities is one of the main reasons for the deterioration in the quality of the

urban environment. The concentration of large numbers of people in confined areas together with supporting infrastructure and industry creates problems such as air pollution, street congestion and noise, which are all immediately attributable to vehicular traffic. These conditions induce stress and are liable to impact directly on health. The problems are exacerbated in many cities by the fact that the inner core of streets date from a much earlier age and are unsuited for the movement of large numbers of vehicles.

All of these problems are now present to a greater or lesser extent in Ireland, especially in the Dublin area; they seem destined to continue and increase until, in particular, further limitations are imposed on private car drivers and the planned improvements to public transport are fully achieved. The development of large and often distant suburbs and the more recent increase in car ownership has led to a much greater private use of the road system with consequent clogging of main routes and increasing journey times between home and work location. Furthermore, access to parking is now difficult in the city area and requires many drivers to start their work day much earlier to increase their chances of gaining a parking space. This has led to an extension of the period over which high traffic densities occur with increasing noise disruption to residents near main roads. Increased



car use also has implications for air quality and as pointed out above, there is evidence that ambient levels of some vehicle-produced pollutants are likely to be in excess of the new, more stringent EU standards for the protection of human health. In addition, there is an economic penalty in terms of time lost due to long periods spent in slow moving traffic.

Efforts to reduce car use in urban areas have had some success recently but cannot have substantial impact until convenient alternatives are made available for a much greater proportion of commuters. The building of new roads does not offer a long-term solution as traffic tends to increase and take up the expanded capacity. This is a particular feature of the large bypasses built around towns which, although intended to divert through traffic from the urban core, tend to be dominated by local traffic making use of such roads in the course of relatively short journeys. While this can be countered by the imposition of toll charges, it is clear from the reaction of interested parties that such a move would be strongly resisted.

CLIMATE CHANGE AND GREENHOUSE GASES

The probability of changes in climate due to increases of carbon dioxide and other gases in the atmosphere is, unlike many other environmental issues, a matter of concern for all of the world's states. While there is no clear-cut evidence that the major problems likely to arise from these changes are presently manifest, there is a consensus that the quantities of the greenhouse gases in the atmosphere have increased due to anthropogenic emissions, that global surface temperatures have increased by between 0.3 and 0.6 degrees C since the late nineteenth century and that the balance of evidence suggests a discernible human influence on

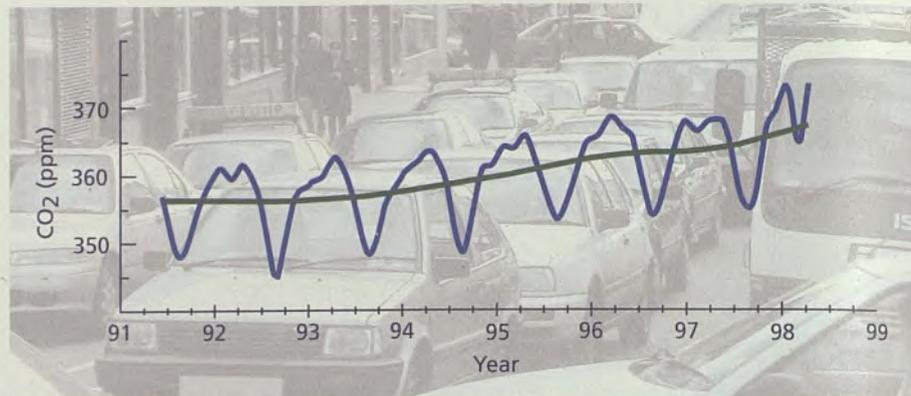


Fig. 13.2 Annual Variation and Increasing Trend in Carbon Dioxide Concentrations Levels (since 1991) at Mace Head (Source: G. Jennings, UCG, pers. comm.)

global climate (IPCC, 1995). It is interesting to note that the long-term records of carbon dioxide concentration at Mace Head Co. Galway reflects the global increase (Fig. 13.2).

In view of the scale of the problems that may arise from climate change, e.g. land inundation due to a rise in sea levels, changes in rainfall patterns and extensions of the ranges of disease-carrying insects, the costs of not reacting appropriately to the situation may be very high. On the other side of the argument is the consideration that the economic impacts of undertaking the necessary measures to reduce the emissions of the gases are likely to be enormous for most States. There is no doubt that the matter presents a major test of the adherence of the world's community to the precautionary principle in dealing with potential environmental problems and, specifically, a

commitment to the international targets agreed for reductions of greenhouse gas emissions.

Ireland has one of the higher emissions of greenhouse gases in Europe per capita, a situation attributable in part to the limited capacity for hydropower development and a policy not to avail of nuclear power. This means that energy generation is almost totally dependent on fossil fuels and is responsible for nearly 30 per cent of the national emissions of the gases. The high per capita figure also arises from the relatively large number of cattle in the country, the methane generation from which, together with the nitrous oxide lost from agricultural land, accounts for one third of the total of greenhouse gas emissions in the State, when expressed in terms of carbon dioxide equivalent (see Chapter 4). Together, energy generation, agriculture and traffic, account for





over 70 per cent of national emissions of greenhouse gases.

In the context of the Kyoto agreement, Ireland was assigned a target of restricting increase in greenhouse gas emissions to 13 per cent by the 2008-2012 period on the base year of 1990 (see Chapter 4). Estimates show, however, that by 1998 there had already been an 18 per cent increase in net emissions compared to 1990 while those forecast for the 2008-2012 period are as much as 30 per cent greater than the base year emissions. Thus, it appears that the State is now in a position where rather than restricting increases it must achieve reductions in the current level of emissions in order to meet the target set for the 2008-2012 period. Most of this quicker than expected change is attributable to increases in the outputs from energy production and, particularly, the transport sector. In the latter case, the unprecedented growth in car ownership has been a major factor. Car ownership is still below average EU levels so that it is likely to continue its increase in the absence of significant disincentives (see Chapter 16).

Efforts to curtail the increase in emissions have been insignificant to date. For instance, there has been very limited development of renewable energy sources, such as wind power, and even this has been met with a negative public reaction in several areas; this does not suggest an

easy passage for the large scale installations which may be necessary in future. Furthermore, the current availability of "sinks" for carbon dioxide in the State is limited because only those forests planted since 1990 are included in relation to the Kyoto commitments. However, this may change if the proposed high planting rates are achieved (see Chapter 16).

Clearly, the situation presents a dilemma for the State; the concession to Ireland of a further increase in emissions, despite the requirement for an overall reduction in the EU's output, and the considerably improved economic situation here, means that little sympathy can be expected from other Member States if the allowed target is not respected. Furthermore, the fact that the economy is still in a strongly growing mode suggests that there will be little appetite in either the private or public spheres for any radical measures which may apply a significant brake on development. Nonetheless, there is a need for immediate action in order to reduce the pain of meeting the accepted target.

PROTECTION OF NATURAL RESOURCES

Natural resources have come under much greater pressure in the last two centuries owing to industrialisation and urbanisation and the associated increase in populations. More recently, changes in agriculture have

had a similar impact. Besides the depletion of minerals, coal and oil and other finite resources, these developments may adversely affect the continued use of potentially renewable resources such as water and fisheries. In addition, they are likely to reduce or even eliminate the habitats of certain flora and fauna leading in some cases to extinction of species.

It is obvious that some of these impacts are not completely avoidable and a certain level of environmental disruption must be accepted as part of the price to be paid for better living and working conditions and for the overall prosperity of society. The change of use of agricultural land to housing and roads, the damming and abstraction of water from rivers and the combustion of fossil fuels are all examples of exploitation of natural resources for which there are no realistic alternatives at present. Thus, it is not reasonable to expect that modern life can have a totally benign impact on natural resources; the aim must be to minimise this impact and to seek alternatives to disruptive developments wherever feasible.

Ireland's main natural resources of economic importance are its agricultural land and its inland and coastal waters and their fisheries. To these might be added the scenic landscapes and indigenous flora and fauna; although of less direct economic significance than the foregoing, these too would be considered by most people as important aspects of the Irish environment. While the country is perhaps not as poorly endowed as once thought with reserves of extractable minerals and fossil fuel sources, these are generally not of the same relative magnitude as those found in many other European countries.

All of these resources and others have been exploited to a greater or lesser extent since man first arrived in the island. The natural forest cover, which once dominated the landscape, was greatly reduced in extent by the



end of the seventeenth century and had shrunk to around 1 per cent of the land by the beginning of the twentieth century. In addition, it is clear from many investigations that the land surface in most areas of the country has been greatly changed, albeit in some cases improved, through the centuries by agricultural activities, particularly in the late eighteenth and early nineteenth centuries when the population increased rapidly and nearly all available land was exploited for the cultivation of food crops. Thus, it is unlikely that there are any substantial tracts of the Irish territory that can be said to be in their natural state and even the most prized landscapes have a large element attributable to man-induced changes.

Relatively low economic activity in the first half of the twentieth century moderated the impact of urban development on the State and it is only in the last 40 years or so that cities and towns have spread significantly over adjacent agricultural land through the development of large suburbs. However, this is now a prominent feature of the State's cities and towns, of Dublin in particular, and many rural areas and their villages in the vicinity of the larger urban centres have now been engulfed by housing estates and industrial development and their identity largely obliterated. In other areas, the rural character has been diminished by ribbon building along

main roads radiating from the nearby urban centre.

The coastal zone, in particular, has been significantly impacted by development, especially in the vicinity of ports and urban areas. Besides economic use, this zone is important for many leisure and recreational activities and there is continual pressure to increase the facilities supporting such activities in these areas. This includes the proliferation of privately built holiday homes and the State-supported development of holiday villages. Such developments have led to adverse changes in the character of the nearby existing settlements and to conflicts with the need for the protection of natural features such as sand dunes and the habitats of various animal and plant species. In addition, the coastal zone in some areas of the country is subject to natural erosion processes.

Agriculture has been the main factor shaping the Irish landscape up to recent times and has in general produced a pattern that is attractive to local and foreign visitors. This pattern has been eroded in some areas by the increase in field size and the removal of hedges, although not on the scale seen in other countries in Europe.

The accelerated development of commercial plantations of trees, especially those composed exclusively

of coniferous species, has also changed the appearance of the landscape in many cases and for the worse in the opinion of many people. Exploitation of the large lowland bogs since the 1940s, while greatly beneficial to the State, has removed a large proportion of these very characteristic features of the Irish midlands.

All of these changes to the land surface have adverse implications for the habitats of a number of native species of flora and fauna; in some cases, they have led to virtual extinction of sensitive species. Such changes may also lessen the attractiveness of the landscape to visitors and may threaten the future success of tourism in the most affected areas.

Water resources are, in general, only moderately exploited in Ireland; as explained in Chapter 9, abundant rainfall and relatively low population density means that the State has a high availability of water on a national basis. However, there is a potential shortfall in the eastern part of the country, which has a combination of the lowest rainfall and the greatest population, and this has already manifested itself in some localised areas. The use of the existing sources supplying Dublin is approaching full capacity and further significant growth of the metropolitan area may involve tapping new sources much further afield, e.g., the Shannon. However, as pointed out in Chapter 7, there is a very large loss from the distribution system in Dublin through leakages; the need for improvements in this situation has been identified and remedial action is in train.

Sea fisheries are the main natural, biological resources of economic importance to the State. There is evidence (see Chapter 10) that the exploitation rates of some of the fisheries are now at unsustainable levels with a large proportion, in some cases the bulk, of the standing

stock of adult fish been removed in the fishing season. In addition, there is evidence of mortality of large numbers of juvenile fish taken as a bycatch. Such exploitation rates and juvenile mortality threaten the ability of the fish population to reproduce itself and are thus unsustainable.

Adequate protection of all of these natural resources requires a planning approach to their use that takes a comprehensive view of the factors involved rather than one which focuses on particular issues. This is particularly needed in relation to the use of the land where there are many competing needs, some of them potentially in conflict. Protection of natural resources is probably the area in which the principle of sustainability is of particular relevance but also the one where its application presents the greatest challenge.

OTHER CONCERNS

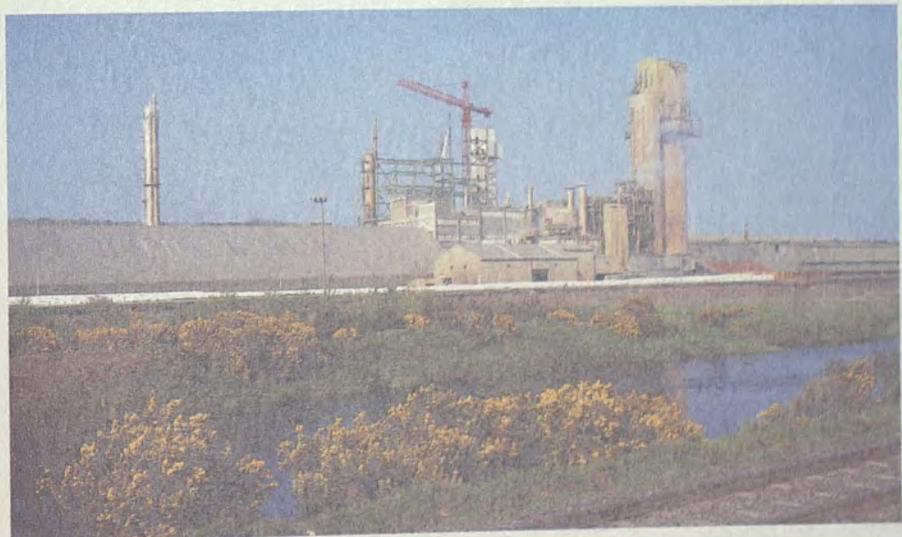
The foregoing issues correspond in general to those raised by the public in recent surveys (EPA, 1998b). However, there are several other matters of environmental concern that do not figure above for various reasons. Perhaps the most outstanding is the potential contamination arising from the Sellafield nuclear processing plant in Cumbria, UK, the proximity of which to the Irish east coast has caused much concern in the populations living in that area. Undoubtedly it is this concern which leads to the Irish population's perception (Lehane, 1999) of the threat from nuclear power being much greater than that held by the inhabitants of other European states, despite not having such a facility here. Although the contamination of the western Irish Sea, due to discharges from the Sellafield complex, has diminished considerably in recent years and is unlikely to present a threat to consumers of sea food (see Chapter 10), the acceptability of even this low

level of contamination has been rightly questioned; however, the possibility of serious accident looms much larger in the public consciousness. Unlike the issues raised above, the main problem in this case is the lack of direct control by the Irish authorities.

The use of genetically modified organisms (GMOs) and their products has become a controversial issue in Ireland within a short period and has been highlighted in particular by the objections to the growth trials of GM crop species which have taken place in a number of areas. From the environmental point of view, it is the possible cross contamination of other crop or weed species with foreign genetic material which is the chief concern. This possibility has been heightened in particular by organic farmers who claim that the use of GM crops in the vicinity of their holdings will pose a risk of such contamination and thus harm the clean image which they claim for their produce. All of these concerns are mirrored in other countries in Europe and now appear to be emerging in the US which up to now has made large-scale use of GM crops. There is a measure of uncertainty now over the further use of genetic modification, at least for use in plants grown in the general environment, and public resistance to the techniques, if it remains unchanged, is likely to continue this uncertainty.

It is noted that emissions from industry continue to be regarded by the public as a significant environmental problem (see Chapter 2). This is somewhat at variance with the improvements that have been achieved in recent years following the introduction of the Integrated Pollution Control licensing system, with its emphasis on emission reduction and on waste minimisation and recovery. In addition, industry, aside from one or two categories, is now a minor contributor to greenhouse gas emissions. It is possible that public attitudes to the sector are largely influenced by problems with odours, which have been a problem with several industries in recent years, notably with rendering plants. Public attitudes may also be influenced by the animal health problems reported in a number of areas in recent years and attributed by locals to industry. The Askeaton case, referred to above, has attracted much public attention in this regard. Overall, of the main sectors of the economy having adverse impacts on the environment, industry is probably now the least damaging.

In addition to the challenge to reduce the national emissions of greenhouse gases, the State is also facing the need to cut back substantially its production of those gases giving rise to acidification of the environment and the production of ozone, principally sulphur dioxide, nitrogen



oxides and ammonia (see Chapter 4). This need arises from the international examination of the problem of acidification in Europe undertaken by the UN and the EU. The proposed emission "ceilings" for the above gases which have emerged from the extensive modeling exercises carried out on behalf of the UN and EU will require substantial reductions of emissions in Ireland, particularly of sulphur dioxide. This has implications for the power generation sector in particular. As in the case of the greenhouse gases, agriculture is also a large contributor to the emissions of acidifying gases, in this case due to the ammonia released from manures.

CONCLUSIONS

Ireland remains a country with a relatively clean environment and one largely free of the residue of past industrial pollution, which afflicts many other European countries. This is as much a result of favourable circumstances pertaining to past pressures on the environment as it is to protective measures. In addition, membership of the EU has helped to highlight the need for environmental protection in the State. However, there are now clear signs that the State is drawing down its capital of good

environmental conditions and following the pattern of deterioration that has characterised many of the early industrialising States. As pointed out above, the more rigorous control of industry introduced in recent years has significantly lessened the potential of that sector to cause environmental damage. Greater efforts will now be needed in other sectors, especially energy production, agriculture and transport, if further deterioration is to be avoided and the aims of the Government's policy on sustainable development are to be achieved.

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ENVIRONMENTAL ECONOMICS

In many countries the use of economic instruments, such as taxes, charges, deposit and refund schemes and subsidies makes a positive contribution to improving the efficiency and effectiveness of environmental policy. A number of such instruments has been in operation in Ireland for some time but their use is not widespread. Ireland has traditionally levied high taxes on mineral oils and on cars. For example, in 1998, receipts from excise duty on petrol and oils totalled £1,028 million. However, there is considerable scope to reform the Irish fiscal system to address the key environmental challenges facing Ireland, to meet international obligations and to apply more fully the polluter pays principle. Such measures could include appropriate cost recovery for the provision of water, waste collection and disposal and waste water treatment, a landfill tax and an excise tax on the sale of fertilisers to discourage overuse. Options to promote energy efficiency and to limit greenhouse gas emissions include a carbon/energy tax on the sale of fossil fuels and emissions trading.

Total capital investment in water and sanitary services in the period 1994-1998 amounted to £689 million with a further £275 million provided for in 1999. Expenditure on heritage has also increased over that period. Expenditure under the basic REPS scheme between 1994-1998 amounted to £217.6 million. Total expenditure on the environment by other socio-economic sectors is, however, more difficult to quantify.

An EC evaluation of the Cohesion Fund in Ireland indicates that while investment in waste water treatment infrastructure has been substantial, Ireland's progress in the implementation of the urban waste water treatment Directive has been slow, principally because of the long lead times for such projects. Evaluating the impact of Structural Funds in Ireland is hampered by a lack of comparable and comprehensive data and there is a clear need to develop indicators to track environmental impacts and to identify the environmental dimensions within various operational programmes.

INTRODUCTION

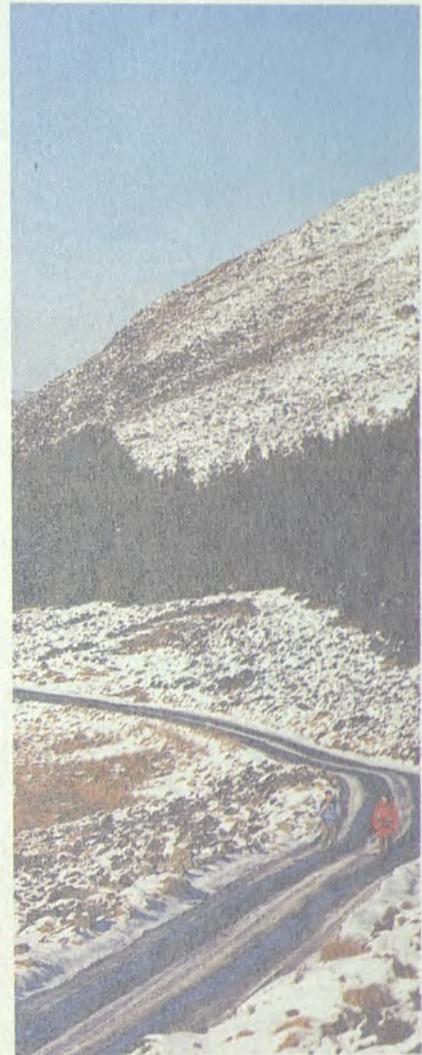
This chapter reviews various economic aspects of the environment, including the use of economic instruments to facilitate a longer term re-focusing of environmental policy. European Union and other international developments are considered along with related national developments in this area. An overview of the EU financial

support mechanisms is given, together with an evaluation of their environmental impact in Ireland. The chapter also addresses expenditure at a national level on environmental services, and on heritage and by the various key sectors of the economy. The application of economic instruments in Ireland is reviewed and proposals for extending their scope are discussed.

INTERNATIONAL DEVELOPMENTS

European Union

The Amsterdam Treaty (CEC, 1997), strengthened the position of the environment in the European Union. It placed the protection of the environment and the achievement of a sustainable pattern of development at the core of the EU's objectives for the future. The Treaty specifies that environmental protection requirements must in the future be integrated into European policies and actions with a view to promoting sustainable development.



A follow-up strategy prepared by the European Commission (CEC, 1998a) outlined the ways in which such policy integration could be achieved. Using as an example the policy package Agenda 2000 (which includes proposals for the reform of the agriculture and Cohesion policies), the strategy outlined how improved use of the EU financial mechanisms could contribute to policy integration. The key proposals in this regard are as follows:

- environmental protection and improvement to be established as objectives, under Structural Funds round 2000-2006, to ensure the funds make a positive contribution to sustainable development;
- enhanced financial support to be provided for projects of particular environmental importance;
- for projects over 50 Million ECU there should be a more systematic scrutiny in regard to environmental protection;
- for the rural development programme under the Common Agricultural Policy, a substantial amount of funds would be reserved for actions with direct environmental benefits. Other projects under this programme should be compatible with environmental objectives;
- Member States to put in place a partnership involving environmental bodies to integrate environmental protection requirements in Structural Fund programmes.

The *Fifth Action Programme on the Environment*, entitled "Towards Sustainability" has made explicit the need for market based and other economic instruments to facilitate a longer term re-focusing of environmental policy in Member States. Such instruments include environmental taxes and charges, fiscal incentives and subsidies. However, since its implementation in 1992, there has been little progress in their use at an EU level. Following a

review of the action programme, the European Parliament and the European Commission agreed on how to strengthen its implementation (CEC, 1998b). As a key priority, the EU reaffirmed its commitment to develop and encourage a more extensive mix of instruments to bring about substantial changes in current trends and practices. In relation to the development of market based and other economic instruments as a means of implementing environmental policy, particular attention is to be given to:

- environmental accounting;
- examining constraints on the introduction of economic instruments;
- the use of environmental charges;
- identifying and reforming subsidy schemes which adversely affect sustainable production;
- encouraging the application in Member States of the concept of environmental liability;
- using voluntary environmental agreements to pursue environmental objectives while respecting competition rules;
- encouraging the use of fiscal instruments to achieve environmental objectives.

Priority is also to be given to improving the use of the EU financial support mechanisms as a means of supporting sustainable

development. This includes better integration of environment considerations in development projects and an evaluation of the impact of these mechanisms on the environment.

EU Financial Support Mechanisms

Structural Funds

The Structural Funds are the EU's primary financial instruments and are aimed at promoting better economic and social balance across the European Union. The funds, which are used to finance development in Ireland, comprise:

- European Regional Development Fund (ERDF), which includes investment in infrastructure aimed at environment protection;
- European Social Fund (ESF), which includes support for training in the environment;
- the European Agricultural Guidance and Guarantee Fund (EAGGF), which includes environmentally friendly farming, rural development and the conservation of rural heritage;
- the Financial Instrument for Fisheries Guidance (FIFG), which includes support to achieve a sustainable balance between fishery resources and exploitation.

The aim of the Structural Funds is to concentrate the support where it is



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most needed. Rather than looking at individual projects proposed by Member States, the priorities and issues of a whole region are examined and comprehensive programmes are developed. Any measure financed by the EU Structural Fund mechanism must be co-financed by the Member State.

Cohesion Fund

The Cohesion Fund was established in 1993 with the purpose of strengthening the social and economic cohesion of the European Union. With a budget of some 15 billion ECU for the period 1993-1999, it aims at assisting those countries with a per capita Gross National Product (GNP) of less than 90 per cent of the EU average. At the time of application, the fund applied to four countries: Ireland, Spain, Portugal and Greece.

Unlike the Structural Funds, the Cohesion Fund assists individual projects as opposed to programmes. It co-finances projects in two fields, environment and transport, and focuses on large infrastructural projects in these areas. In Ireland, the main environmental themes to which the Cohesion Fund contributes are:

- Water Resource Management - improving drinking water supply and improving water conservation;
- Waste Water Treatment: - meeting Ireland's commitment under the

urban waste water treatment Directive;

- Integrated Catchment Management: protecting key river catchment areas.

The aim of the funds is to target environmental projects linked to the implementation of European Policies and more specifically to the themes of the EU Fifth Action Programme on the Environment. One important environmental dimension that affects all Cohesion Fund investments (both environment and transport) is that the project appraisal procedures are designed to ensure that each project complies with EU environmental policies and legislation as well as being consistent with national strategies and programmes.

Since the introduction of the Cohesion Fund, Ireland has benefited greatly in terms of environment and transport developments. By the end of 1999, a total of 107 projects were approved for Cohesion Fund assistance, with EU funding amounting to £1,178 million (Table 14.1) (DoF, 1999a).

Roads investment co-financed by the fund resulted in the provision of 71 km of motorway, 157 km of single carriageway, 47 km dual carriageway and 5 km of three lane carriageway. Rail investment resulted in 355 km track renewal as well as bridge renewals and improvements to level

crossings. On the environmental side, investment (including structural fund assistance of £96 million) supported 163 major water and sewerage schemes, one landfill, a waste baling station and the development of number of river catchment monitoring and management systems (DoF, 1999a).

Community Financial Instrument for Environment (LIFE)

Introduced in 1992, the Community Financial Instrument for Environment (LIFE) contributes to the development and implementation of EU environmental policy by financing demonstration projects in Member States. The budget for the period 1996-1999 (the second phase of the instrument) amounted to 450 million ECU. Two particular areas of activity addressed under LIFE are:

LIFE-Environment: which provides support for innovative and demonstration projects designed to promote sustainable development in industrial activities and land use planning and support for preparatory measures designed to implement EU policy measures and legislation.

LIFE-Nature: Support of measures for protection of endangered species and habitats.

Table 14.1 Cohesion Fund Assistance in Ireland 1993-1999

Category	Cohesion Fund Contribution (€million)
Transport	
Road	441.8
Rail	111.8
Ports	32.3
Airports	2.4
<i>Sub-total Transport</i>	<i>588.3</i>
Environment	
Water Supply	197.7
Waste Water	377.2
Solid Waste	7.9
Habitats	1.6
Technical Assistance	5.5
<i>Sub-total Environment</i>	<i>589.9</i>
Total	1,178.2
<i>DoF, 1999a</i>	

Unlike the Cohesion and Structural Funds, funding under LIFE is open to any person or company in the EU. Between 1992 and 1998 a total of 23 projects have been funded in Ireland under LIFE-Environment, with a total EU funding of almost £8.7 million. In 1999, an additional four Irish projects were successful in securing European funding totalling over £1 million.

Organisation for Economic Cooperation and Development (OECD)

The OECD, consisting of 29 member countries (including Ireland), provides a forum to develop economic and social policy. Some of the basic premises of the OECD are that economic activity is fundamentally linked to environmental quality and that economic and environmental policies cannot be made in isolation. The OECD has been at the forefront of studies on the potential use of economic instruments for environment policy and on the progress made in various Member Countries in integrating the economy and the environment.

The OECD has concluded that economic instruments, such as those outlined in Box 14.1 can make a

positive contribution to improving the efficiency and effectiveness of environmental policy. In comparison to the more traditional "command and control" approaches, they could in principle reduce the economic costs of achieving a given level of environmental protection. They may stimulate growth in pollution abatement technologies, as they provide incentives to reduce pollution. In the cases of taxes and charges, revenue raised through these instruments could be used for financing other environmental policy measures or for developing environmental infrastructure or reducing taxes in other areas (OECD, 1997a.)

However, the environmental benefit of subsidies is not as clear. Many subsidies can generate either a negative or positive environmental effect depending on what they subsidise and how they are targeted. For example, subsidies for agriculture under the Common Agricultural Policy, such as the sheep headage payment and ewe premium, have had an unintended detrimental effect on the environment in Ireland, particularly in relation to overgrazing of mountain areas (See Chapter 11). On the other hand, public funding for rail and the public transport infrastructure can promote a modal

shift away from private transport which can have significant environmental benefits.

In addition to encouraging the use of economic instruments for environmental policy, the OECD stresses that greater efforts are needed to evaluate the effectiveness and efficiency of the instruments in actual practice. This would contribute to improving future policy by identifying the circumstances in which the most appropriate economic instruments could be applied in the most effective manner (OECD, 1996).

NATIONAL DEVELOPMENTS

National Sustainable Development Strategy

The National Sustainable Development Strategy (DoE, 1997) has the aim of ensuring that economy and society in Ireland can develop to their full potential within a well protected environment. To achieve this objective, environment, economic and social policies must be mutually supportive. In relation to environmental economics, some of the key strategic actions proposed in the strategy include:

- supporting EU approaches which advocate a shift of the tax burden away from labour towards polluters;
- development of suitable economic instruments including:
 - resource pricing
 - green taxation measures
 - exploration of market based instruments such as emission trading;
- maintaining a substantial environmental infrastructure investment programme to underpin sustainable economic and social development;
- pursuing active labour market policies to promote cleaner production and environmental management and auditing;
- promoting and encouraging the development of environmental industry.

Box 14.1 Examples of Economic Instruments for Environmental Policy

Charges/Taxes

- Emission Charges: based on quantity/quality of discharged pollutants
- User Charges: payments for collection of waste or treatment of effluents
- Product Charges: charges on products that are polluting in the manufacturing or consumption phase or for which a disposal system has been organised

Subsidies

- Grants: non-repayable forms of financial assistance
- Soft Loans: loans with interest rates below market rates
- Tax Allowances: tax exemptions and rebates

Tradeable Emission Permits

Deposit and Refund Systems

- Surcharges on potentially polluting products
- Deposit-refund on short cycle goods (packaging and batteries)
- Deposit-refund on durables (e.g. cars)

OECD, 1997a

National Development Plan 1994-1999

One of the primary objectives of the National Development Plan (1994-1999) was to enhance economic performance through sustainable growth and development. The plan states that a well maintained environment offers an important opportunity for competitive advantage in the development of the agriculture, food and tourism sectors and the promotion of branded Irish products. It identified that a sound environment must be maintained as the natural resource base and guarantor of these activities.

The National Development Plan included strategies and policies to be assisted by the EU Structural Funds, and other European initiatives. It formed the basis of the negotiations between the Irish Government and the European Commission which in turn led to the finalisation of Ireland's Community Support Framework. The new National Development Plan (2000-2006) is considered mainly in Chapter 16.

Community Support Framework 1994-1999

The Community Support Framework (CSF) is a legal agreement between the European Commission and the Irish Government. It outlined the purpose and priorities for the use of

some £5 billion provided to Ireland under the Structural Fund Mechanism over the six years between 1994-1999 (The CSF does not include Cohesion Fund projects).

Building on the National Development Plan, the CSF set strategic goals and targets to the year 2000. The priorities of the CSF are covered in nine Operational Programmes as follows:

- industrial development;
- agriculture, rural development and forestry;
- fisheries;
- tourism;
- transport;
- economic infrastructure;
- environmental services;
- human resources development;
- local urban and rural development.

Operational Programme for Environmental Services 1994-1999

The Operational Programme (OP) for Environmental Services details the sub-programme and measures agreed between Ireland and the EU in the use of Structural Funds for investment in environmental services. The OP outlined a phased programme of infrastructural development for water supply, sanitary services, waste disposal and coastal protection over the six year period. A total of £101 million was allocated to this OP.

Environmental Accounts

The Irish national accounts provide a framework in which national economic data are presented in a consistent and reliable manner. However, it has been recognised that the national accounting framework gives an incomplete picture of the economic activity in the country as, among other matters, the effects of pollution are not taken into account. At EU level there have been various suggestions for mechanisms to address this issue, including the development of satellite environmental accounts to supplement the main national monetary accounts. Owing to difficulties in dealing with environmental accounts purely in monetary terms, there has recently been a shift towards using physical environmental data which quantifies the negative impacts of sectors, such as households and industry, and places them alongside the beneficial impacts in terms of employment and their contribution to the economy.

The first set of satellite environmental accounts for Ireland was produced in 1999 (CSO, 1999), and focused on four environmental themes; global warming potential, acid rain precursors, eutrophication and solid waste arising. The contribution of various economic sectors to these themes was set against the numbers at work and the contribution to GDP. A brief outline of the main findings of this pilot exercise is given below (Table 14.2).

Table 14.2 Compilation of Pilot Environmental Accounts under Four Environmental Themes

Sector	Global warming potential (%)	Acid rain Precursors (%)	Eutrophication potential (%)	Solid waste arising (%)	Numbers at work (%)	Contribution to GDP (%)
Agriculture, forestry, fishing	29.30	49.48	62 to 72		12.04	8.53
Fuel, power, water (FPW)*	1.42	0.54		3.35	1.12	1.82
Industry excl. FPW	23.00	20.40	11 to 15	65.76	26.36	35.08
Transport*					3.85	3.42
Total Services excl. transport	18.99	10.81	11 to 15	17.51	56.63	51.15
Residential	27.29	18.77	5 to 7	11.93		
Unclassified				1.45		
Total	100.00	100.00	100.00	100.00	100.00	100.00

Notes: * Emissions from electricity and transport are attributed to users of electricity and transport. Figures refer to the year 1994, except for solid waste arising which are for 1995 (and are for non-agricultural wastes). There are uncertainties in the figures for eutrophication.

CSO, 1999

The accounts show that the agricultural sector is a principal contributor to the national totals of global warming potential, acid rain precursors and eutrophication. In terms of numbers of persons employed and contribution to GDP, the sector has a disproportionate role in this regard. Industry as a whole contributes proportionally less to these three themes, has greater numbers employed and contributes significantly more to GDP. The residential sector (households) is also a key contributor to global warming potential mainly through the use of electricity and transport. For the waste theme, industry is the main contributor, but it should be noted that the assessment focused only on non-agricultural waste.

Further updates and refinement of the satellite environmental accounts for Ireland are expected in the coming years.

EXPENDITURE ON ENVIRONMENT SERVICES AND HERITAGE

Total expenditure on environmental services and on heritage can be difficult to estimate as such expenditure is not always identifiable in the national accounts.

Environmentally related expenditure is often linked to or contained in other social or economic expenditure.



Expenditure on Environmental Services

In the past number of years, economic growth, tourist numbers and levels of residential development have greatly exceeded the predictions outlined in the National Development Plan. As a result there was increased demand for both water services and waste water treatment facilities and major capital investment in water and sanitary services was required. Total capital investment in water and sanitary services in the period 1994-1998 amounted to £689 million with a further £275 million provided for in 1999. The bulk of this investment has been EU co-financed through Structural Funds and the Cohesion Fund (DELG, 1999a).

In addition to capital investment, local authorities must also fund operating and maintenance costs associated with the water and sewage schemes. Local authority estimates show that current expenditure on water supply and sewerage amounted to over £170 million in 1998. This is expected to rise to nearly £190 million by the year 2000 as sewage collection and treatment schemes required to comply with the urban waste water treatment Directive are completed.

Expenditure on waste collection and disposal services provided by local authorities is estimated at £390

million over the period 1994-1998. With the introduction of a licensing regime for waste management facilities, it is likely that the costs and expenditure associated with such activities will increase substantially in the coming years (DELG, 1998).

The investment in environmental services over the period 1994-1998 is illustrated in Fig. 14.1



Fig. 14.1 Investment in Environmental Services (DELG, 1999a)

Expenditure on Heritage

The bulk of State expenditure on heritage is channelled through the Department of Arts, Heritage, Gaeltacht and Islands, where it is used for specific explicit heritage functions. However, there are also various activities under the remit of other Government Departments which, although not primarily concerned with heritage, may include heritage related projects. An example of this is the EU LEADER II programme which is focused on rural development but offers possibilities for funding specific heritage projects. It can be difficult to define where expenditure on heritage begins and ends. For example, in regard to tourism and heritage, a question arises as to whether heritage expenditure includes facilitating public access to heritage areas and properties or confined solely to preserving and maintaining them (Heritage Council, 1999).

In general, expenditure on explicit heritage functions includes provision

of funds for the maintenance, protection, improvement and/or restoration of the following:

- the natural environment, inland waterways, foreshores and harbours;
- national monuments and heritage buildings;
- archaeological and genealogical resources and designated heritage archives and records.

It also includes the purchase of public land, heritage buildings, heritage artefacts and the establishment of museums and heritage centres. The annual expenditure on heritage between 1995-1998 is shown in Fig. 14.2.

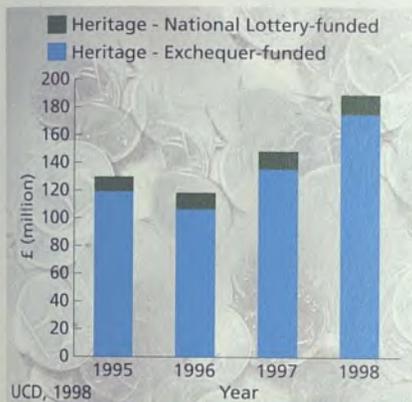


Fig. 14.2 Expenditure on Heritage

ENVIRONMENTAL EXPENDITURE BY KEY SECTORS

Although investment in environmental infrastructure and on heritage can be estimated, total expenditure on the environment is more difficult to quantify. This is mainly because much of the data are not readily available and because it is not always clear what constitutes environmental expenditure. This information gap is presently being addressed by the EPA, which has funded a research fellowship in this area. A brief overview of environmental expenditure across a number of socio-economic sectors is outlined below.

Agriculture

Owing to the dispersed nature of the agricultural sector, it is difficult to



ascertain either the total level of expenditure or the magnitude of environmental protection expenditure. In recent years, however, both the EU and national Government have instituted a number of programmes aimed at creating incentives for farmers to maintain and improve the rural environment.

The rural environmental protection scheme (REPS) is the primary agri-environmental measure in Ireland. Expenditure under the basic REPS scheme between 1994-1998, amounted to £217.6 million (Fig. 14.3), with an additional £73.6 million allocated under two supplementary measures (DAF, 1999).

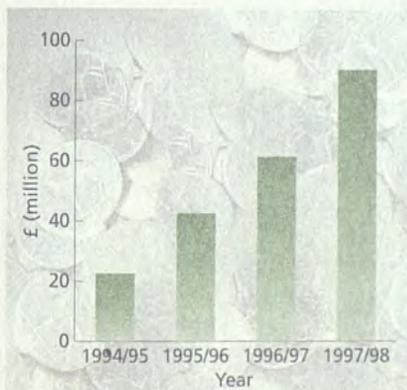


Fig. 14.3 Expenditure Under Basic REPS Scheme 1994-1998 (DAF, 1999)

Under the Control of Farmyard Pollution Scheme, participants receive grant aid towards the provision of animal housing, waste storage facilities, fodder storage facilities and associated farmyard facilities, with

farmers submitting investment proposals for particular projects. Entry into the scheme was suspended in the mid 1990s due to over subscription, but was reintroduced in 1999. Approximately £132 million was allocated in grant aid under the scheme to some 15,570 applicants between 1995 and mid-1999 (Source: Department of Agriculture, Food and Rural Development).

Energy

The energy sector in Ireland is largely publicly owned through a number of semi-state bodies and therefore most (if not all) environmental protection expenditure forms a subset of expenditure by the public sector. This will change as the Irish electricity market is gradually opened up to competition over the next three years. There is increased importance being placed on energy conservation as part of Ireland's commitments under the Kyoto agreement. The pursuit of such a policy is leading to a substantial increase in the level of funds being invested in environmental protection and energy conservation activities.

The Alternative Energy Requirement programme aims at doubling the capacity of renewable energy electricity plants to 10 per cent of total capacity by the year 2000. This is to be accomplished by a mixture of grant aid and price support and an investment of £160 million was predicted between 1998 and 2000 (DPE, 1998).

Under the Energy Efficiency Investment Support Scheme (EEISS), approximately £8 million in grants was allocated between 1994 and 1999. In addition, approximately £18 million was spent by grant recipients in co-funding of projects. The Energy Audit Grant Support Scheme (EAGS) was launched in 1994 to encourage industry and the commercial sector to identify energy saving opportunities. A total of £900,000 was allocated in grants between 1994 and 1998 and approximately £1.35 million was spent by the recipients (DPE 1999).

Expenditure on awareness programmes by the Irish Energy Centre is approximately £600,000 per annum. It is estimated that awareness efforts in the domestic sector will result in annual savings of some £5.8 million per year (DPE, 1999).

Industry

A report to Enterprise Ireland on the value of the environmental services sector in Ireland estimated environmental expenditure in Ireland to be approximately £982 million for 1998 (Ecotec, 1999). It would be reasonable to assume that this figure would have exceeded £1 billion by 2000. The expenditure is almost equally divided between capital investment and services (Table 14.3).

While it is difficult to estimate the total spin off of the manufacturing sector to the environmental industry, the combined capital investment of the sector in projects supported by Ireland's development agencies, IDA Ireland, Shannon Development and Enterprise Ireland now exceeds £1 billion. It is safe to estimate that the resulting spend on environment related activities could be as high as £200 million (P. Doherty, pers. comm.).

The Cleaner Production Pilot Demonstration Programme within the Environmental Services OP is a good example of integration of environment within the industry sector and has demonstrated a clear demand for this type of support provided it is clearly linked with improving overall environmental performance and competitiveness. The programme was established in 1997 to promote a more environment friendly approach to production in the manufacturing and service industries in Ireland.

Fourteen companies were involved with a total investment of £1.7 million (including EU funding up to 40 per cent). Each company set environmental objectives and targets to be achieved in the demonstration project. The projects, which are now complete, have shown good results - both in environmental benefits and cost savings (EPA, 1998).

Transport

The OP for Transport envisaged a total expenditure of over £2,600 million (of which some £1,100 million was EU co-financed). It is difficult to ascertain what percentage of this expenditure can be attributed to environmental protection, due to the conflicting environmental effects of much of the transport investment. However, £356 million of the planned expenditure was earmarked for the Dublin Transportation Initiative (excluding road development) and public transport most of which should have a positive environmental impact.

Under the National Development Plan (2000-2006) a capital provision of £430 million has been made for the construction of the surface element of the proposed LUAS light rail network and a contingency provision of £500 million made for the construction of the underground section and a longer term rail development programme.

Tourism

A total of £2.5 million over the period 1998-1999 was allocated for some 20 pilot projects under the *Tourism and Environment Initiative* (DTSR, 1997). This initiative proposed funding of tourism-led projects which enhance management of the interface between tourism and

Table 14.3 Environmental Expenditure in Environmental Services Sector (Ecotec, 1999)

	Capital Expenditure (£M)	Services Expenditure (£M)	Total (£M)
Air Pollution Control	37.0	32.6	69.6
Water & Wastewater	423.3	275.0	698.3
Waste Management	40.5	126.4	166.9
Contaminated Land	0.8	2.9	3.7
Marine Pollution Control	1.1	0.9	2.0
Energy Management	2.8	2.2	5.0
Noise & Vibration Control	3.0	0.3	3.3
Environmental Monitoring & Instrumentation	8.4	6.6	15.0
Environmental Contracting & Engineering Services	0.0	17.6	17.6
Total	516.9	464.5	981.4

Table 14.4 Areas for Positive Action Toward Sustainability

Step	Action Area
Business as usual	<ul style="list-style-type: none"> • Enhancing and maintaining visual environmental quality • Ensuring adequate environmental infrastructure is available • Ensuring environmental awareness and adjustment programmes for SMEs • Supporting the development of eco-industries
Minimisation	<ul style="list-style-type: none"> • Encouraging the application of clean and cleaner technologies • Supporting energy conservation, materials reuse and recycling • Supporting developments on brown-field sites • Supporting developments on sites which are already served by road/utilities/rail infrastructure
Laying the basis for sustainability	<ul style="list-style-type: none"> • Supporting innovation in new "green" products/services/processes • Supporting the production/use of renewable energy/materials • Encouraging economic sectors with little environmental impact • Supporting environmentally responsible transport • Supporting use of information technology for sustainability • Encouraging awareness in consumers and tourists • Spatial planning to reduce environmental impact • Development planned to encourage "industrial ecology"

ERM, 1999

the environment in Ireland. They include projects to measure carrying capacity, visitor management, the exploration of new tourism routes and access control mechanisms for sensitive locations. The results of these pilot projects will be used to develop a range of procedures to measure, correct and revise sustainable tourism programmes, including the Irish Tourist Board's Tourism Development Plan 2000-2006.

EVALUATION OF ENVIRONMENTAL EXPENDITURE

The Irish CSF (1994-1999) and its associated OPs were recently assessed to identify their environment and sustainable development focus and the impact of investment on the environment (ERM, 1999). In assessing the sustainable development focus, the budgetary resources within OPs were set against three scenarios; business as usual, minimisation, and laying the basis for sustainability. The potential actions within OPs for each of these steps are shown in Table 14.4.

It was estimated that approximately 4 per cent of the total expenditure within the Irish CSF could be linked to business as usual, 3 per cent to minimisation and 4 per cent to laying the basis for sustainability. While the remainder (89 per cent) is classed as having no clear contribution to the environment or sustainability, it must be noted that the Human Resources and Industry OPs do not contain sufficient information to classify expenditure in this context. Despite this limitation, it is estimated that approximately 1.15 billion ECU within the Irish CSF has some environmental protection or sustainable development focus. This figure excludes expenditures on environmental infrastructures from the Cohesion Fund and other EU initiatives (ERM, 1999).

In terms of the actual impacts of the CSF on the environment, only tentative conclusions could be drawn as there is a general absence of comparable and reliable data on which to base the assessment. Within several OPs a number of potential impacts (both positive and negative) can be identified. The mid-term

review of the CSF (Honohan, 1997) also indicated that the environmental effects of expenditure under the CSF are mixed. The Operational Programme (OP) for environmental services, which accounted for only 2 per cent of the total CSF investment in Ireland, could be said to have resulted in environmental improvements. However, there is insufficient evidence to determine if it provides best value for money. The environmental impact of other OPs such as agriculture, fisheries, transport and economic infrastructure varied - ranging from actual harm and missed opportunities to real improvements. One of the reasons for this is that expenditure was primarily planned with other objectives although within the overall concept of sustainable development. Some of the main impacts are discussed briefly below.

Agriculture, Rural Development and Forestry OP

The measures under this OP that most affect the environment are the control of farmyard pollution and compensatory headage allowance schemes.



The environmental benefit from the Control of Farmyard Pollution Scheme resulted in a decline in fish kills due to agricultural activities. However, priority for funding was given to those operating under the REPS scheme, who theoretically should have been operating to good practices. Therefore, the actual environmental benefits may not have been as significant as if priority had been based on the risk of pollution from farms (Honohan, 1997).

The compensatory headage allowance scheme is explicitly social in purpose and has been partially successful in achieving its aim of maintaining rural populations in marginal farming areas. However, the scheme led to gross overstocking of sheep and combined with the EU-wide Ewe Premium Scheme resulted in overgrazing and damage to many uplands areas of Ireland (Chapter 11) (Heritage Council, 1999).

Transport OP

The measures in the Operational Programme for Transport include investment in both road and rail infrastructure. These measures have potentially both positive and negative environmental impacts. The increased usage of transport, particularly road transport, which is promoted by the OP clearly has a

detrimental effect. On the positive side, environmental considerations have been addressed to some extent in major infrastructural projects through environmental impact assessment. It was concluded that the OP has not incorporated environmental considerations in a systematic way into either the design or implementation of the programme (Honohan, 1997).

Economic Infrastructure OP

Measures under this aspect of the CSF include the Energy Efficiency Investment Support Scheme (EEISS) and the Renewable Energy Measure. The EEISS provides grants to projects aimed at improving energy efficiency. With such energy savings, there is also an associated environmental benefit. However, little information is available to determine the

magnitude and significance of these environmental benefits. The renewable energy measure, which promotes the use of renewable energy sources, has a clear environmental benefit, particularly in reducing the emission of carbon dioxide. However the peat-fired power station proposed under the OP could have an adverse effect on the environment through increased CO₂ emission and the risk of siltation of rivers. It will also have implications in relation to Ireland's commitments under the Kyoto Protocol on climate change.

Overall the CSF could be said to have had an environmental focus in terms of the range of measures within its OPs. However, the visibility of the environment in the implementation and monitoring of the CSF is weak and needs to be improved. There is a clear need to develop indicators to track environmental impacts and to identify the environmental dimensions within OPs (ERM, 1999).

Environmental Benefits of the Cohesion Fund

A report by the European Commission (EC) in 1999 evaluated the approach adopted in Ireland in the use of Cohesion Funds to further EU and national environmental policies. The report noted that while the Cohesion Fund investment in waste water treatment infrastructure has been substantial, Ireland's progress in the implementation of the urban waste water treatment



Directive has been slow. This is principally due to the long lead time taken to bring projects from the design stage through to completion (Berg, 1999).

An overhaul is now underway in relation to water resources management within Ireland where water conservation is the central goal. The EC concluded it is unlikely that such a radical approach would have been undertaken without the Cohesion Fund. However, the EC highlighted that the absence of direct domestic user charges for water is at variance with the water conservation strategy and this needs to be addressed.

The Fund has also helped improve environmental management structures and systems in Ireland, for example the Lough Ree and Lough Derg catchment management and monitoring system. The EC indicate that this project has been innovative in the way it fostered partnerships between national, regional and local bodies in the implementation and management of a project to address an environmental issue. Such an approach is consistent with the key principle of shared responsibility for environmental protection.

ECONOMIC INSTRUMENTS

A number of economic instruments for environmental protection, such as taxes, charges and subsidies, have been in operation in Ireland for some time. The use of such instruments however is not widespread. The Government is now developing a more concerted approach in this regard, in the interests of sustainable development and the application of the polluter pays principle. The role of the taxation system in environmental policy has been given further recognition in the 1996 and subsequent budgets, which included taxation measures that have environmental benefits. Such measures included:

- the car scrappage scheme, which was extended until the end of 1997;
- increased Vehicle Registration Tax for cars with an engine capacity above 1400 cubic centimetre capacity;
- a three year improved capital allowance for farm pollution control.

In addition, an Interdepartmental Group on Environmental Taxation is undertaking a review of options for adopting environmental taxation measures in future budgets. This work will involve two approaches:

- removing anomalies in the current system of tax and subsidies to ensure the structure of the system does not have significant adverse effects on the environment;
- developing new measures to secure more environmentally friendly behaviour across the economic sectors.

Strategic options include pricing of resources and services, emissions trading and product and emissions charges. In the design of these instruments, particular attention must be paid to environmental effectiveness, economic efficiency, public acceptability and correct targeting of the measures. Some examples of the economic instruments presently being applied for environmental protection are reviewed briefly below.

User Charges

In some areas local authorities charge for the provision of sewerage services and for solid waste removal. Industrial effluent discharged to municipal waste water treatment plants is charged in most areas and is generally volume based. A survey in 1996 indicated that 31 of the 88 local authorities levied separate charges for domestic waste water services (Barrett *et al.*, 1997). In all cases these charges were fixed and not volume based. With regard to waste collection and disposal, many

households pay either a low charge or no charge for this service. Waste charges levied on industry are often well below the true economic cost of managing their waste. In 1998, local authorities estimated that £80 million would be spent in the collection and disposal of waste, while a total of only £38 million would be recovered in landfill gate receipts and waste charges (DELG, 1998)

Charges in many urban areas are also levied on infrastructure use. Examples include parking meters and disks and pay-for-use car parks. The revenue raised per annum is now approximately £1 million, and local authorities are now required to spend this revenue on road related projects (Barrett *et al.*, 1997).

Administrative Charges

The main administrative charges applied in Ireland for environmental purposes relate to licensing and monitoring fees. Fees for applications for an IPC or waste licence are payable to the EPA and are designed to recover the costs to the Agency of processing licence applications and the revision of licences. For IPC licences the levels of fees are scaled according to the type and size of the operation so as to avoid placing an undue burden on small to medium enterprises. For waste licence applications, higher fees are levied on disposal operations. Annual monitoring charges are also levied by the EPA on IPC and waste licensees. The charges are designed to cover the costs of ongoing monitoring of the licensed facility by the EPA.

Environmental Taxes

Ireland has traditionally levied high taxes on mineral oils and on cars. It is estimated that over 65 per cent of the cost of a litre of petrol and about 35 per cent on the cost of a car is tax (DoF, 1999b).

Vehicle Registration Tax (VRT), which is payable on first registration of a vehicle, is graded according to the cubic capacity of the engine and favours smaller cars. The current VRT structure is as follows:

- cars up to 1400 cc – 22.5 per cent
- cars from 1401 to 2000 cc – 25 per cent
- cars greater than 2001 cc – 30 per cent
- all commercial vehicles (vans, trucks and lorries) are charged a flat rate of £40.



It is estimated that VRT paid on cars amounted to approximately £40 million in 1997 with an additional £22 million collected in VAT. VRT collected on commercial vehicles in 1998 amounted to £1.8 million (DoE, 1998a).

Excise duty on fuel varies by fuel type and unleaded petrol and LPG have been taxed at lower rates than leaded petrol. As a result, the switch from leaded to unleaded petrol was very pronounced and annual average sales of unleaded petrol as a percentage of total petrol sales continued to rise throughout the 1990s. Since January 2000, leaded petrol is no longer on sale in Ireland. In 1998, receipts from excise duty on petrol and oils totalled £1,028 million.

Excise duty on fuel used by public transport can be rebated and charges to the public for the use of public transport are not subject to VAT. These tax differentiations are designed to promote the use of public

transport. However the high rate of taxation on vehicle purchase and on fuels has not stemmed the growth in the purchase of cars and the use of motor fuel (Chapter 3).

Subsidies

Subsidies include grants, loans with interest rates below market rates and tax exemptions and rebates. Various subsidies are given to firms to undertake environmental audits and towards industrial education in environmental management and energy use. The agri-tourism grant scheme provides grant aid to farmers and rural dwellers towards the cost of upgrading or enlargement of heritage and interpretative centres. A capital allowance scheme for farmers who incur expenditure on pollution control measures was introduced in 1997 and a new scheme of grants for protected buildings was introduced in 1999 at a cost of £3.9 million. In addition, grants totalling £6 million were made available in 1999 for the improvement of individual water supplies which are not connected either to a public or group water scheme. At the time of writing, the maximum grant allowable is £1,600 per house (DELG, 1999b).

Grant aid allocated to local authorities for public education and awareness initiatives on litter amounted £1 million between 1997 and 1999. A total of £2.1 million in grants was approved in 1998 for private sector projects to improve the management and recovery of hazardous waste.

The 1998 Finance Act introduced a tax relief for corporations making investments in renewable energy projects. The relief applies to wind, hydro, solar and biomass energy projects and is estimated to cost the Exchequer £5 million annually. Tax relief is available for maintenance, repair and reconstruction work of buildings of scientific, historical or architectural interest. The building

however must allow for reasonable access by the public. An estimated cost of this relief is about £400,000 per annum (DoE, 1998b).

Tax relief is also available for urban renewal projects in designated areas (Chapter 11) and in 1999, tax incentives were introduced for the rejuvenation of designated smaller towns and villages where the population is between 500 and 6,000. The seaside resorts scheme and associated tax breaks, introduced in 1995, has come in for much criticism as it led to the upsurge of holiday homes where infrastructure may be inadequate (Chapter 11).

The Finance Bill 2000 provides for the continuation of the excise duty concession for diesel fuel used in buses, but only in respect of low-sulphur diesel.

Deposit-refund Schemes

Deposit-refund schemes operate by imposing an additional charge on an item at the time of purchase, which is refunded when the item or its container is returned. The application of such schemes in Ireland remains very limited. Over the past number of years some supermarket chains have operated an indirect refund scheme on plastic bags. For each bag re-used a donation is made to a charity or local school.

Environmental Agreements

Environmental agreements are an emerging force in the international policy arena. They are defined as commitments undertaken by firms and sectors resulting from negotiations with public authorities (Box 14.2). While more than 300 such agreements are in place in European countries, only two have been established in Ireland. The first was formed in 1996 between the Department of Environment and Local Government, IBEC and Repak Ltd. Repak, a non-profit company

established by industry, operates a recovery scheme for packaging waste. Since commencing its operation in 1997, over 500 companies have become involved in the initiative, contributing a total of £2.2 million by the end of 1998. Member companies have collected, separated and recycled over 71,000 tonnes of packaging waste arising in their own premises.

The recent environmental agreement between the Government and the Irish Detergents and Allied Products Association will provide for the phasing-out of phosphate based domestic laundry detergent products and should contribute to the reduction of phosphorus inputs to freshwaters.

Enforcement Incentives and Liability Insurance

The enforcement incentives include non-compliance fees and performance bonds. Also included are fines and damages, which are sometimes decided by the courts. Payments of insurance bonds for the rehabilitation of mines is allowable against tax. This presently costs the Exchequer approximately £1 million per year.

Anomalies

There are a number of anomalies in the Irish fiscal system that appear to be in conflict with the polluter pays and user pays principles. As noted earlier in the report, eutrophication of surface waters is a serious problem in Ireland caused by the over application of nutrients, including

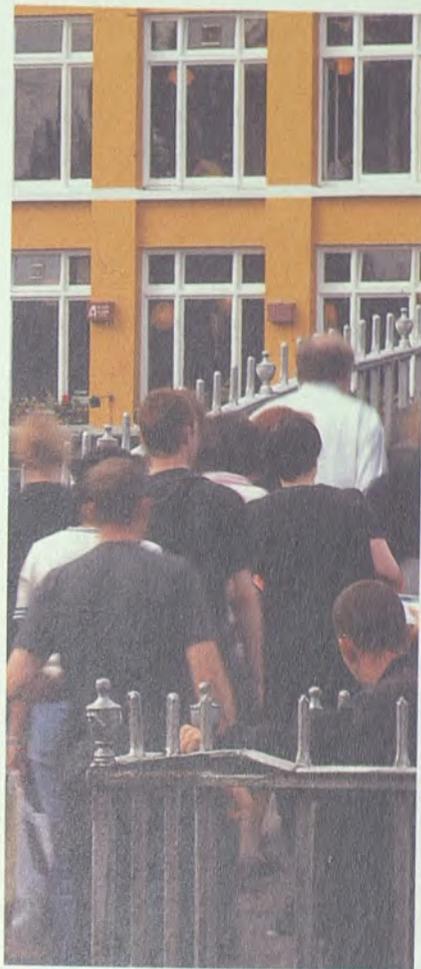
artificial fertilisers. However Ireland, unlike other EU Member States, has a zero VAT rate on the purchase of fertilisers.

Ireland currently applies a reduced rate of VAT on energy products, including electricity, but VAT on insulation materials, energy audits and energy conservation work is presently charged at the standard rate.

ECONOMICS AND THE ENVIRONMENT

A comprehensive review of the tax system and application of the polluter pays principle in Ireland has been recently undertaken (Barrett, *et al.* 1997). The study concluded that while the principle has been applied to some degree, there is considerable scope to reform the Irish fiscal system to apply the principle in a more comprehensive and concerted manner. Some economic based instruments used for the application of the polluter pays principle have been discussed earlier in this chapter.

However, the Tax Strategy Group under the auspices of the Department of Finance has indicated that the introduction of environmental taxes present a number of difficulties. They may be ineffective in curbing consumption, especially if there are stronger factors such as income growth or particular consumer preference. They may adversely impact on those with low incomes and if they are too general or imprecisely targeted they may not



sufficiently address the environmental problem (DoF, 1998a). Outlined below are a number of suggestions for the reform of fiscal policy to tackle some of the key environmental challenges facing Ireland.

Climate Change

Economic instruments, which give a price signal to encourage energy efficiency and to limit CO₂ emissions, are essential if Ireland is to meet its international obligations. One policy option is to use market mechanisms, such as eliminating subsidies to fossil fuels. A second option is emissions trading, where companies are granted permits setting an emissions cap. These permits can be a tradable commodity between companies and countries. However, monitoring and enforcement costs related to carrying out of trades in such a system may be high (DPE, 1999).

Box. 14.2 Environmental Agreements at EU Level

One of the key elements of the EU climate change strategy is to reduce carbon dioxide emissions from cars. In this context, the EU in 1998 negotiated an environmental agreement with the European automobile industry. Under the terms of the agreement, the industry commits itself to reducing the average carbon dioxide emissions to 40g CO₂/km for new cars by 2008, which will represent a 25 per cent reduction on 1995 new car emissions. Similar agreements have also been reached with the Japanese and Korean motor industries. However, these measures are not expected to compensate for the increase in traffic growth.

There is also an option to impose a carbon tax, raising revenue that could be invested in renewable energy, or used to lower other forms of tax (DoF, 1999b). Carbon taxes provide an incentive for emissions reduction through placing a price on carbon. Usually this is achieved through a tax on the sale of fossil fuels with the tax rate varying with the carbon content of the fuel. Under such a system coal and peat would have a higher charge per unit of utilisable energy than would oil and gas. (Barrett, *et al.* 1997). To promote energy efficiency, VAT on heating fuels and power could be raised to the standard rate, in line with other EU Member States. However, as industry can recover VAT, the burden would fall mainly on domestic users.

Increases in energy prices could particularly affect low income households and therefore consideration would need to be given to introducing compensatory social welfare measures.

Water Quality

To address the problem of eutrophication of surface waters in Ireland arising from the over application of nutrients, in particular artificial fertilisers (Chapter 9), a tax based measure could be imposed on fertilisers to discourage over-use. The Tax Strategy Group does not recommend increasing VAT on fertilisers, as farmers can recover their input costs. However, the sale of fertilisers could be subject to a new excise type tax, which would not be refundable and should impact on consumption (DoF, 1998a). The sale of agri-chemicals could also be subject to a charge to discourage over-use. The revenue gained could be used to cover the costs of environmental monitoring and education (Convery and Rooney, 1998).

Urban Environment and Transport

There have been relatively few developments in the area of tax incentives for less polluting vehicles or in the area of noise control of road transport. The 1999 budget restructured the Vehicle Registration Tax rates for cars to favour the purchase of smaller cars, which are generally more fuel efficient. However, this measure is fairly crude and tax provisions based on vehicle emissions would be preferable. There is a strong case to increase the VRT on goods vehicles, especially heavy goods vehicles. A proposal from the Tax Strategy Group suggests an increase in VRT to £100 for light goods vehicles and to £300 for heavy goods vehicles (DoF, 1999b).



Attempts to reduce the costs of congestion could include road tolls, increased charges for urban parking, the removal of tax benefits for building multi-story car parks and providing tax deductions to those who commute by public transport (Barrett, *et al.* 1997).

With regard to fuel prices, it can be argued that the true price of unleaded petrol is the leaded petrol rate, as the former was originally lower to encourage use. Now that leaded petrol has been phased out, the rate for unleaded petrol could be raised to its true level. This could mean an increase of 6.5 pence per litre (DoF, 1999b).

Waste

As noted earlier in the report, increasing amounts of waste are being disposed to landfill. To ensure that landfill is correctly priced to reflect its environmental cost and to promote a more sustainable approach to waste management, there is potential to introduce a landfill tax. In the UK there is evidence to suggest that such a tax has an effect, particularly on commercial and industrial waste. The most marked change has been the drop in the amounts of construction and demolition waste disposed to landfill. By discouraging the landfilling of inert waste, the tax can also support the recycling of aggregate (DoF, 1998a).

It is estimated that approximately 1.26 billion plastic bags are consumed in Ireland each year. Most of the product consumed is ultimately landfilled as part of the household waste stream. A recent study recommends that a charge in excess of 3 pence per unit be levied to reduce their consumption. For administrative purposes, the study recommended a supply-based levy, targeting manufacturers and wholesalers.

Depletion of Natural Resources

The ESRI recommend that full cost recovery should be implemented gradually for the provision of environmental services (e.g., water supply, waste collection and disposal and waste water treatment). Ideally the charges should be volume based to provide incentives to consumers and producers to reduce waste arisings and water use (Barrett, *et al.* 1997, Convery and Rooney, 1998). Since water charges were abolished in 1996 domestic charges have been consolidated in the general tax system. In terms of the polluter pays principle, there is now a degree of inequity whereby industrial and commercial users of water resources are required to pay directly but

domestic consumers of water are not (ERM, 1999).

Employment in Environmental Services

Environmental industry is defined as those firms who provide goods or services for activities such as air pollution control, waste water treatment, waste management, contaminated land and water remediation, environmental research, noise and vibration control, environmental monitoring and general environmental consultancy (OECD, 1997b). At a European level it was estimated that employment in environmental industries in the EU amounted to just over one and a half million jobs in 1994. In addition, the EU estimated in 1997 that a further two million people are employed in environment related jobs in areas such as renewable energy, waste recycling and nature and landscape protection (Ecotec, 1997).

In Ireland there are approximately 225 companies providing environmental services. These companies employ a total of 1,700 personnel. A further 2,000 persons are employed in the public sector provision of waste management, water and waste water treatment. This gives a total of 3,700 persons

employed in the public and private sector provision of environmental services (Ecotec, 1999)

The EU has indicated that there is great potential for increased employment in the environmental sector. For example, it is estimated that, through investment of up to 180 million ECU, over a half a million jobs could be created in the EU in the field of renewable energy by the year 2020. In Ireland, the potential for major job creation in environmental industry is somewhat limited due to the size of the country and economy. However, as clean technology is a relatively new market, it is a potential growth area and thus affords a significant opportunity for enterprise (Hunt, 1997).

CONCLUSIONS

Economic instruments can make a positive contribution to improving the efficiency and effectiveness of environmental policy. While a number of economic instruments for environmental protection have been in operation in Ireland for some time, their use is not widespread. There is, therefore, considerable scope to reform the Irish fiscal system to address the key environmental challenges facing Ireland, to meet international obligations and to apply more fully the polluter pays principle.

The evaluation of the impact of investment, including Structural Funds and other EU financial support measures is hampered by a lack of comparable and reliable information. There is a clear need to develop and apply indicators to track environmental impacts and to identify the environmental dimensions within operational programmes. More information is required on expenditure on the environment by industry and other economic sectors.

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MANAGING AND PROTECTING THE ENVIRONMENT

Environmental policy and legislation in Ireland have for some time been driven by European and global developments. A key consideration in current environmental policy is the integration of environmental issues into wider social and economic development. The goal of this approach is to ensure that development is sustainable, thus ensuring that future generations experience a quality of life similar to, if not better than, our own.

This chapter aims at evaluating whether Irish society is responding adequately to the pressures that exist on our environment. This evaluation has found that, whilst there have been significant advances in the development of environmental policy and legislation in the State, key deficiencies still remain (e.g., in relation to coastal zone management policy and natural heritage legislation). Future developments in these areas are pending and a national greenhouse gas abatement strategy is near completion. There has been successful application of measures to reduce particular forms of air pollution (e.g., control of smoke and lead pollution) and the growth in integrated licensing of industrial and waste facilities and in environmental management systems is to be welcomed. However, there remains an urgent need to apply measures to tackle effectively problems relating to greenhouse gas emissions, water quality (particularly eutrophication), waste generation and management, urban development and transport, and aspects of marine resources and natural heritage management and protection.

INTRODUCTION

Where problems exist with environmental quality, such as those outlined in previous chapters of this report, then responses are required to address these problems so that environmental quality can be protected and, where there is evidence of degradation, improved. This chapter outlines the main responses to the various pressures that exert an impact on the state of the environment and, as far as possible, evaluates these responses to determine their effectiveness.

There have been several key developments since the publication of the last State of the Environment

report (Stapleton, 1996), such as the enactment of the Waste Management Act, 1996, and the publication of the National Sustainable Development Strategy (DoE, 1997a). Policy and legal instruments provide a framework for environmental protection. Key responses are considered here both from a sectoral perspective and from an environmental perspective. In addition, given the interconnections between sectors and between environmental media, the importance of an integrated approach to environmental management is highlighted and a framework for integrated environmental management and protection is presented.

POLICY INSTRUMENTS – RECENT DEVELOPMENTS

Global Policy

Global policy in relation to the environment in the past twenty years has been driven largely by the various international agreements and work programmes arising out of the work of the United Nations Environment Programme (UNEP). International policy on environmental issues is also developed by the Organisation for Economic Co-operation and Development (OECD). It may be noted that an environmental performance review of Ireland by the OECD is due to be published in 2000.

The principal global policy instrument in relation to environmental protection and sustainable development is Agenda 21 and the associated agreements signed at the Earth Summit in Rio de Janeiro in 1992, i.e., the Convention on Climate Change (Chapter 4), the Convention on Biological Diversity, the Forest Principles and the Rio Declaration (or Earth Charter), which outlines a set of principles linking future social and economic progress to global environmental protection.

World leaders from over 165 countries reviewed progress on the implementation of the Rio agreements at the Earth Summit+5, in New York in 1997. Unfortunately the outcome of this summit was not as successful as had been hoped. While the leaders agreed that the planet's health was generally worse than ever, there were no major breakthrough commitments, largely because of North-South differences on how to

finance sustainable development globally. A programme was adopted for the Further Implementation of Agenda 21 containing a number of elements aimed at providing a basis for progress in the future. Key elements of this programme and other relevant initiatives agreed included measures to deal with issues relating to production and consumption (i.e., eco-efficiency), climate change, freshwater scarcity, forests, desertification and poverty eradication.

European Policy

The Fifth Action Programme on the Environment, *Towards Sustainability*, set the EU policy framework up to the year 2000 by committing the Union to a sustainable development strategy. A review of the Action Programme carried out from 1995 onwards indicated that the EU is making limited progress in reducing many pressures on the environment (EC, 1997). The review resulted in a renewed commitment by the Community to the achievement of the Programme's objectives. The European Commission submitted a global assessment of the implementation of the Programme to the European Parliament and the Council in 1999, accompanied by proposals for the priority objectives and measures that will be necessary beyond 2000.

Box 15.1 The Challenge of Integration of the Environment into other Policies

The real challenge facing the Community is to find a way of developing action that meets all of its objectives in an integrated way. This is the challenge of sustainable development, a concept too often perceived as purely environmental, but which brings together concerns for social and economic development alongside protection of the environment. The current pattern of economic development too often entails conflicts between development and environment; this cannot be permitted to continue. The development of new technologies and practices shows that we have the know-how to find solutions to some of these problems. Solutions are frequently shown to be not only cost effective for industries concerned but also generating broader benefits to the economy through the creation of value added and employment, thus providing a genuine double dividend. However achieving the desired results will require more far-reaching behavioural and policy changes in many sectors of society (EC, 1998b).

The need for integration of environmental concerns into all policy areas has been rising up the political agenda since the Maastricht Treaty. Integration was reinforced in 1997 by the Amsterdam Treaty, which underlines its importance and defines it as a way to achieve the general goal of sustainable development (Chapter 14). Other recent European initiatives promoting integration of environmental and economic policy include Agenda 2000, adopted by the March 1999 Berlin European Council and the European Community Biodiversity Strategy adopted in 1998 (EC, 1998a). The European Commission advanced the concept of integration in a 1998 strategy document (Box 15.1). The European Council has given a mandate to prioritise the integration process in the transport, energy and agriculture sectors, and in

the areas of development, internal market and industry.

National Policy

General

The most significant recent policy development in relation to environmental protection and sustainable development at national level was the publication of the National Sustainable Development Strategy (DoE, 1997a). Other significant developments included the publication of strategies against eutrophication (DoE, 1997b) and on waste management (DELG, 1998), and a proposed plan for hazardous waste management (EPA, 1999a). Additional policy developments expected in the near future include a National Greenhouse Gas Abatement Strategy, a National Spatial Strategy, a National Biodiversity Plan, a



National Heritage Plan and a National Coastal Zone Management Policy.

The National Sustainable Development Strategy aims at providing a comprehensive analysis and framework that will allow sustainable development to be taken forward in a more systematic manner. A number of initiatives are outlined to allow for better supporting structures for sustainable development. Actions are described within strategic sectors (agriculture, forestry, marine resources, energy, industry, transport, tourism and trade) to integrate environmental concerns with economic activity. One of the key objectives of the Strategy is to secure the widest possible participation and involvement through the implementation of Local Agenda 21 (Box 15.2). Some aspects of policy relating to the key environmental challenges (Chapter 13) are set out below.

Box 15.2 Local Agenda 21

As part of the commitment to the Earth Charter signed at the United Nations Conference on Environment and Development at Rio de Janeiro in 1992, each local authority in the State is expected to initiate a process that will result in the development of a Local Agenda 21 for its area. A Local Agenda 21 is a blueprint for sustainable development at a local level, built through consultation with and in agreement with the local community. The Government requested all local authorities to complete a Local Agenda 21 for their areas by 1998 (though there has been some slippage on this date). Each local authority has since designated a Local Agenda 21 officer. The designated officers also constitute regional networks. In addition, each regional network has at least two representatives on a national network, which is chaired by the Department of the Environment and Local Government.



Reducing Eutrophication

Government measures to prevent pollution of fresh waters as well as for integrated land and water management and development are detailed in the policy document *Managing Ireland's Rivers and Lakes - A Catchment Based Strategy Against Eutrophication* (DoE, 1997b). Key measures suggested in the Strategy include the following: setting of targets and standards for water quality; catchment water quality management planning; further implementation of the urban wastewater treatment Directive (CEC, 1991a) and freshwater fish Directive (CEC, 1978); agri-environment schemes; promotion of the Code of Good Agricultural Practice (DAFF and DoE, 1996); farm surveys; nutrient management planning; integrated pollution control licensing; control of domestic effluent treatment systems; restrictions on the phosphorus content of detergents; the increased use of statutory powers by local authorities; and increased monitoring and research.

Preventing and Managing Waste

The Government recently launched a major strategy *Waste Management: Changing Our Ways* (DELG, 1998). The strategy is grounded on the internationally recognised waste management hierarchy, which favours in order of preference: prevention, minimisation, reuse, recycling, energy

recovery and, finally, environmentally sustainable disposal of waste only where it cannot be prevented or recovered. This initiative signalled Government determination to move away from landfill as the primary means of waste disposal. The strategy sets recycling and recovery targets for achievement over a 15-year time-scale. The policy statement emphasises the key role of local authorities in changing Irish waste management practice, considers the implementation of the polluter pays principle and recognises the importance of economies of scale when planning for waste infrastructure. It is clear however, that the State still has a considerable way to go before policy targets are reached (Chapter 6). The development of the National Waste Database, with national level information available for 1995 and 1998, and the proposed National Hazardous Waste Management Plan (see below) provide essential information for implementation of future waste management policy.

The proposed National Hazardous Waste Management Plan (EPA, 1999a) tackles issues relating to hazardous waste prevention, management and disposal. The EPA will amend the proposed plan in response to feedback from the public and other interested parties and will publish a National Plan in 2000. Implementation of the Plan will require involvement by State

agencies, Government Departments, the EPA, local authorities, industry, agriculture and the general public in promoting waste prevention/minimisation and finding alternative solutions to disposal. The Plan will be reviewed at least every five years and will seek to provide a practicable, economical and environmentally sound solution to the management of the State's hazardous wastes (Chapter 6).

Urban Environment

Government policy on the urban environment has been developing in a number of areas. Urban transport policy in Dublin has been implemented largely through the Dublin Transport Initiative but the rapid increase in road traffic volume in recent years has required additional measures (see section on Transport). In addition guidelines on strategic planning in the Greater Dublin Area (BSM, 1999) and residential density (DELG, 1999a) have been published which aim at integrating land use and transportation policy. The Government intends to publish a National Spatial Strategy by the end of 2001, which will aim at providing for the management of regional and urban development within the State (Chapter 11).

Control of Greenhouse Gases

A National Greenhouse Gas Abatement Strategy is being developed to provide a framework for achieving the necessary greenhouse gas emissions reductions required under the Kyoto agreement, and to prepare the State for more ambitious commitments that will be required after 2012. The Strategy will most probably include cross-sectoral economic instruments and specific sectoral policies and measures to reduce emissions. It is widely recognised that action is required to be taken by all sectors as early as possible, and in a sustainable manner, if commitments under the Kyoto

agreement are to be met (Chapters 4 and 16).

Conserving Natural Resources

A National Biodiversity Plan is being drawn up in accordance with Article 6 of the Rio Convention on Biological Diversity. The Plan is considered to be one of the most important means of delivering the Convention on Biological Diversity at a national level. The Plan will review the status of biological diversity in the State (habitat, species and genetic diversity) and assess the adequacy of the measures currently in place for the conservation and sustainable use of biological diversity. The aim of the Plan will be to integrate the conservation and sustainable use of biological resources into all sectoral and cross-sectoral plans, programmes, and policies. It is expected that the Plan will be published in 2000.

In addition, a National Heritage Plan is being developed to produce, for the first time, an integrated plan for the State's national heritage. The aim is to provide for the protection, conservation, management and preservation of the State's natural heritage (in the context of the National Biodiversity Plan); archaeological heritage; architectural, artistic and historic heritage; natural and cultural landscapes; inland waterways; and documentary and archival heritage. The Plan is to be published in 2000.

The Government issued a national policy statement on the release of genetically modified organisms to the environment in October 1999 (DELG, 1999b) to address concerns in this area (Chapter 7). This followed a period of national consultation and debate on *GMOs and the Environment*. The policy statement accepted the conclusions and recommendations of the chairing panel, stating that national policy must be balanced in terms of



environmental protection and socio-economic considerations. The Government stated that it intends to follow a positive but precautionary approach on releases of GMOs to the environment, with the primary emphasis on precaution, based on scientific risk assessment and management.

In relation to the coastal zone, effective management is extremely difficult given the range of Government Departments, agencies and organisations involved and the complex national and international legislative framework, much of which is structured on a single medium or sectoral basis and so does not promote integrated policy. In order to address this problem, a Draft National Coastal Zone Management policy document was published for comment (BSM, 1997) and was followed by a public consultation seminar in 1998. Mechanisms to promote greater co-ordination among the various statutory agencies and other interested parties active in the coastal area, as well as procedures to avoid or, where necessary, resolve conflicts of use are addressed. These are to be finalised in a forthcoming National Coastal Zone Management Policy. This Policy is particularly urgent given increased leisure, tourism and developmental pressures on the fragile coastal environment and predictions of significant sea-level rise and increased coastal erosion in the future.

LEGISLATIVE INSTRUMENTS

Recent Developments Internationally

Ireland is subject to a number of international conventions that deal with environmental protection and sustainable development. Recent Conventions that the State has ratified, signed or is a party to are listed in Box 15.3.

Recent Developments in European Legislation

Environmental law in Ireland is greatly influenced by European legislation. Major developments in European environmental legislation since 1995 include Directives relating to the following:

- integrated pollution prevention and control (CEC, 1996a),
- ambient air quality assessment and management (CEC, 1996b),
- the control of major accident hazards involving dangerous substances or 'Seveso II' (CEC, 1996c),
- the assessment of the effects of certain public and private projects on the environment (CEC, 1997),
- the contained use of genetically modified micro-organisms (CEC, 1998a),
- the quality of water intended for human consumption (CEC, 1998b),
- the landfill of waste (CEC, 1999a) and
- solvents (CEC, 1999b).

While implementation of these and other European Directives has improved the State's environmental performance, the European Commission has also taken legal action against the State relating to environmental concerns (e.g., in relation to the waste Directive (CEC, 1975) and amending Directives, the EIA Directive (CEC, 1985) and the

Box 15.3 Recent International Conventions

- Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, which was signed at Aarhus, Denmark in 1998 (Chapter 1).
- OSPAR Convention for the Protection of the Marine Environment of the North-east Atlantic - signed in 1992 and ratified in 1997 (Chapter 10).
- Protocols, under the 1979 United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution (CLRTAP), on Persistent Organic Pollutants, Heavy Metals and on Further Reduction of Sulphur Emissions (known as the 'Oslo' or 'Second Sulphur Protocol') were signed in 1998.
- The UNECE Protocol to CLRTAP to abate acidification, eutrophication and ground-level ozone was signed in Gothenburg in 1999 (Chapter 4).
- The Kyoto Protocol to the United Nations Framework Convention on Climate Change was signed by Ireland, along with the other EU member states, in 1998. It has not yet been ratified (Chapter 4).

habitats Directive (CEC, 1992a)). In addition, the Commission has indicated that it intends to take legal action against the State in relation to the drinking water Directive (CEC, 1980) and the wild birds Directive (CEC, 1979).

Recent Developments in National Legislation

Planning and Environmental Impact Assessment (EIA)

Planning and EIA legislation continues to evolve at both a European and national level (Box

15.4). Recent amendments extend and clarify the list of developments requiring EIA; they enable a person who is required to submit an EIS in respect of a proposed development to request the competent authority concerned to provide an opinion on the information to be contained in it; they set out the procedures to be followed in the case of a proposed development on an environmentally sensitive site or likely to have significant effects on the environment in another Member State; and they include indicative parameters for assessing whether a project is likely to have a significant

Box 15.4 Recent Developments in Planning and Environmental Impact Assessment Legislation

At European level, the original EIA Directive (CEC, 1985) was amended in 1997 (CEC, 1997). The latter was transposed into Irish law mainly by the European Communities (Environmental Impact Assessment) (Amendment) Regulations, 1999 and the Local Government (Planning and Development) Regulations, 1999.

The Government has recently published the Local Government (Planning and Development) Bill, 1999, which aims at introducing formally the concept of sustainable development into national legislation. The Bill also aims at consolidating all the planning Acts and much of the EIA legislation into one piece of legislation, in order to benefit users of the planning system. However there has been some concern from NGOs that certain proposals within the Bill may restrict public participation in the planning process (O'Sullivan, 1999).

A recent ruling at the EU Court of Justice that Ireland had failed to apply correctly the 1985 EIA Directive (case C-392/96) may also have implications for Irish EIA legislation. The Court ruled that Irish authorities had exceeded their discretion in implementing the EIA Directive by only laying down size thresholds for EIA, in this case for afforestation, peat cutting and land reclamation projects, without taking into account the nature, location and cumulative effects of projects. The court ruled that even small projects might be deemed to have significant impacts if located in an environmentally significant area.

impact on the environment. While these amendments improve the EIA process, the Directive has been criticised in a number of areas, including failure to incorporate formally early public participation or post-project monitoring in the EIA process (Sheate, 1997).

The most recent EIA Directive (CEC, 1997) specifically refers to the concept of sustainable development, but gives no guidance as to how the sustainability of a proposal should be assessed through EIA. Whilst EIA, when used wisely, is an important tool in assisting in the sustainable development of the economy, it is constrained by the fact that the EIA Directive only provides for project-based assessments (Fry, 1999). In this context, the European Commission adopted in 1996 a Proposal for a Directive on the Environmental Assessment of Plans and Programmes (i.e., Strategic Environmental Assessment or SEA). The purpose of the SEA proposal is to ensure that the environmental consequences of plans and programmes are identified and assessed before adoption, with public participation included in the process, thus contributing to a more transparent planning process and to the goal of sustainable development. In Ireland this could lead to assessment of the environmental effects of, for example, development plans. The draft SEA Directive is at an advanced stage at European level.



Pollution Prevention/Control

The principal domestic Acts governing the prevention and control of pollution in the State are the Local Government (Water Pollution) Acts, 1977 and 1990, the Air Pollution Act, 1987 and the Environmental Protection Agency Act, 1992. Recent developments of note include the Waste Management Act, 1996, the Litter Pollution Act, 1997, the Phosphorus Regulations, 1998, and various legislation relating to the marine environment.

Waste and Litter

The Waste Management Act, 1996 has radically altered the regulation of solid

waste management in the State (Chapter 6). Under the Act, local authorities are responsible for regulating the collection and movement of waste within the State, with the exception of the importation of waste into the State, which is regulated by the EPA. The Act nominates the EPA as the licensing authority for all significant waste disposal and recovery activities. Eight regional waste strategy studies have been completed and most local authorities have either published, adopted or are in the process of adopting waste management plans (Fig. 15.1). The EPA is responsible for the preparation of a national hazardous waste management plan (see above).

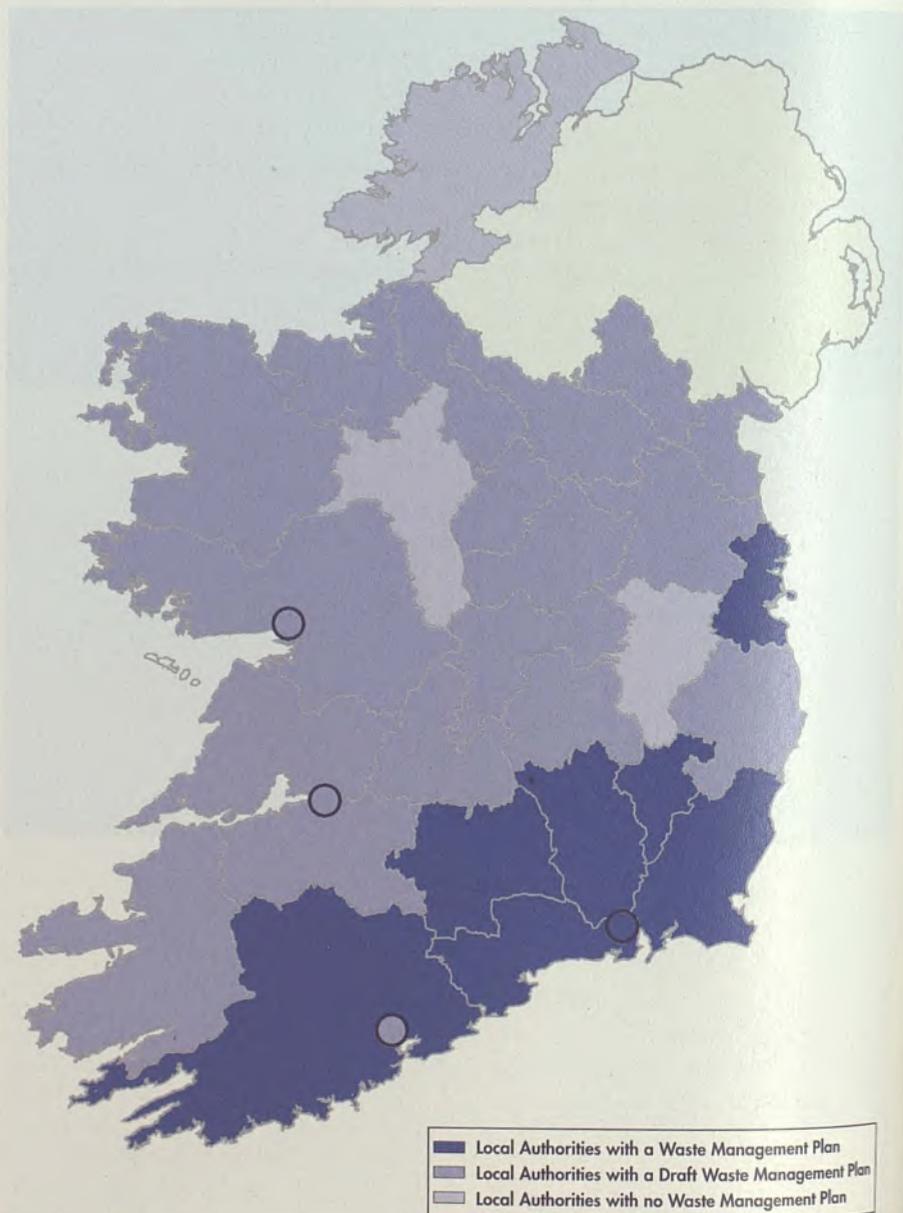
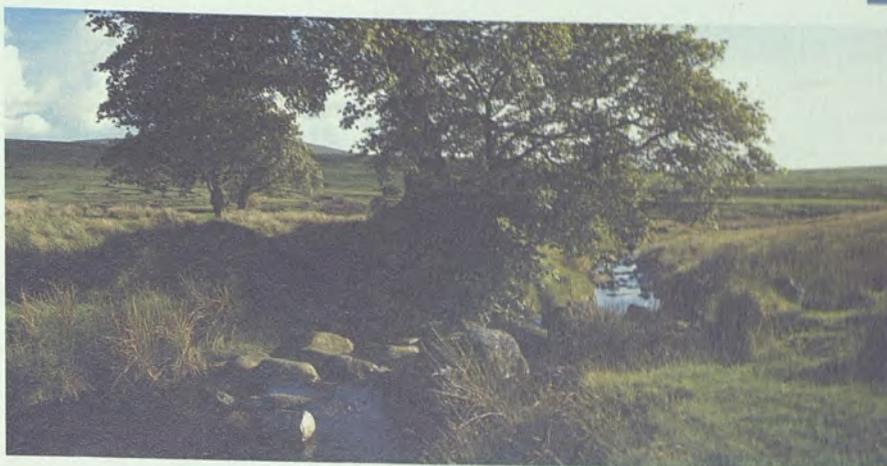


Fig. 15.1 Local Authorities with Waste Management Plans

The Litter Pollution Act, 1997, provides local authorities with enhanced enforcement powers to tackle litter and requires each local authority to prepare a litter management plan for its own area. The plan must set out objectives and measures aimed at litter prevention, control and awareness, and there must be consultation with local community and voluntary interests before a plan is adopted by the Council members. Most local authorities have adopted, or are in the course of finalising litter management plans.

Eutrophication

The Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorus) Regulations, 1998, have been introduced under the requirements of the dangerous substances Directive (CEC, 1976) to deal with the increasing problem of eutrophication of the State's lakes and rivers (Chapter 9). The Regulations require that water quality be maintained or improved by reference to biological quality rating/trophic status or phosphorus concentrations. Where water quality is deemed unpolluted, the regulations require that the existing quality of rivers and lakes be maintained. Where quality has been found to be unsatisfactory, the regulations require that the water be improved by 2007 at the latest for waters surveyed by the EPA in the period 1995-1997 and within a maximum timeframe of ten years for waters first surveyed after 1997. The degree of improvement required is based on the existing quality and standards prescribed by the regulation. A six year extension to the period allowed to reach compliance for a certain water body is permissible in exceptional circumstances. Local authorities have primary responsibility for ensuring that the standards set by the Regulations are met. They were required to submit a report to the EPA in 1999 setting out measures to



be taken to meet the prescribed standards. This is to be followed up by a report to the Agency on the implementation of these measures by 31 July 2000 and every two years thereafter until 2008. The EPA must publish progress reports including such recommendations it considers appropriate by 31 March 2001 and every two years thereafter until 2009.

Marine Environment

Recent legislation introduced to prevent marine pollution includes the following: the Dumping at Sea Act, 1996, which strictly limits the types of substances that can be dumped at sea and provides for rigorous control of residual disposals (Chapter 5); the Fisheries (Amendment) Act, 1997, and the Fisheries and Foreshore Act, 1998, which provide for a comprehensive new licensing procedure for aquaculture activities; the Sea Pollution (Amendment) Act, 1999, which deals with procedures relating to oil pollution incidents at sea; and regulations introduced in 1997 under the Sea Pollution Act to give effect to parts of the MARPOL Convention for the prevention of pollution from ships. The Government has also recently published the Fisheries (Amendment) Bill, 1999, which includes proposals for significant changes to the structure, management and organisation of the inland fisheries services and the establishment on a statutory basis of a National Salmon Commission.

Conserving Natural Resources

The principal national legislative instrument governing nature conservation in Ireland is the Wildlife Act, 1976. Recent significant developments in natural heritage legislation in the State include the publication of the European Communities (Natural Habitats) Regulations, 1997, and the Wildlife (Amendment) Bill, 1999. The European Communities (Natural Habitats) Regulations, 1997, provide for the designation and protection of Special Areas of Conservation or SACs (under the habitats Directive), and for the protection measures that apply to Special Protection Areas or SPAs (designated under the wild birds Directive). Irish law largely anticipated both Directives in respect of direct species protection and the relatively minor adaptations required in respect of such species protection were introduced either under the existing Wildlife Act, in the case of the wild birds Directive, or by way of the 1997 Regulations in the case of the habitats Directive (DAHGI, 1998). The habitats and wild birds Directives provide a framework for the conservation of fauna and flora and their habitats including the establishment of NATURA 2000, which is a network of sites for the conservation of species and habitats that are of European importance.

It has been noted with concern for some time that many habitats important at a national level have



received limited protection under national legislation. The Wildlife Amendment Bill, 1999, aims at amending many of the provisions of the Wildlife Act, 1976, which had relatively weak habitat/site protection measures. Objectives of the Bill include the following: provision for the establishment and statutory protection of a national network of protected areas of both wildlife and geological importance - to be known as Natural Heritage Areas (NHAs); the improvement of various measures for the conservation of wildlife species and their habitats; the strengthening of penalties for contravention of the Wildlife Act; ratification of certain international



agreements; and the introduction of further measures relevant to hunting and trade. The Bill also aims at strengthening the protective regime for SACs by ensuring that protection will in all cases apply from the time of notification of proposed sites.

The Planning and Development Bill, 1999, proposes a number of significant changes to Planning Authority duties and powers relevant to protection of the environment and biodiversity. For example, it is proposed that mandatory objectives for the conservation and protection of the environment, including the protection of sites that are designated as European sites, must be included in County Development Plans. It is proposed that an assessment must be included in the Plan on the likely significant environmental effects of the Plan. It is further proposed that local authorities will have new powers to designate landscape conservation areas where planning controls may apply to developments that would normally be exempted. Local authorities may also produce Local Area Plans (for any area with a population in excess of 1,500) and regional authorities may produce plans for their areas. There are also provisions that turbarry (peat extraction) and initial planting of forests would no longer be exempt from planning control.

Owing to concerns about potential risks to human health and the environment from GMOs, the EU has passed legislation relating to the contained use of genetically modified micro-organisms (GMMs) (CEC, 1990a, 1998a) and deliberate release of GMOs (CEC, 1990b). The original EU Directives (CEC, 1990a, CEC, 1990b) have been transposed into Irish law (under the Genetically Modified Organisms Regulations, 1994 to 1997). EU Member States are required to transpose the 1998 Directive on contained use of GMMs, amending the 1990 Directive (CEC, 1990a), by June 2000. Irish Regulations also cover GM animals and plants used in containment.

STRATEGIES AND TOOLS

Environmental management and protection tools generally evolve from legislative and policy instruments, which provide an overall framework within which environmental management can proceed. Recent developments in the area of policy and legislation have been outlined above. Examples of key strategies and tools available in Ireland for environmental management and protection are summarised in Table 15.1, along with the sectors and media affected. As can be seen, many of these tools can be described as both multi-sectoral, in that their application affects more than one sector of society, and multi-media, in that their application is designed to have effects on more than one environmental medium. This highlights the interconnections between the various tools available and the need for an integrated approach to environmental management.

Integrated Environmental Management and Protection

In recent years, there has been a growing trend towards the adoption of an integrated approach to

Table 15.1 Key Strategies and Tools

RESPONSES

	SECTORS								MEDIA				
	Agriculture	Forestry	Marine	Energy	Industry	Transport	Tourism	Trade	Municipal	Water	Air	Soil	Landuse/ Landscape*
Policies and Strategies													
National Sustainable Development Strategy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Waste Management: Changing Our Ways	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Growing for the Future - Forestry Strategic Plan	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓
Catchment-based Strategy Against Eutrophication	✓	✓			✓	✓		✓	✓	✓	✓	✓	✓
Guidance Tools													
Codes of Good Agricultural Practice	✓	✓			✓				✓	✓		✓	✓
Teagasc agricultural guidelines	✓	✓			✓				✓	✓		✓	✓
Forestry Guidelines		✓							✓	✓		✓	✓
EPA Guidelines on Landfill and BATNEEC notes	✓			✓	✓				✓	✓	✓	✓	✓
Planning Tools													
Groundwater Protection Schemes	✓	✓			✓		✓		✓	✓		✓	✓
Catchment Management Planning	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓
Phosphorus Regulations Measures Reports	✓	✓			✓		✓		✓	✓		✓	✓
Forest Inventory and Planning System		✓							✓	✓		✓	✓
Local Authority Waste Management Plans	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Air Quality Management Plans				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
County Development Plans	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Environmental Impact Assessment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Licensing Control and Enforcement Tools													
Environmental Legislation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Integrated Pollution Control and Waste Licensing	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Single media licensing by Local Authorities (for water and air)					✓			✓	✓	✓		✓	✓
Licensing and Control of GMOs	✓				✓							✓	✓
VOC Emissions Control					✓	✓				✓	✓	✓	✓
Monitoring Tools													
EPA and local authority monitoring programmes	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dúchas monitoring of designated areas	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Environmental Protection Tools													
Urban waste water treatment					✓		✓		✓	✓		✓	✓
Nutrient Management Planning	✓	✓			✓				✓	✓		✓	✓
Rural Environment Protection Scheme	✓								✓	✓		✓	✓
Control of Farmyard Pollution Scheme	✓								✓	✓		✓	✓
Environmental Management Systems				✓	✓				✓	✓	✓	✓	✓
Cleaner Production				✓	✓				✓	✓	✓	✓	✓
Traffic Reduction Measures						✓			✓	✓	✓	✓	✓
Catalytic converters						✓			✓	✓	✓	✓	✓
Energy conservation / alternative energy				✓	✓	✓			✓	✓	✓	✓	✓
Protected sites / species	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

* including natural heritage and biodiversity

environmental protection and management in Ireland. Integrated pollution control (IPC) licensing of industry was introduced in 1994 and now most industrial and manufacturing activities with significant pollution potential are controlled through IPC. The integrated licensing approach has been extended to the control of all

significant waste disposal and recovery activities following the enactment of the Waste Management Act, 1996. There has also been a significant growth in the adoption of an environmental management systems approach, both at individual company level and at institutional level. The integrated approach recognises the need to consider all

aspects of the environment so that media such as air and water are not being protected at the expense of other media such as soil and land.

IPC Licensing

IPC licensing focuses on the elimination or reduction of waste and emissions of all kinds at source

having regard to the principle of best available technology not entailing excessive cost (BATNEEC). Under IPC, a single licence is issued for one activity to cover all aspects relating to the risk of environmental pollution. As expected, there has been a strong growth in the number of companies

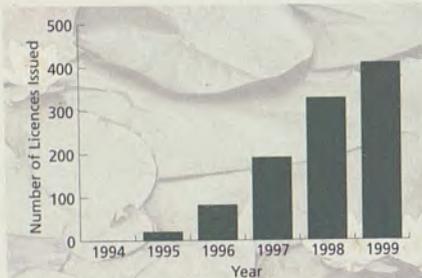


Fig. 15.2 Cumulative Number of IPC Licences Issued.

controlled through IPC since 1994 (Fig. 15.2 and Fig. 15.3) with 409 licences issued by December 1999. Ultimately, all new and existing industrial and manufacturing facilities in the State with significant pollution potential will be subject to IPC licensing.

Regulation and enforcement of IPC licences provide a dynamic operating procedure within which progressive environmental improvements can be achieved. Two essential ingredients of the licensing system are the Environmental Management System (EMS) and the Annual Environmental Report (AER). The EMS is the engine that drives

continual improvement of environmental performance, with each licensee required to establish and implement an EMS so that measurable objectives and targets can be set to minimise and, where practicable, eliminate adverse environmental effects. The AER, in conjunction with independent assessment by the EPA, provides detailed information on the environmental performance of the activity concerned. A Pollution Emissions Register (PER) is also included in the AER where required by the licence (Box 15.5). Examples of pollution reduction, solvent reduction, waste reduction and energy and water use initiatives undertaken by licensees during 1998 (EPA, 1999b) illustrate the dynamic nature of IPC and show how the process goes well beyond simply controlling emissions. Where licensees are found to be out of compliance with a licence condition, appropriate action is taken to bring the licensee back into compliance either through the issuing and follow-up of notices or, where there is an inadequate response to notices served, through prosecution (EPA, 1999b).

The EPA has also organised a successful cleaner production pilot demonstration programme under the Environmental Monitoring R&D sub-programme of the Environmental Services Operational Programme 1994-1999 (Chapter 14). Waste and energy reduction values achieved by the 14 participating companies were very impressive; for example, the typical reduction achieved in hazardous waste generation was 50-80 per cent. The total economic benefit of the cleaner production initiatives undertaken in this pilot demonstration programme is conservatively estimated at £700,000 per year (Byrne Ó Cléirigh, 1999).

Waste Licensing

Licensing of waste activities by the EPA under the Waste Management

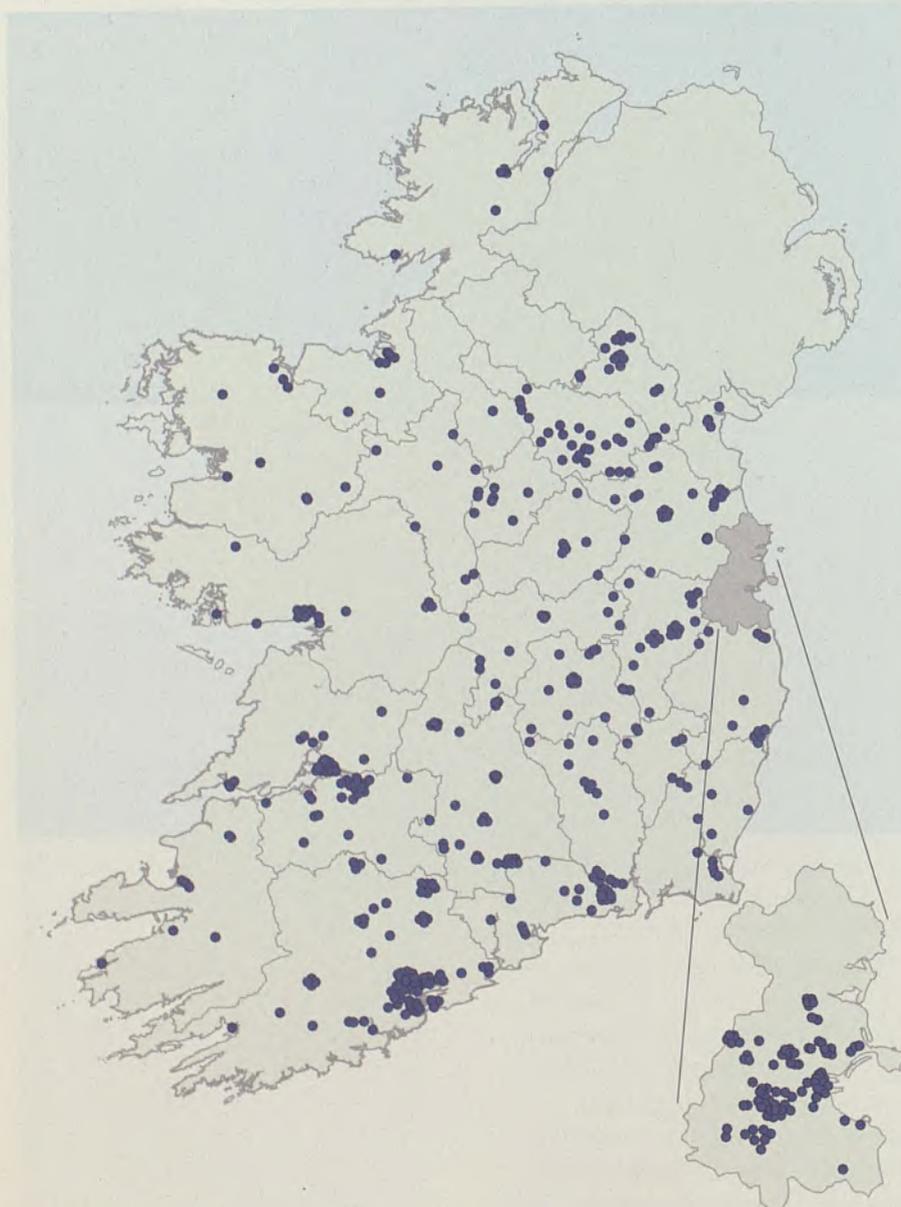


Fig. 15.3 Distribution of IPC Licensed Activities in Ireland

Box 15.5 Control of Hazardous Substances

Control of the vast number of chemical substances in use is difficult, and it is necessary therefore to adopt a policy of prioritisation, based on identifying those substances of greatest risk to humans and the environment. For instance, the main EU Directive intended to control discharges of dangerous substances to water (CEC, 1976) prioritises in its List I a number of pesticides and chlorinated solvents, as well as the metals cadmium and mercury, the toxicity and persistence of which are relatively high. A recent development under this Directive was an Informal Priority Setting (IPS) scheme relating to substances likely to enter the aquatic environment, which has resulted in two priority lists of about 230 substances. It is proposed that the water framework Directive when enacted will replace the dangerous substances Directive. In preparation for the water framework Directive, the European Commission recently proposed a priority list of 32 substances (EC, 2000a). An ongoing project undertaken by the Clean Technology Centre in Cork as part of the EPA environmental research programme (Chapter 1), aims at producing a priority list of substances which are believed to be relevant in an Irish context, with an emphasis on the aquatic environment.

In relation to air, the CLRTAP Protocol on Persistent Organic Pollutants (Box 15.3) establishes a list of 12 named pesticides and PCBs to be eliminated from production and use, with restrictions on the use of several others. Reductions of national emissions of a number of additional listed substances (including polycyclic aromatic hydrocarbons and dioxins and furans) are required, referenced to a specified base year. The CLRTAP Protocol on Heavy Metals will require reductions of harmful emissions of the metals cadmium, lead and mercury, to be achieved by applying best available techniques (BAT) and emission limit values. The recently adopted solvents Directive (CEC, 1999b) aims at preventing or reducing emissions of volatile organic compounds and the potential risks to human health.

Industrial emissions of hazardous materials are largely controlled through the IPC licensing procedure. The Pollution Emissions Register (PER), required as a condition of the majority of IPC licences, details how much of a tracked substance ends up in product, is recycled or is released to the environment. It is expected that both the quality and quantity of PER reporting will improve in coming years and that it will provide a valuable tool in estimating and controlling losses of certain substances to the environment.

In industry, substitution of dangerous solvents or active ingredients by less hazardous substances has had considerable environmental, health and safety benefits. It is important, however, that chemical substitution does not shift the source of environmental pressure and become detrimental to another area of the environment. An example of such an unintended effect can be found in changes in the chemicals used in dipping of sheep to treat against ectoparasites, such as scab, which has resulted in the use of alternative chemicals (synthetic pyrethroids) which are highly toxic to the aquatic environment.

Act commenced in May 1997. By the end of 1999, 133 applications had been received with 30 licences granted (Figure 15.4). Ultimately all significant waste disposal and recovery activities in the country will be licensed. Applications for waste licences are determined by the Agency on the basis of a single integrated licence (as for IIPC) that deals with emissions to all environmental media, in addition to

the environmental management of the facility. All related operations carried on by the applicant in, on or adjacent to the facility are taken into consideration. Given the specific nature of waste activities such as landfilling, the Agency has the power to control the entire life cycle of an activity, from the construction phase through to closure and aftercare. Waste licensees, in addition to being required to comply with strict

emission limits, are required to establish and implement an Environmental Management System (EMS) and to prepare an Annual Environmental Report (AER). While it is too early to make any specific judgements about the relative impact of waste licensing, it is clear that the introduction of the licensing system is resulting in significantly increased investment. Standards of waste management are undoubtedly rising and will continue to rise.

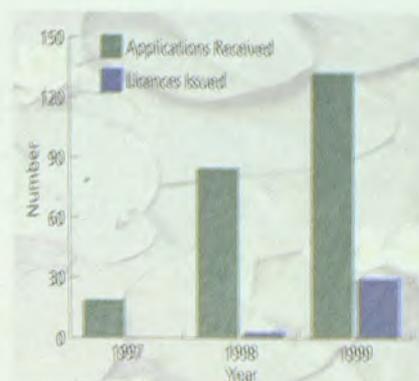


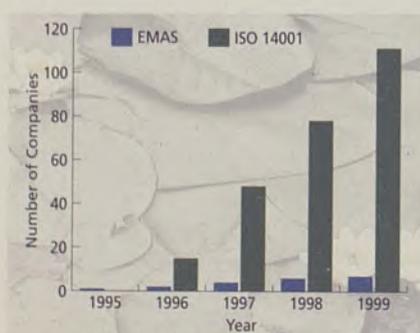
Figure 15.4 Cumulative Number of Waste Licence Applications and Licences Issued

Environmental Management Systems

There has been strong growth in the adoption of Environmental Management Systems (EMS) in Ireland, with over 300 in place and at least as many again being implemented. The primary drivers behind companies installing an EMS are the requirements of IIPC and waste licensing, company interest in setting up an EMS voluntarily, local authority licensing and the 'supply-chain driver', i.e., large companies requiring that their suppliers have an EMS in place. Grant schemes to promote environmental efficiency and installation of EMSs amongst small and medium sized indigenous Irish manufacturing industries are provided by Enterprise Ireland.

The EPA is the first regulatory body in Europe to insist on an EMS as a mandatory licence condition, appropriate to the nature and scale of

the activity concerned. Large manufacturing industries are increasingly moving towards the adoption of accredited EMSs (such as ISO 14001 or the Eco-Management and Audit Scheme (EMAS)), particularly where increased competitiveness through cost savings and enhanced public image can be achieved as a result of better environmental management (Figure 15.5). The National Accreditation Board (NAB) and the EPA produced a guidance document in 1997 on harmonisation of the requirements of integrated licensing and accredited EMSs (NAB and EPA, 1997). This initiative is the first of its type in Europe and is being widely recognised for the benefits it brings in terms of cost savings, improved reporting and increased public recognition of a company's environmental efforts (Hussey, 1998; Maclean, 1998). It is consistent with the EU drive towards achieving increased coherence between the various legislative instruments in the environmental field at the level of the individual member states. Proposals for a revised European Commission Scheme - known as EMAS II - are being considered at present, to enhance the effectiveness, credibility and public awareness of the Scheme based on the experience of implementing EMAS I.



Sources: NAB, NSAI, SGS, ERM

Figure 15.5 Adoption of Accredited Environmental Management Systems

The EPA also actively encourages an EMS approach to environmental management in general, including matters such as catchment management planning, the operation



of waste water treatment plants and evaluating the environmental performance of local authorities. The growth in the adoption of an EMS culture in Ireland is to be welcomed and every effort should be made to continue to encourage developments in this area, both in the public sector and the private sector.

Genetically Modified Organisms – Licensing and Control

The Department of the Environment and Local Government is responsible for national policy in the GMO area. The EPA is the competent authority for implementing the GMO Regulations, which includes consideration of notification for GMO use in the State. The EPA may consult the National Advisory Committee on Genetically Modified Organisms on any aspect of its functions under the GMO Regulations. The Committee consists of 12 members nominated by both Government and non-Governmental organisations (NGOs) and is re-appointed every three years.

In Ireland, GMO activities are considered under the headings of: (a) contained use and (b) deliberate release. Containment is provided either by physical barriers, or by a combination of physical barriers, together with chemical and/or biological barriers. Deliberate release of GMOs into the environment means any intentional release into the environment of a GMO without provisions for containment. There are two different types of deliberate

release covered by the Regulations and these are for (i) research and development purposes - field trials and (ii) placing GMO products on the market. The EPA maintains a Register of GMO Users in the State and this is available for public inspection. Up to end of 1999, there were 89 entries on the Register. More than 90 per cent of the GMO users in the State fall under the category of contained uses.

Protecting Water Quality

The principal planning tool for protecting the quality of water resources in Ireland is the power of a local authority to make and implement a water quality management plan (Fig. 15.6). Extensive powers also reside in the Local Government (Water Pollution) Acts, 1977-90, in relation to licensing, monitoring and enforcement. However, it is clear that the availability of these powers has not prevented the gradual deterioration of water quality in the country, particularly through eutrophication.

It is now widely acknowledged that the principal cause of eutrophication is diffuse or non-point source pollution, principally of agricultural origin (Chapter 9; Lucey *et al.*, 1999). Past water quality management plans tended to concentrate on controlling and reducing point source inputs and did not, to any significant extent, address diffuse sources of pollution. There is also little evidence that water quality



Fig. 15.6 Water Quality Management Plans

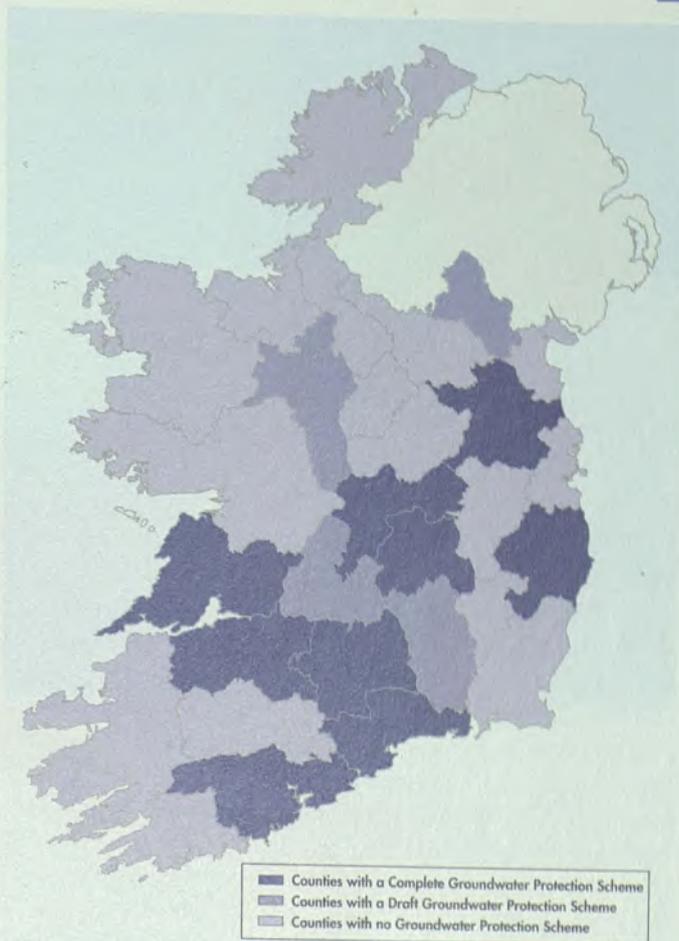


Fig. 15.7 Groundwater Protection Schemes

management plans have been subject to the necessary review and modifications required of a dynamic planning process, even though revision was viewed as an integral part of the legislation adopted (Fanning *et al.*, 1999).

The restriction of water quality management planning to the protection of surface waters has also meant that groundwater quality has not been afforded the same level of statutory protection. Groundwater protection schemes, have been developed by several county councils in association with the Geological Survey of Ireland (Figure 15.7) and more are in preparation, based on published guidance (DELG *et al.*, 1999). In addition, a number of measures for the protection of groundwater are being pursued in the context of the Rural Water Programme. While these initiatives will go some way to protecting groundwater, a more integrated

approach to surface water and groundwater planning can lead to a higher level of environmental protection.

All existing water quality management plans are to be reviewed in the next ten years and this revision will have to take into account the objectives and measures recommended in the Government strategy document against eutrophication (DoE, 1997b), as well as the requirements of the Phosphorus Regulations, 1998 (see above) and relevant EU Directives. In addition, these plans will have to take into account the requirements of the draft water framework Directive when enacted. All recent water quality management plans, strategies and monitoring schemes are now addressing the issue of diffuse sources of pollution in some detail. Projects are underway for the establishment of systems for the management and monitoring of water quality in

relation to Loughs Derg, Ree and Leane and the rivers Boyne, Liffey and Suir, with Government and European funding.

The status of urban waste water treatment in the State was reviewed in Chapter 5. Under the urban waste water treatment Regulations, the majority of agglomerations (i.e., population equivalents between 2,000 and 15,000) will have to have secondary treatment by the end of 2005. More stringent requirements, in terms of treatment and/or timeframe, apply to large agglomerations or agglomerations discharging into sensitive areas. The National Development Plan 2000-2006 provides for the investment of some £2.5 billion in water and waste water infrastructure with the major portion being assigned to waste water treatment facilities. Sludge arisings from urban waste water treatment plants are thus expected to increase. Reuse of sewage sludge (e.g., in

agriculture and forestry), in compliance with the Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998, is the preferable option (O'Leary and Carty, 1998).

A recent assessment of drinking water quality in the State found that while public water supplies are generally satisfactory (although problems exist in certain areas), a significant proportion of group water schemes are cause for concern (EPA, 1999c). A systematic evaluation of all group schemes commenced in 1999 through a partnership agreement between the Local Authorities, the National Federation of Group Water Schemes and the Government. This should lead to the identification of specific problem areas and help in the identification of solutions. The EPA recommends effective disinfection of drinking water supplies and appropriate siting and control of silage pits, slurry tanks and septic tanks to improve the quality of supplies (EPA, 1999c). New regulations introduced in 1999 strengthen the legal basis for addressing quality problems in private group water schemes, and require improvements within the framework of Strategic Rural Water Planning. These Regulations are a response to European Commission concern about the legal position governing quality-deficient private group water schemes. These Regulations, however, are a temporary measure and more comprehensive provisions in relation to group water schemes are expected in the forthcoming Water Services Bill. The adoption of the new drinking water Directive (CEC, 1998b) is of major significance and will have far-reaching implications. Within the next five years there will be a major change in the nature and extent of the monitoring of drinking water throughout the country and the EU at large (EPA, 1999c). Designation of nitrate vulnerable zones under the nitrates Directive (CEC, 1991b) is pending.

Protecting Air Quality

Ambient smoke, SO₂ and lead levels in urban areas of the State are now at very low levels due to the introduction of a series of measures to control their emissions (Chapter 8). However, insufficient monitoring of other air pollutants has hampered adequate assessment of the State's air quality (McGettigan, 1998). The EPA has been assigned the role of implementing the EU Directive on ambient air quality assessment and management in the State. Under this Directive, the first daughter Directive sets stringent legal limit values for SO₂, NO₂, PM₁₀ and lead, which are to be met within 10-15 years (CEC, 1999c). Future daughter Directives will address ozone, benzene, carbon monoxide, polyaromatic hydrocarbons and some heavy metals. Ireland and all other Member States must take steps to comply with the new limits, monitor and assess air quality on the basis of common methods and criteria, and ensure that adequate information on ambient air quality is made available to the public (Chapter 8). The EPA has finalised a national air quality monitoring programme which takes full account of the requirements of the new legislation. This will require an increased monitoring frequency for a wider range of parameters in a greater number of locations around the State. In addition, local authorities in the Dublin area have recently published an air quality management plan under the Air Pollution Act, 1987. The success of measures to address emissions to air is addressed in Chapters 4 and 8.

Protecting Soil Quality

While Ireland has fortunately escaped the legacy of significant soil contamination experienced by many industrialised countries, it is clear that a proportion of soils in Ireland are either managed inappropriately (e.g., by over-application of nutrients) or are under threat of degradation (e.g., by overgrazing or peatland development). Pressures on soils

principally arise from the following: intensive agriculture; industrial organic waste disposal; drainage; commercial forestry; peat extraction; mining; and urbanisation and infrastructure development. Many of the activities affecting soil functions also have the potential to cause deleterious effects on surface water and groundwater resources and biodiversity.

Legislation relating directly to soils and soil protection is generally poorly developed at national level and at European level, with a few exceptions (e.g., Germany, Netherlands). However, in many cases existing air, water and conservation legislation affords protection indirectly to soils, and soils are specifically addressed in environmental impact assessment legislation. A number of agreements, protocols and codes of good practice have been developed in relation to soil protection both at international and national levels (e.g., the European Soil Charter (EC, 1972), World Soil Charter (UN, 1981), the Code of Good Agricultural Practice (DAFF and DoE, 1996), Forestry and Fisheries Guidelines (Forest Service, 1991)). It is necessary that soil quality in Ireland should be maintained and, where necessary improved, through the adoption and application of appropriate environmental management practices. This will require effective application of existing legislation and codes of practice and the eco-auditing of relevant policies and programmes, such as those relating to agricultural grant schemes, forestry development, industrial and urban development and peat extraction for the energy sector.

Protecting Biodiversity

Primary Biodiversity-related Designations

The Department of Arts, Heritage, Gaeltacht and the Islands distinguishes two categories of

protected areas in the State:

- one comprising sites set aside primarily for nature conservation, which are generally unpopulated with no significant economic activities, e.g., National Parks and Nature Reserves; and
- a much larger category of sites which are designated at a national (NHAs) and European (SPAs/SACs) level for their biodiversity importance, but where sustainable economic activities also take place.

In recent years progress has been made in establishing, or proposing for designation, a range of protected areas (i.e., NHAs, SPAs and SACs) for biodiversity. Approximately 1,100 sites of national ecological and geological importance have been proposed by Dúchas for designation as NHAs. However NHAs have no legislative basis until the Wildlife Amendment Bill is enacted and consequently receive limited legal protection at present, except where developments are covered by the Planning Acts. Despite Government and EU Policy to only grant-aid developments in these areas that are compatible with protecting the environment, concern has been expressed that some proposed NHAs may already have been affected by damaging activities (Hickie, 1997).

The transposition of the habitats Directive (CEC, 1992a) into Irish law in 1997 was a major step forward in protection of European (NATURA 2000) sites in Ireland. Until 1997, SPAs designated under the wild birds Directive (CEC, 1979) received relatively limited legal protection under Irish legislation. With the Habitats Regulations now in force, it is expected that SPAs and SACs threatened by development will be safeguarded from damaging activities. However, in comparison to most other European countries, Ireland has currently designated a relatively low proportion of its national territory as SPAs or proposed Sites of

Community Importance (pSCIs - an intermediary stage before full SAC status) (Figure 15.8). A recent assessment of the Irish conservation designation lists indicates that the State's SPA list is incomplete and the pSCI list is notably insufficient (EC, 2000b). Concern has also been expressed over the number of complaints which the European Commission has received relating to a wide range of potentially damaging activities in Irish SPAs (or sites requiring such protection) (Ó Briain, 1999). Indeed, the European Commission is pursuing legal action against the State in relation to the habitats Directive (Cashman, 1999) and has indicated that it intends to pursue legal action in relation to the wild birds Directive (Chapter 12).

Limited resources and the SAC appeals process are considered to have delayed NATURA 2000 site designation. Increased funding for nature conservation in the State should help address some of these and other issues relating to biodiversity protection and management (Chapter 12). Dúchas is currently developing management plans for Ireland's SPAs and candidate SACs, which should provide for effective management of these areas



and maintain and enhance the value of the sites, particularly for the species or habitats for which they are designated. It is expected that the process of designating candidate SACs will be completed in 2000 and that approximately 400 sites (or 9 per cent of the national territory) will be designated.

Statutory Nature Reserves are regarded as the most rigorous mechanism in Ireland for the protection of ecosystems and species of flora and fauna, as almost all damaging activities can be legally prevented in Nature Reserves. Concern has been expressed about

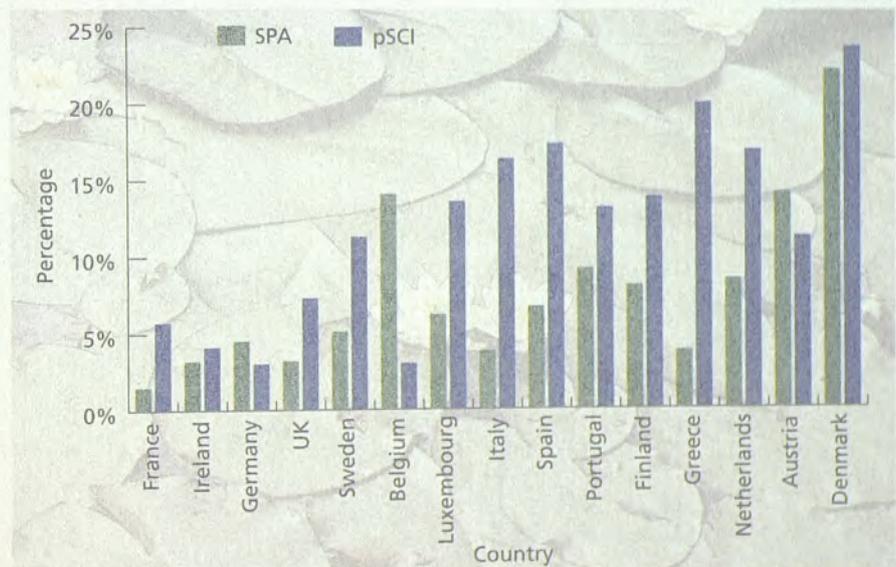


Fig. 15.8 The Percentage of National Territory Designated as SPAs or pSCIs.

Note: Based on the total terrestrial and marine surface area designated in relation to the terrestrial surface area of the Member State as of 08/03/00 (EC, 2000b).



the extent and monitoring of the Nature Reserve network, though its value in protecting habitats which may otherwise have been damaged or destroyed is recognised (Hickie, 1997). The area of land designated as National Parks in Ireland has increased by approximately 18,000 ha since 1996 (to a total of 57,000 ha). This includes the designation of a sixth National Park in the Owenduff/Nephin area of Co. Mayo in 1999, comprising 9,700 ha. The National Park designation appears to have achieved its aims of balancing nature conservation with public recreation and appreciation reasonably well, despite some problems with encroachment of livestock, infestation with exotic species such as *Rhododendron ponticum* and controversial visitor centre proposals in the Burren and the Wicklow Mountains (Hickie, 1997). To date only the Killarney National Park has a published management plan (OPW, 1990),

although plans are in preparation for the other National Parks. Other categories of areas designated for biodiversity in the State (e.g., Ramsar sites, Refuges for Fauna, Wildfowl Sanctuaries) are outlined in Chapter 12.

Other Conservation Measures

Less than 10 per cent of the Irish countryside has a formal nature conservation designation. Outside protected areas, biodiversity conservation is not generally the dominant priority. Nevertheless, it is necessary to maintain, and where possible enhance, in so far as possible, biodiversity in the broader countryside. Changes in farming practices and development pressures are thought to be the main factors exerting increasing threats to biological diversity in the State, causing deterioration in the quality of habitats and even their destruction.

As stated earlier, nature conservation countryside is primarily put into effect through the Wildlife Act, 1976, which has been difficult to enforce effectively due to deficiencies in the Act and lack of resources. The Wildlife (Amendment) Bill, 1999, aims at addressing many of these deficiencies (see above). The Planning Acts also afford some protection for wildlife on a national basis, for example through the EIA regulations. Local authorities (and other national bodies) may have a

significant positive influence on local biological diversity, through wildlife friendly management of public areas, roadside margins, etc. and planting of native species and seed stock. Other measures important for protection of biodiversity countrywide include legal protection of species and specific conservation programmes (Chapter 12), the compilation of Red Data Books on an all-Ireland basis on species under threat and various measures to preserve genetic diversity (DAHGI, 1998).

There are a number of designations which, though not primarily made for the direct protection of biological diversity, contribute to its conservation. The most important of these in terms of biodiversity are development controls (e.g., Areas of Special Control and Special Amenity Area Orders), water quality designations and land managed under the Rural Environment Protection Scheme (REPS). Other relevant designations are generally of limited extent (Tree Preservation Orders, the UNESCO World Heritage Sites).

Several types of designations are available to local authorities to protect the environment and, *inter alia*, biodiversity. Planning authorities may designate 'Areas of Special Control' in County Development Plans to designate land where stricter planning controls apply to protect scenic landscapes, amenities and areas of ecological value. Planning authorities may also make Special Amenity Area Orders (SAAOs), on the grounds of outstanding natural beauty, special recreational value or a need for conservation, and Conservation Orders, for the conservation of threatened flora or fauna. The SAAO allows planning authorities to control development without the need for compensation and to control certain developments that are normally exempted. SAAOs are considered more effective than zoning Areas of Special Control in County



Development Plans (Hickie, 1997). However, to date, only two SAAOs have been made (for North Bull Island and for the Liffey Valley in Co. Dublin - one is also proposed for Howth) and no Conservation Order has ever been made. This is a matter of some concern, as SAAOs would appear to be the best existing designation for protecting 'green belts' that are subjected to intense development pressure. Changes proposed in the Planning and Development Bill, 1999, will have significant consequences for the duties and powers of planning authorities to protect the environment and biodiversity (see section on Legislation). However, included in these changes is the proposal that nature conservation will not be an objective of Special Amenity Area Orders (SAAOs) in the future, proposing that this objective is more appropriate to other specialised designations.

There are a number of existing and proposed designations to protect water quality, which may have benefits for biodiversity. These include the designation of 22 Salmonid Waters under the freshwater fish Directive and the designation of 10 water bodies as Sensitive Areas under the urban waste water treatment Directive. The EPA has proposed that the objective for all surface waters should be salmonid water quality, except where otherwise classified by a competent authority due to particular local conditions (EPA, 1997). Work is ongoing at a European level on a draft water framework Directive, which aims at protecting and enhancing the status of aquatic ecosystems (including their ecological quality), and the terrestrial ecosystems and wetlands that depend on them.

REPS is the main countrywide agri-environmental incentive scheme, which is seen as a potentially important instrument for nature conservation, though this scheme has

a number of deficiencies (Box 15.6). Despite the large uptake of REPS particularly in ecologically significant areas (and predictions of further increases in future uptake), over two-thirds of the utilisable agricultural area in the State is not presently farmed under REPS. Large-scale intensive farming activities, which may potentially have a large impact on the environment, are significantly

under-represented in REPS. It has been suggested that the provision of financial incentives to encourage farmers, who are unsuited to participation in the existing REPS, to maintain, manage and restore heritage sites and habitats (including hedgerows) on farms may provide an effective means of aiding conservation in the wider countryside (Heritage Council, 1999a).

Box 15.6 Rural Environment Protection Scheme (REPS)

Introduced in Ireland in 1994 under Council Regulation 2078/92 (CEC, 1992b), REPS constitutes the primary agri-environmental measure nationwide. The scheme aims at rewarding farmers for carrying out their farming activities in an environmentally friendly manner and at bringing about environmental improvement on farms. Aside from the Wildlife Act, 1976, it is one of the principal mechanisms for protecting wildlife habitats both inside and outside conservation designated areas. Currently, approximately 31 per cent (or 1.5 million ha) of the utilisable agricultural area is being farmed under REPS guidelines (Fig. 15.9). It is anticipated that participation in REPS will rise significantly as a result of recent revisions to provide for increased payments to farmers in Natural Heritage Areas (including SACs and SPAs) and commonages.

A recent Government evaluation of REPS indicated that it was having positive environmental and socio-economic impacts, including reducing fertiliser use on farms and increasing awareness of environmentally sensitive farming practices (DAF, 1999). The review does, however, identify the need for better evaluation procedures and indicators. While Teagasc and other organisations have undertaken studies on aspects of the Scheme, the lack of adequate baseline information in REPS plans and the absence of a formal country-wide environmental monitoring programme of representative farms make it very difficult to assess the environmental benefit of REPS nationally. Thus it is important that a system for baseline data collection and monitoring be established.

Commonage framework plans, in the process of being drawn up by Dúchas and the Department of Agriculture, Food and Rural Development, should provide valuable ecological data for evaluating the success of REPS in future years in restoring and managing these fragile systems. Concerns have been expressed about the ecological expertise of REPS planners and the competitive pressures under which they operate the scheme (Heritage Council, 1999a). It is important that there is a clear and transparent mechanism for monitoring and evaluating the scheme. As REPS is one of the principal mechanisms to meet conservation objectives in national (NHAs) and European (SACs and SPAs) sites, appropriate ecological management of these areas under REPS is essential.

The requirement since 1998 for cross-compliance between REPS and the Headage and Ewe Premium Schemes in areas degraded by overgrazing (and the subsequent extension of this requirement to all commonages), the development of Commonage Framework Plans and the introduction of the SAC programme, are positive developments and should help address the overgrazing brought about by these sheep payment schemes. However, it appears incongruous that one scheme, REPS, makes payments to farmers in degraded areas, to counteract the negative effects of other schemes - the Ewe Premium and Headage Payment Schemes. It would be far more desirable that environmental objectives would be an integral part of all relevant agricultural grant schemes.



A SECTORAL ANALYSIS

In the National Sustainable Development Strategy the Government set out Action Programmes for sustainability for the following sectors: agriculture, forestry, marine resources, energy, industry, transport, tourism and trade. Examples of key tools and strategies available for implementing these programmes are outlined earlier in Table 15.1. This section reports on progress in relation to key elements of the Action Programmes. The challenges ahead for each sector are considered in Chapter 16. While a sectoral analysis is worthwhile in itself, it is important to appreciate the cross-linkages and inter-relationships that exist between sectors in relation to their potential impacts on the environment. Thus, integrated environmental protection and management requires that a multi-sectoral approach be adopted, for instance, when dealing with the key environmental challenges that were outlined in Chapter 13.

Agriculture

Since the publication of the National Sustainable Development Strategy, there has been some progress in introducing measures to improve agricultural sustainability, though there is still considerable work to be done. For example, cross compliance is now required between REPS and the Headage and Ewe premium

schemes, as previous measures failed to prevent overgrazing in vulnerable upland areas (Box 15.6). Targets for uptake of REPS have largely been met and the number of farmers in the scheme is expected to continue to increase (Fig. 15.9). In contrast, entry into the Control of Farmyard Pollution (CFP) scheme and the related Improvement of Dairy Hygiene Standards scheme was suspended in 1996, due to over subscription, and was not reintroduced until 1999. Participants in both schemes are required to follow an approved nutrient management plan (Chapter 16) or participate in REPS. Despite considerable expenditure on the CFP scheme (Chapter 14), the occurrence of inadequate farm slurry storage facilities is still widespread (Chapter 5).

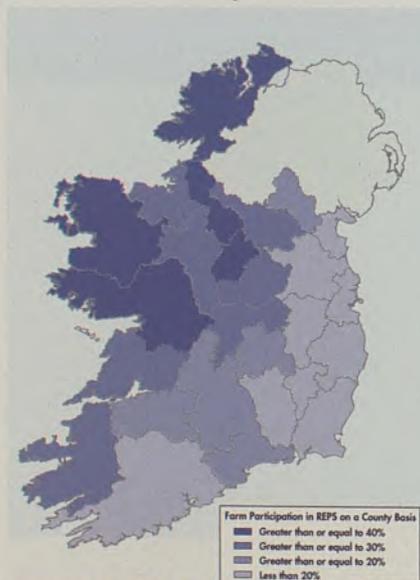


Fig. 15.9 Farm Participation in REPS in 1999

Significantly, Teagasc has issued revised guidelines on use of phosphorus and potassium fertiliser, which considerably reduce the recommended phosphorus application rates (Teagasc, 1998). IPC licensing of large-scale intensive pig and poultry operations has been introduced and a farm plastic recovery scheme is also in place. However, comprehensive guidance on sustainable agriculture by the Department of Agriculture, Food and Rural Development is still outstanding.

Forestry

Forestry may have both positive and negative impacts on the environment and the relevant issues include water resources, water quality, acidification, biodiversity, landscape and climate change (Chapter 11; O'Halloran *et al.*, 1996). Environmental considerations are taken into account for forestry grant approval, with State Agencies and local authorities consulted where environmental concerns arise. Since most afforestation only proceeds with grant aid, this has been a reasonably effective means of control (Hickie, 1997). Grant aid is precluded where plantations may impinge on listed and designated sites, and local authorities are consulted on all afforestation over 25 hectares in size. However, concern has been expressed that areas of biodiversity, landscape and heritage value outside of protected areas, such as marginal agricultural land, are at risk of overdevelopment from commercial forestry (Heritage Council, 1999b).

The Local Government (Planning and Development) Bill proposes that initial planting of forests will no longer be exempt from planning permission given that afforestation can have significant environmental effects. Development by the Forest Service of Geographical Information System-based planning tools such as the Indicative Forestry Strategy and

the recently developed Forest Inventory and Planning System (FIPS) should help guide the location and character of future afforestation to ensure it is in harmony with the environment. Appropriate strategic planning of forestry is particularly important given the rapid expansion of forestry envisaged in Government policy (DAFF, 1996).

Many of the actions recommended in the National Sustainable Development Strategy to ensure sustainable forestry have not yet been completed. Forestry legislation remains under review and the National Forest Standard is still under development by the Forest Service. The National Forest Standard will entail a Code of Best Forest Practice, embracing Forestry Guidelines (on fisheries, landscape, archaeology, biodiversity, harvesting, etc.) and criteria for sustainable forest management. In this context it is worth noting that Coillte Teoranta has produced a Sustainable Forest Management Framework and intends to develop a Management System to translate the Framework into practice (Coillte, 1999). The draft consultation guidelines for planning authorities on designation of areas sensitive to forestry development have yet to be finalised. While the requirement for EIA for new afforestation has been reduced to 70 hectares as promised in the National Sustainable Development Strategy, this threshold has been criticised by the European Commission. The European Court of Justice recently ruled that Ireland failed to apply correctly the 1985 EIA Directive in this area.

Marine Resources

There has been a significant number of international and national legislative developments in the marine sector since 1996 (see Legislation section). These developments have aimed at improving the prevention and control

of certain potentially polluting activities in the marine environment, dealing with areas such as oil pollution, dumping at sea and aquaculture. The ongoing upgrading of urban waste water treatment plants will also have positive benefits for marine water quality. In addition, the development of aquaculture zoning plans by Dúchas in Special Protection Areas, as part of site conservation plans, should help to minimise the environmental impact of mariculture operations at these sites. Other activities ongoing to address marine and coastal issues include the following: the provision of port reception facilities for ship waste; monitoring of bathing water quality and the operation of the Blue Flag Scheme in relation to quality of beaches; the Coastwatch Europe survey; and local authority programmes to combat coastal erosion. The publication of an environmental strategy for offshore oil and gas exploration is still outstanding.

The principal instrument within the EU to secure the long-term rational development of marine fisheries is the 1983 Common Fisheries Policy (CFP). A combination of Total Allowable Catches (TACs)/quotas, technical conservation measures (such as controls on fishing gear, area and time of fishing, minimum landing sizes, selectivity of gear) and multi-annual guidance programmes (to control catching capacity and fishing effort of the combined European Community fleets), is aimed at reducing and controlling fishing mortality rates, minimising discards and by-catch, and generally improving marine ecosystems. However, stocks of fish, such as cod, saithe, plaice, sole and northern hake, are at present considered by the International Council for Exploration of the Seas (ICES) to be close to or outside their safe biological limits in certain waters around Ireland and therefore give cause for concern. In addition, discarding of juvenile fish

and non-target species is perceived to be a continuing problem in many fisheries (Boelens *et al.*, 1999). Future strategies to address these issues and other problems are discussed in Chapter 16.

In relation to inland fisheries, the Government is implementing a Salmon Management Strategy on a phased basis, to ensure sufficient salmon return to their native rivers to spawn and that the surplus is shared equally between legitimate interests. It is crucial that this Strategy is successful as nominal overall Irish salmon catch is currently at historically low levels (Boelens *et al.*, 1999). Conservation regulations were introduced in 1997 as the first phase of the new management regime. A key element of the second phase is the introduction of a salmon tagging scheme, as proposed in the Fisheries (Amendment) Bill, 1999. Measures to address the sea-trout collapse include a policy of 'Single Bay Management', put in place to introduce new and better husbandry practices on fish farms. The Single Bay Management concept has been shown to be successful in reducing sea lice loads on farm fish (Boelens *et al.*, 1999). Improved catchment management planning in various rivers and introduction of the Phosphorus Regulations, 1998, should also help protect inland fisheries and reduce chemical inputs to the aquatic environment.

Energy

Progress in meeting sustainable development targets for the energy sector has been relatively poor. Greenhouse gas emissions from the energy sector continue to increase (Chapter 4) and renewable energy comprises only approximately 6 per cent (or c.307 MW) of total installed electricity generating capacity (Irish Energy Centre, 1999a, 1999b), which falls short of the Government target of 10 per cent by the end of 1999 (DoE, 1997a). This is despite



incentives for development of alternative and renewable energy, e.g., under the EU THERMIE program, EU Interreg funding in Border areas and a series of four Government operated 'Alternative Energy Requirement' schemes. In 1998, the Government introduced tax relief for corporate equity investment in renewable energies and the Irish Energy Centre operated a Renewable Energy Feasibility Study Grant Scheme to stimulate renewable energy projects (Chapter 14). As a further support to the developing renewables sector, the Electricity Regulation Act, 1999 allows all electricity customers to purchase electricity that is produced using a renewable or alternative form of energy from February 2000.

In relation to energy efficiency, Ireland participates in the EU SAVE programme and the Irish Energy Centre provides grant-aid and advice to energy users in the industrial, institutional, and commercial sectors to facilitate reduced energy use in these sectors through schemes such as the Self Audit and Statement of Energy Accounts Scheme and the Energy Efficient Investment Support Scheme (Chapter 14). Revised Building Regulations were introduced in 1998 to enable energy saving in space heating of buildings thus reducing CO₂ emissions. Ongoing integrated pollution control licensing for larger industries and activities can lead to more efficient use of energy. IPC licensing requirements will come into operation for the existing energy sector on a phased basis from September 2000.

Industry

As discussed above, the ongoing application of IPC licensing, cleaner production technology and environmental management systems to industry, and the extension of these management tools within industry, represent the primary responses for sustainable industrial development. Local authorities must regulate industry that does not come under the remit of the EPA (generally through the issuing and enforcement of single media licences).

Additional initiatives introduced for managing and reducing industrial impacts on the environment include the following: a number of Enterprise Ireland grant schemes to improve the environmental performance of small and medium sized indigenous manufacturing industries; the annual Better Environment Awards for Industry; and the setting up and funding of REPAK, a private organisation, by users of large volumes of packaging to promote the

recycling of packaging waste (Chapter 6). In addition the European Eco-labelling Scheme, which promotes the design, production, marketing and use of products that have a reduced environmental impact during their entire life-cycle, has awarded eco-labels to over 200 products at present. This scheme provides consumers with better information on the environmental impact of products and aims at encouraging preferential consideration of eco-labelled products in purchasing decisions.

Transport

The rapid growth of the transport sector presents a considerable environmental challenge to Ireland's sustainable development. Measures to reduce reliance on private cars have failed to check the rapid increase in private car ownership and use (Chapter 3). This is despite increased investment in public transport under the Operational Programme for Transport 1994-1999 and in the Dublin Transport Initiative (Box 15.7). The construction of bypasses and improvement in roads has relieved problems in some areas. There are however continuing problems of traffic congestion, noise and pollution, which threaten the environmental and social fabric of many of our cities and large towns. In addition, whilst major infrastructure investments generally require the use of environmental



Box 15.7 Dublin Transport Initiative (DTI)

The Dublin Transportation Office was established as a corporate body in 1995 to co-ordinate and monitor the implementation of the DTI strategy (DTI, 1995), to make recommendations for an implementation programme and to review the strategy at least once every five years. By the end of 1998 a total of £320 million had been spent on DTI measures, the bulk of which relates to road projects. Progress has been reported on the DTI strategy across a number of fronts to date, including improvements in public transport (both bus and rail) and in facilities for cyclists and pedestrians, as well as significant investment in traffic calming and traffic management (DTO, 1998).

However, despite these improvements, overall progress on the implementation of the DTI strategy has fallen well short of expectations and this, coupled with increased demand for travel in the Strategy area, led to the preparation of a Short Term Action Plan to address immediate needs (DTO, 1998). The Plan was designed to accelerate the implementation of those elements of the DTI Strategy that could be completed in the period up to 2000. It focused on public transport enhancement, traffic management, parking policy and cycling facilities, and also included a comprehensive public information campaign to promote sustainable transport choices.

The DTI strategy and DTO short term action plan initiatives include:

- LUAS, the Dublin Port Tunnel and the completion of the Dublin C-Ring;
- 12 Quality Bus Corridors (by end 2000);
- An additional 150 buses (by end 1999);
- Additional rolling stock for the DART and lengthening of 12 station platforms;
- Extension of DART to Malahide, Co. Dublin and Greystones, Co. Wicklow;
- 47 additional suburban railcars;
- Upgrading of Maynooth-Clonsilla rail line;
- 160 kilometres of cycle tracks (by end 2000);
- Pilot park and ride facilities;
- Improved traffic management and enforcement.

impact assessment procedures, some recent development projects have proved particularly controversial e.g., the widening of the N11 through the Glen of the Downs and the possible impact of the proposed Kildare bypass on the ecology of Pollardstown Fen. The National Development Plan 2000-2006 contains proposals for significant further infrastructural development in the transport sector. The Government has stated that it will eco-audit individual operational programmes within the Plan. It is important that these eco-audits are carried out at a strategic level to ensure sustainable transport development. At a time of increasing pressure on the environment from the transport sector it is important that unsustainable demands are not placed on our natural heritage.

The Government has phased out the use of leaded petrol since 1 January, 2000 with only small amounts (0.5 per cent of total petrol sales) permitted for specialist vehicles (e.g., vintage cars). Since 1993 all new cars with petrol engines sold in the State have catalytic converters (which reduce vehicle emissions). Vehicle testing is being phased in under European legislation (CEC, 1996d), commencing with pre-1992 cars in the year 2000, followed by all 1992-96 cars in 2001, and all 4 year old cars and eligible older cars in 2002. Tests of emissions are specifically incorporated in the test. Recently introduced tax incentives for more fuel efficient cars and cleaner fuels are discussed in Chapter 14. The potential for success of these and other measures in combating air

pollution from transport is discussed in Chapter 16.

Tourism

Tourism and recreation can exert significant pressure on the environment, particularly in sensitive areas (Chapter 7; Chapter 12). In order to address these pressures, the Department of Tourism, Sport and Recreation has allocated £2.5 million for some 20 pilot 'Tourism and the Environment' projects, in partnership with local authorities, state agencies and the private sector. The projects, which were initiated in 1998, aim at demonstrating how particular problems affecting tourism and the environment might be dealt with, thus supporting tourism development while at the same time sustaining the environment on which it is based (Chapter 14).

Fifteen areas in the west of Ireland have been awarded the 'Beatha' quality mark, in recognition of their unspoilt environments that are being managed in a sustainable manner. This initiative was launched in 1995 and is jointly financed by the EU Life Programme and Eco-Lipead NASC Teo, a partnership of various interested agencies (NASC, 1998).

The European Blue Flags Scheme, operated in Ireland by An Taisce, promotes high standards of



environmental protection for beaches while at the same time catering for the needs of visitors through the provision of environmental information (Chapter 10). Facilities at 17 locations on the Shannon, Grand Canal and Barrow Navigation Systems have been provided by local authorities to cater for river cruisers fitted with appropriate storage and pumping facilities for waste water. Boats operating on the Shannon are required to have storage tanks fitted (ENFO, 1999). The Marine Institute has recently produced a number of publications on water-based tourism and leisure (e.g., Marine Institute, 1997, 1998a, 1998b, 1999). Further policy and action is required to ensure sustainable tourism and leisure growth, particularly in the coastal zone.

Trade

Ireland is strongly dependent on trade (Chapter 3). In order to ensure that Irish exports are sustainable, Irish products and services must demonstrate a high degree of environmental awareness and protection (Chapter 16). Equally Ireland must ensure that the goods and services that it imports do not adversely affect the environmental and socio-economic sustainability of other countries, e.g. through the application of fair trade policies. The Government's Statement of National Trade Policy aims at taking account

of the objectives of Agenda 21, with particular attention to the needs of developing countries (DETE, 1998). The policy presses for action in the World Trade Organisation (WTO) and elsewhere to ensure that trade expansion is compatible with the principles of sustainable development. Ireland has not yet ratified the Convention on International Trade in Endangered Species (CITES), however there are provisions to do so in the Wildlife (Amendment) Bill, 1999. In practice, however, the main provisions of the CITES Convention have been implemented in the State (DoE, 1997a).

FRAMEWORK FOR INTEGRATED ENVIRONMENTAL MANAGEMENT AND PROTECTION

Ireland is, in many ways, staking its claim as a clean country with a high quality environment. Agriculture, tourism and marine resources, in particular, depend for their continued development on a clean environment. Integrated environmental management will provide one part of the framework for sustainable economic development in Ireland.

The Environmental Protection Agency has proposed the integration of a number of environmental management tools, namely



environmental quality objectives (EQOs), environmental quality standards (EQSs) and environmental and socio-economic indicators, to help plan for sustainable natural resource management (Clenaghan *et al.*, 1999). EQOs describe the intended *use* of environmental media or the desired quality of the media (i.e., water, air, soil and land, including natural resources such as minerals and flora and fauna). By setting EQOs we are deciding the boundaries or limits, based on the extent of our current scientific understanding, within which development is sustainable, i.e., we are setting a 'Sustainability Target'. Sustainability targets or EQOs are quantified through the application of EQSs (medium-specific standards for chemical, physical or biological parameters). Indicators are then required to measure progress towards the sustainability target.

EQOs and EQSs for environmental media establish the framework within which the sustainability of various sectors can be measured (Figure 15.10). This *resource management framework* can guide sectors in dealing effectively with environmental issues, such as eutrophication. To ensure that a sector is sustainable, emission limit values or environmental management plans may be applied. Indicators can then be used to track progress.

It is intended that the proposed framework will allow complementary 'top-down' and 'bottom-up'

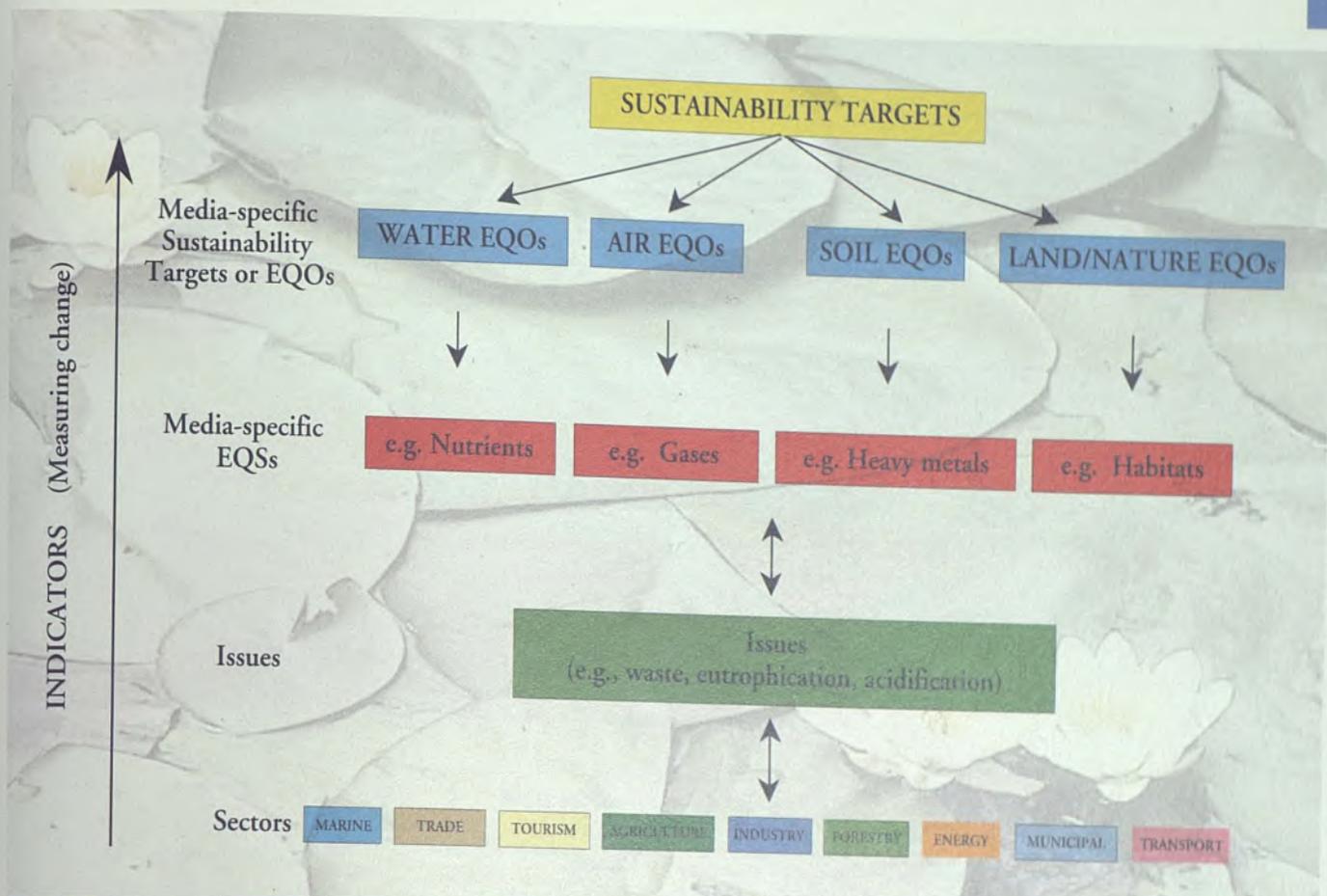


Fig. 15.10 Resource Management Framework

approaches to sustainable environmental resource management. The publication of the Phosphorus Regulations, 1998, is an example of a 'top-down' approach. The 'bottom-up' approach allows complex issues to be addressed in a sectoral or cross-sectoral context, whether at a local, catchment or national scale. For example, such a cross-sectoral approach is presently being adopted to combat eutrophication in the Lough Conn Catchment.

Sustainability targets, EQOs and EQSs need to be developed for all media to enable full implementation of the proposed model. To date, surface water is the sole medium for which proposed EQOs and EQSs are currently being considered in a manner consistent with this model (EPA, 1997), though a number of standards exist for air quality in national and international legislation. Considerable work is required to identify sustainability targets for all media and to assign appropriate

EQOs and EQSs. Typical EQOs that might be considered for various environmental media are presented in (Table 15.2). The Environmental Protection Agency Act, 1992, empowers the EPA to specify and publish quality objectives for any environmental medium.

Work is also ongoing at national and international level on indicator development (Lehane, 1999). Changes in environmental and sectoral indicators inform us of the



Table 15.2 Examples of Objectives where EQSs may be Established

Water	Air	Soil	Land-use/ Landscape
drinking	health	agricultural	urban
fisheries	noise	horticultural	residential
bathing	odour	residential	agricultural
shellfish		recreational	industrial
boating		commercial	national park
agriculture		industrial	wilderness
amenity			protected area
			tourism

'ebb and flow' of the impact of human activities on the environment. However, in the absence of clearly defined targets, it is difficult to estimate the net worth of moving in any particular direction and, thus, setting priorities. Targets based on the sustainability of our natural capital may be the rudder that will keep the ship of sustainable development on course.

CONCLUSIONS

Integration of environmental concerns into national policies and sectoral programmes is a key requirement for sustainable social and economic development in Ireland. Recent developments in this regard include the establishment of structures and mechanisms intended to facilitate co-operation and consultation among Government Departments and between Government Departments and other interested parties. These include the Green Network of Government Departments, *Comhar* (the National Sustainable Development Partnership) and the Inter-Departmental Biodiversity Steering Group. In addition, the recent introduction on a pilot basis of eco-auditing of legislative proposals, plans, programmes and policy statements in specific sectoral areas by Government Departments is a positive development (DELG, 1999c). The wider application of eco-auditing within Government would be in line with the aim of the National Sustainable Development Strategy, which undertook to develop

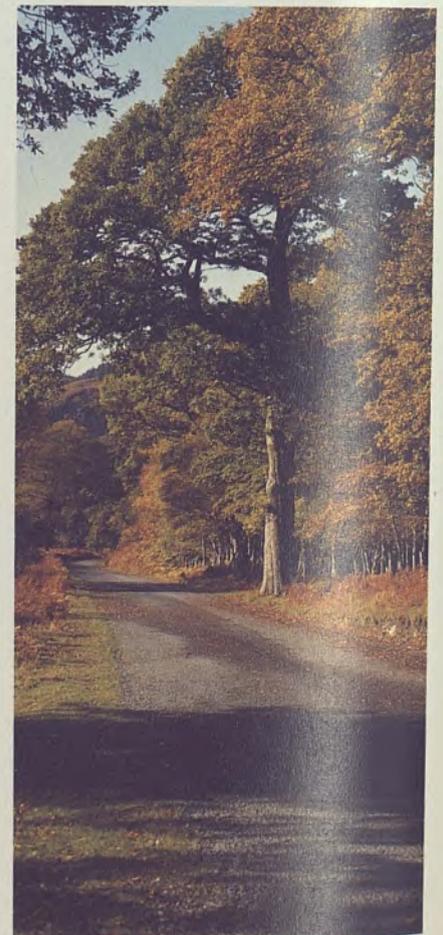
a Strategic Environmental Assessment system for major sectoral plans and programmes within three years, and in line with European developments in this area. Eco-auditing or SEA is vital for the achievement of sustainable development at a national level in Ireland.

At a sectoral level it is clear that certain sectors are exerting unsustainable pressures on the environment. As noted in Chapter 13, water quality is declining, greenhouse gas emissions and waste generation continue to increase, certain habitats and species are under increasing threat, and the impact of transport, particularly in urban areas, is of concern. Whilst, there has been significant progress made in relation to national environmental policy and legislation (e.g., in the areas of water quality and waste), at the time of writing deficits remain in other areas (e.g., in relation to biodiversity, greenhouse gases and coastal zone management). It is expected that these deficits will be addressed.

Of course to be successful, policy and legislation needs to be implemented effectively. For example, in relation to water quality many of the tools to tackle the problems are already in place. However, reversing the decline in water quality requires application of these tools, and appropriate resource allocation and effort (particularly at the catchment level). Significant future investment in public transport and waste infrastructure (including measures to prevent, recycle and reuse waste) will

be required to achieve sustainability in these areas. In relation to planning and urban development, the full integration of adequate infrastructural requirements within the planning process (e.g., waste, sewage and, where necessary, public transport infrastructure), is urgently required. In addition, action needs to be taken to counteract the proliferation of unsustainable low density housing (Chapter 16).

Whilst the quality of the Irish environment is relatively good, there have been some disturbing signs of deterioration in recent years. Failure to implement measures to protect certain aspects of the environment could, in the past, be partly excused through lack of understanding and resources. However, such an excuse does not presently apply to most issues. We now have the knowledge, and the financial and technical resources, to rectify most of the mistakes of the past and to endeavour to create a sustainable future.





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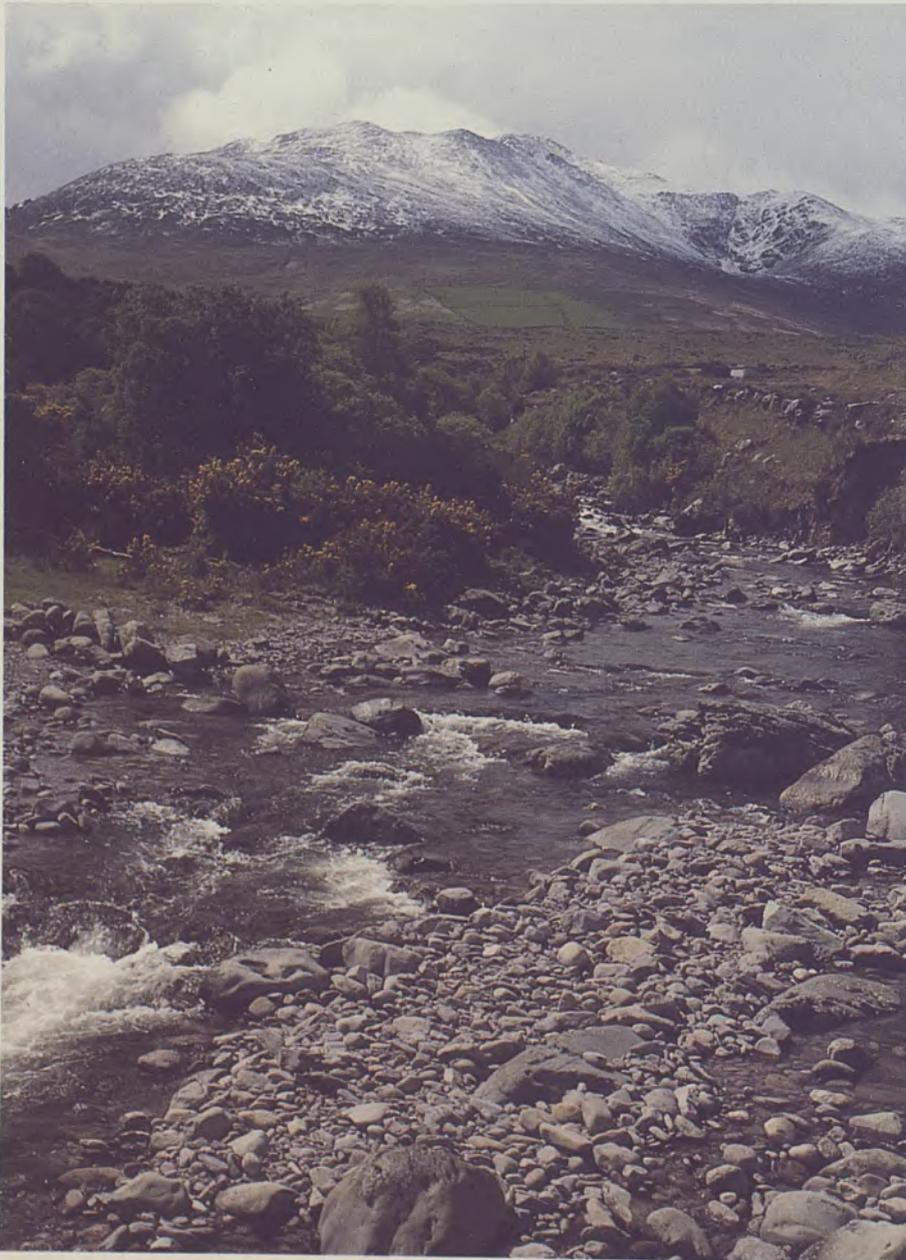
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FUTURE OUTLOOK

The possibility exists of a sustained long-term boom in the global economy, but this is dependent on advances in international co-operation, including co-operation on the environment. One pointer towards the potential for sustainable growth is the general shift in developed countries from manufacturing towards service industries, which have lower impacts on the environment.

In Ireland, gross national product (GNP) is forecast to increase by around 5 per cent per annum over the next five years. By the year 2011, the population is expected to exceed four million persons. Over the next decade there will be a need for 45,000 or more dwellings per year, an unprecedented level of house building, which underlines the need for careful land-use planning integrated with environmental protection. The National Development Plan provides for major investment in infrastructure, including environmental infrastructure. The pilot eco-audit of the Plan points out that care will be needed to ensure that unsustainable elements of growth do not occur under the Plan. Upgrading of infrastructure for waste management and waste water treatment is now an urgent need.

In many of the strategic sectors of the Irish economy there is significant potential for further growth and change, and this poses clear threats to the environment. Projected growth levels in transport, energy and forestry are highly significant, and sustainable development in these sectors will be a major challenge. Agriculture already features strongly as a source of pressure on the environment, for example in relation to eutrophication and greenhouse gas emissions. Environmental challenges for the marine resources sector include ensuring sustainable levels and methods of fishing and developing environmentally friendly aquaculture. Environmental issues will continue coming to the fore in tourism and trade. As with the other sectors, industry will need to integrate environmental considerations fully into policy and decision-making. This can be a win-win outcome, conferring business advantages by making Irish products and services environmentally friendly in line with growing market sentiment internationally.

Environmental awareness in Ireland must be raised significantly so that in daily life citizens take the environment into account in the way that they manage their homes, use transport and make consumer choices. The continuing widespread litter problem underlines the need for action to raise environmental awareness.

INTRODUCTION

Clearly the relationship between economic growth and the

environment is complex. Pressures on the environment can increase with economic activity but alternatively more efficient methods of production

can reduce both natural resource use and emissions to the environment. Balancing economic development with the environment requires, among other things, increased eco-efficiency.

Eco-efficiency aims at de-coupling economic activity from resource use and pollutant release. Put more simply it means getting more from less and breaking the link between economic growth and environmental damage. Indicators of eco-efficiency represent the 'use of nature' in society and the economy. Monitoring eco-efficiency on the macro level (e.g., for sectors and whole economies) is necessary in order to assess whether sustainability is being achieved (Moll and Gee, 1999).



An initial assessment of eco-efficiency in Ireland on the macro-level was made in the 1999 EPA report on key national environmental indicators (Lehane, 1999). This has been updated for this report with more recent information on some aspects and is presented in Fig. 16.1.

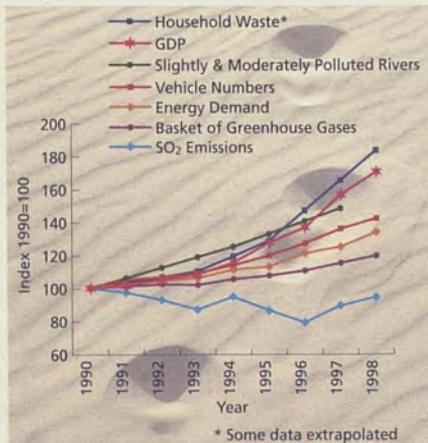


Fig. 16.1 Eco-efficiency in Ireland 1990-1998

The purpose of Fig. 16.1 is to show the trends in a number of key indicators in relation to the trend in gross domestic product (GDP). It is clear that the increase in the amounts of household waste has been matching or exceeding GDP growth. A number of the other indicators are increasing at different rates, generally somewhat slower than GDP; this is termed relative de-linking from GDP. Among the selected indicators, only in the case of sulphur dioxide has there been no general increase (in fact some reduction); this is termed an absolute de-linking from GDP, and is



clearly the more desirable outcome for the environment.

The overall trend is thus one of pressures on the environment increasing at varying rates as GDP increases, and this must raise concerns for the future. Hence there is a need to focus on future projections and their implications, which is the subject of this chapter. The objective is to assess emerging and intensifying environmental problems.

THE GLOBAL ECONOMY

A 1998 OECD conference concluded that the world was on the threshold of a tantalising opportunity - the possibility of a long sustained boom. A confluence of forces - particularly the transition to the knowledge society, the emergence of a global economy, and the pursuit of environmental stability - could propel huge improvements in wealth and well being worldwide. For this to happen there must be major advances in international co-operation on the environment (OECD, 1999a).

The potential for sustainable growth is evidenced by a shift in the balance away from manufacturing towards services, by technological potential for energy efficiency, by prospects of telework and teletrade, and by global affluence facilitating investment in the environment. It may take decades, however, to change energy infrastructures, urban settlements, the

construction of dwellings, transport systems, industrial capital stock, consumer technologies, values and attitudes - all of which tend to lock societies into energy intensive patterns (Michalski *et al.*, 1999). Hence it has been argued (Lipietz, 1999) that any long-term boom

- will be constrained principally by ecological sustainability;
- must be based on the 'earth' factor, especially sustainable energy;
- will be fuelled by research and investment in energy-saving and environment-friendly technologies;
- will be guided by new forms of environmental regulation.

In developing the outlook in relation to the environment in Europe (EEA, 1999a) the assumption on macro-economic development was that the European GDP would increase by between 2.0 and 2.5 per cent a year in the period 2000 to 2010.

THE IRISH ECONOMY

The ESRI (Duffy *et al.* 1999) suggests the Irish economy is fully wound up and moving very fast but that over the next decade it is likely to unwind gradually and eventually return to the EU average rate of growth after 2010. A growth rate for GNP over the next five years of around 5 per cent a year was projected. (This compares with real GNP growth of 8.1% in 1998, 7.25% estimated for 1999, and 6.5 % projected for 2000). However, there remains the danger that either external shocks or domestic mistakes could put this scenario at risk. There will be a gradual shift from high technology manufacturing to market services, especially internationally traded services. The need for a high level of investment, especially in public physical infrastructure and housing, will limit the resources available for consumption. Over the next decade, there will be a continuing need for 45,000 or more new dwellings a year. The ESRI review concludes that a series of environmental taxes and charges are needed (see Chapter 14).

Box 16.1 National Development Plan 2000-2006 - Economic and Social Infrastructure

The total investment under the Economic and Social Infrastructure Operational Programme will be £17,610 million as follows:

	£ million
National Roads	4,700
Public Transport	2,234
Water and Waste Water	2,495
Coastal Protection	35
Energy	146
Social and Affordable Housing	6,000
Health Capital	2,000

The public transport provision includes, in the Greater Dublin Area, implementation of the light rail network LUAS, and investment in suburban rail, the bus service, traffic management measures and cycling facilities. There will also be investment in public transport outside Dublin.

Investment in water and waste water infrastructure will include the following:

- all outstanding schemes required under the urban waste water treatment Directive;
- water supply for urban areas, including measures against leakages;
- extending lake and river catchment protection;
- water and sewerage services for the development of land.

THE NATIONAL DEVELOPMENT PLAN 2000-2006

A brief summary of the overall levels of investment in the National Development Plan 2000-2006 was given in Chapter 1. The bulk of the investment will be in economic and social infrastructure (Box 16.1), in employment and human resources and in the productive sector. There will be mainstreaming of environmental considerations.

At least 50 per cent of all new jobs from greenfield projects are planned for the Border, Midland and Western (BMW) Region. Modernisation of

the fishing fleet will be supported. There will be increased investment in research, technological development and innovation (RTDI), in agriculture, food, marine resources and the environment (Box 16.2). Research and promotion will embrace energy efficiency, carbon dioxide abatement, and alternative energy.

Box 16.2 National Development Plan 2000-2006 - Environmental Research

The Environmental Research Programme (£20 million) will aim at measuring the impact of economic development and contributing to the sustainable use of natural resources. It will complement research in forestry, agriculture and marine resources and will act as a focus for integration of environmental concerns into sectors. Projects may involve networks for data, long term monitoring sites, and the development of systems, models, instruments and techniques.

In addition, the Plan refers to the possible establishment of a National Environmental Research Unit or centre of excellence (£5 million) possibly incorporated into the Environmental Protection Agency, with priority programmes including:

- integrated environmental assessment;
- environmental management systems;
- information systems development;
- air pollution and acidification;
- waste prevention and management guidance.

Additional regional infrastructural investment will include rural water supply, waste management (£650 million) and urban and village renewal. In the productive sector there will be investment in micro-enterprises, tourism, fisheries, forestry and rural development. A pilot Eco-audit of the Plan was undertaken (Box 16.3).

TECHNOLOGY

The future directions of technology may have positive or negative impacts on the environment. Internationally,

uncertainty applies not just to future technical breakthroughs but also to the range of applications of existing breakthroughs, in particular what may prove to be radical innovations known as general-purpose technologies. Such technologies now in place include, for example, the internal combustion engine and the computer. There may be some technology in its early stages of development at present that will emerge as one of the twenty-first century's influential general purpose technologies (Lipse, 1999).

Box 16.3 National Development Plan 2000-2006 - Aspects of the Pilot Eco-audit

The Pilot Eco-audit notes that economic and social development, together with investment of the order contained in the Plan, has unavoidable implications for the environment. Without appropriate integration measures there would be impacts on, among other things, water and air quality, biodiversity, patterns of land use, energy consumption and waste production. This places a premium on the pursuit of policies that promote economic efficiency, less intensive resource use and less environmental stress. Overall, the environmental dimension is addressed through the following:

- a National Spatial Strategy;
- better integration of land use and transport;
- enhanced eco-efficiency of transport;
- support towards meeting climate change policy objectives;
- assistance towards sustainable agriculture;
- improvements in water supply and waste water treatment;
- integrated waste management;
- environmental research.

The possibility of the emergence of some unsustainable patterns of development within the Plan cannot be excluded, and therefore measures will be taken so that the environmental dimension is fully integrated into the further stages of programme planning and into implementation. Indicators of environmental performance will be developed.

In 1998 the Irish Council for Science, Technology and Innovation (ICSTI) undertook a *Technology Foresight* exercise for Ireland. The time horizon for the exercise was set at 2015. The overview report (ICSTI, 1999) emphasised the importance of knowledge as one of the main drivers of prosperity and well being. It recommended that Ireland should become a centre of excellence in information and communication technologies (ICT) and biotechnology niches.

The importance of sustainable development policy was recognised. Inevitably, ecological and environmental considerations would increasingly inform and modify areas as diverse as school curricula, production, manufacturing and building processes, the use of natural resources, transport and energy. Future technological development would have to contribute to achieving greater competitive and environmental sustainability. The current low level of 'ownership' of environmental concern by Irish enterprises results in products and services that are not future-proofed against a sudden shift in market sentiment, based on broad environmental considerations. Significant market opportunity would arise for Irish enterprises that proactively operate on environmental principles. The report emphasised the need for Government, consumers and producers in Ireland to develop a shared understanding of the trade off involved in real, effective environmental policies.

DEMOGRAPHIC AND SPATIAL ASPECTS

Population and labour force projections have been prepared recently (CSO, 1999). The projections use three sets of assumptions for fertility, one for mortality and two for migration trends. Two distinct sub-periods are distinguished. For the period to 2011, Table 16.1 gives the range of the

projections for the total population, suggesting that it is likely to exceed four million in the second half of the present decade. Migration assumptions account for most of the difference between the highest and lowest population projections. The labour force is projected to increase from 1.62 to 1.9 million or more by 2011.

Table 16.1 Projected Population 2001-2011

Year	Range (000 persons)
2001	3,808 - 3,836
2006	3,938 - 4,052
2011	4,014 - 4,255

CSO, 1999

The CSO report notes that the more distant the projection period the greater the uncertainty. The total projected population for the period 2016 to 2031 is given in Table 16.2.

Table 16.2 Projected Population 2016-2031

Year	Range (000 persons)
2016	4,040 - 4,423
2021	4,039 - 4,561
2026	4,009 - 4,672
2031	3,955 - 4,768

CSO, 1999

The National Spatial Strategy will be a strategic spatial planning tool for the country as a whole. It will develop a dynamic conception of the Irish urban system, together with its links to rural areas. Its challenges include maintaining a competitive position while assisting in the development of the regions and ensuring that the principles of sustainable development are applied. In the recent consultation paper (DELG, 2000) an indicative list is presented of issues to be addressed in the strategy. This includes issues relating to the environment (see Chapter 11).

Challenges Ahead

The projected increases in population are likely to concentrate in urban areas

and their hinterlands and in the coastal zone, thereby adding to pressures in these areas. Strong population growth is likely to continue in the Dublin region, putting pressure, for example, on water resources. Across Ireland there are already pressures on infrastructure for waste management (Chapter 6) and wastewater treatment (Chapter 5), with increased congestion and pollution from transport (Chapters 4 and 8), and loss of green belts and wildlife habitats (Chapters 11 and 12).

Minimising potential impacts on the environment from dealing with the housing crisis is crucial, and coherent integrated policies must be developed at local and national levels. Proposals in the Planning and Development Bill, 1999, to require environmental assessment of County Development Plans are to be welcomed and are in line with developments at European level in relation to the strategic environmental assessment Directive (see Chapter 15).

The projections underline the need for the integration of policies on land-use planning, transport, energy and the environment. An integrated land-use/transportation strategy should maximise the use of available urban derelict sites in order to reduce the uptake of land of agricultural or wildlife value and to reduce the environmental impacts of transport. Appropriate management of urban waste waters will play an integral role in meeting requirements under the forthcoming water framework Directive. With several large new waste water treatment plants coming on-stream (Chapter 5), the proper treatment and disposal of large amounts of sewage sludge is a further important issue. Approaches such as anaerobic digestion of suitable wastes need to be exploited where possible and the increase in production of household and commercial waste will need to be tackled at source.

AGRICULTURE

The white paper on Rural Development notes that although the economic character of rural areas is no longer synonymous with agriculture, the sector remains the single most important contributor to the economic and social viability of rural areas (DAF, 1999).

Agriculture policy is largely determined by the Common Agricultural Policy (CAP). The outcome of the Agenda 2000 negotiations sets the framework for the immediate future. This will include linking environmental protection requirements to direct support payments to farmers (Hamell, 1999). EU enlargement and international trade negotiations will also have a considerable bearing. Promoting quality output, improving consumer assurance, and environment friendly production will be essential (DAF, 1999).

The Government is committed to the continuation of the Rural Environment Protection Scheme (REPS) (see Chapter 15). The Government's strategy includes farm-based diversification and alternative enterprises, e.g., organic production and forestry. There will be continued support for environmental protection, and safeguard conditions will be included in various agriculture support schemes.

The National Development Plan notes that while the importance of primary agriculture to the economy has reduced in line with the trend in all industrialised countries, agriculture remains more important to the Irish economy than it is to the other 14 Member States. Its contribution to GDP is twice the EU average. The Plan recognises the need for an integrated rural policy, including the environment.

Challenges Ahead

The OECD (1998) has stated that regulation has increased in areas such as food safety and quality, genetic modification, pollution control and animal welfare and that such regulation may create impediments to international trade unless these issues are addressed in a multilateral framework.

In Ireland, both REPS and the Control of Farmyard Pollution Schemes have resulted in relatively large expenditure (Chapter 14) on environmental protection and further increased expenditure is proposed. Whilst these schemes have the potential to make a significant contribution to ensuring sustainable farming, it is important that a formal system is put in place to monitor their effectiveness, with a view to improving their value. The uptake of REPS is uneven across the country, and is least in many of the areas where agricultural contributions to eutrophication are greatest. This and broader biodiversity considerations underline the need for a range of measures for environmental protection outside of REPS areas.

It is a matter of serious concern that many Irish soils contain nutrient levels far in excess of that required agronomically, placing Irish

waterways under increasing threat from diffuse agricultural pollution. It is imperative that appropriate farm management is practised and nutrient management planning is more widely applied in problem areas for the benefit of the farmer and the environment (see Box 16.4).

The prevention of pollution arising from farmyards is important and the proper management and utilisation of slurries needs to be promoted and supported at all levels, with the objective of ensuring that their resource potential is fully used in a sustainable manner and their capacity to cause environmental damage is minimised.

The need for control and reduction of emissions of greenhouse gases (methane, nitrous oxide) and acidifying substances (ammonia) from agriculture is very likely to have major implications for this sector in the future. The Kyoto Protocol, the Gothenburg (multi-pollutant multi-effects) Protocol and the proposed EC Directive on national emissions ceilings aim at reducing production of these and other gases (Chapter 4). These international agreements and Ireland's forthcoming National Greenhouse Gas Abatement Strategy (see later) may require significant changes in farm management practices.

Box 16.4 Nutrient Management Planning

Nutrient management planning is advocated in the Government's Catchment Based Strategy against Eutrophication and is promoted by Teagasc through its Farm Advisory Service. A local authority can require nutrient management planning under the Local Government (Water Pollution) Acts where it is considered necessary in the interests of water quality protection.

Nutrient management planning involves an area by area assessment of the amounts of manure, slurry or inorganic fertiliser that should be applied based on soil type and nutrient status, crop nutrient requirements and the nutrient content of the proposed fertiliser.

Currently nutrient management planning is being applied through REPS and in the catchment monitoring and management schemes for Loughs Erne, Derg, Ree and Leane and the Rivers Liffey, Boyne and Suir. Cork County Council has introduced bye-laws in relation to agricultural practice, which contain provisions for nutrient management planning in three river catchments. In addition, nutrient management planning is obligatory in respect of IPC licensed intensive pig and poultry units.

FORESTRY

National policy on forestry is to support the development of a sustainable forestry industry that has a balance of species, to recognise the key role of farm families in forestry, and to insist on proper maintenance as a condition of drawing down premia (DMNR, 1998). The goals for future forestry were outlined in the Government Strategic Plan for the Development of the Forestry Sector in Ireland (DAFF, 1996). The document deals with the development of the forest sector up to 2015, and also gives an outline projection to 2035. The targets imply that in each three-year period about a further 1 per cent of the total land area of the country will be afforested.

The White Paper on Rural Development states that compatibility with the protection of the environment is a basic principle of the forestry programme and refers to controls in relation to fisheries, archaeology and the landscape (DAF, 1999). The main elements of the Government strategy for forestry include the following:

- to increase the productive forest area to 1.2 million hectares;
- to increase the diversity of species;
- to ensure compatibility with the environment;
- to encourage the provision of public access to forests;
- to promote a range of forest-based processing industries;
- to promote research and development, to include environmental concerns;
- to develop a comprehensive inventory and planning system (to include environmental data).

The National Development Plan states that the industry offers considerable scope for expansion and that the development of forestry, on a certain scale and in a particular manner, can contribute to sustainable economic and social well being

compatible with the protection of the environment. Expenditure will be geared towards, *inter alia*, better knowledge of environmental issues.

Challenges Ahead

The balance of forest ownership in the State is changing, as the private sector (in particular farmers) becomes increasingly involved. The forest estate is predominantly Sitka spruce, an exotic conifer species, though the emphasis in forestry guidelines and conditions for grants is now on greater diversity. However, the target of 20 per cent for planting of broadleaves in the Government Strategic Plan (DAFF, 1996) is considered much lower than the EU planting average (Heritage Council, 1999). Imaginative forest management needs to be developed (Chapter 11) to support greater biological and landscape diversity in tandem with the production levels required in commercial forestry. Such forest management will contribute to attaining the goal of sustainable forestry envisaged at the UN Earth Summit in 1992. Increased commercial planting of native hardwoods may also help ultimately to relieve pressure on tropical forest resources about which there is much global concern.

In addition, effective measures are needed to prevent the exacerbation of surface water acidification from forestry, particularly in areas of base poor geology (Chapters 9 and 11). This is likely to require radical measures, such as restriction on planting and replanting of evergreen trees in certain categories of river catchment. The potential of forests in respect of carbon sequestration will need to be realised. An integrated environmental strategy for forestry must ensure that all factors are taken into account. The proposal for a National Forests Standard (Chapter 15) is important in this context.

MARINE RESOURCES

The elements of the Government's policy for marine resources (DMNR, 1998; DAF, 1999) include the following:

- setting out a coherent strategy and maximisation of the long-term contribution of the fisheries sector;
- developing aquaculture in a fair, equitable and environmentally-conscious way;
- protecting the Irish coast through Coastal Zone Management;
- continued support for inland fisheries;
- maximising processing;
- preserving and protecting the marine environment;
- implementation of effective RTDI.



The National Development Plan notes that the industry has an important role in sub-regional distribution of economic activity and employment. In particular it sustains remote coastal communities where there are few economic alternatives. Aquaculture production is important in the west and northwest. National policy will continue to balance the objectives and parameters of EU Common Fisheries Policy with the potential to develop the sector in coastal regions.

The Marine Institute has evaluated the development potential in the marine food sector. The Institute estimates that the implementation of its RTDI programme along with private investment from industry and support from State agencies will lead, over a 5 year period, to an increase in sectoral turnover of £100 million and an increase in employment of up to 1,000 jobs. Further growth is expected also in water-based tourism and leisure and marine technology (Marine Institute, 1998).

Challenges Ahead

Action at the international level is essential for sustainable management and protection of the marine and coastal environment. The concerns relating to the sustainability of certain fish stocks and to the effects of by-catch of juvenile fish and non-target species have been noted in earlier chapters. New regulations agreed by the Council of Fisheries Ministers in October 1997, and which come into effect from January 2000, are designed to improve the effectiveness of existing technical conservation measures and thus minimise the capture of juvenile fish. In addition, EU fisheries ministers voted in June 1998 to introduce a ban on drift-net fishing for tuna to reduce by-catch of marine mammals such as dolphins, which will come into effect in January 2002. However, cetacean (particularly harbour porpoise) by-catch mortality in other fisheries is



still a matter of some concern (Chapter 10). EU funded research is currently underway to assess methods of reducing the impact of demersal trawls on benthic marine organisms.

The Irish Government is also involved in co-operating with the British Government on managing and monitoring the Beaufort Dyke and other weapons dumping sites. Ireland has presented papers to OSPAR on the problems caused by dumped munitions, which will form the basis for future actions on the subject.

A Government Task Force reported in 1999 on the extent and impact of the dumping by Britain of radioactive waste around the British coastline. Following agreement at the International Maritime Organisation (IMO) Assembly in November 1997, to make mandatory the code that governs the transport by sea of irradiated nuclear fuels, the Government is developing improved reporting arrangements.

As discussed in Chapter 15 the Government is preparing a National Coastal Zone Management Policy. There is a pressing need for coherent action in this area, not least because of the rapidly increasing developmental, tourism and recreational pressures on the coast and a predicted increase in coastal erosion.

ENERGY

In the coming decades the world energy sector will face increasingly complex challenges – economic, geopolitical, technological and environmental. Energy demand will grow at a time when tight limits are being placed on greenhouse gas emissions, leading to greater interest in alternative energy. Meeting some of the challenges will require long lead times, as they are related to physical infrastructure (OECD, 1999b).

In Ireland, the Green Paper on Sustainable Energy contains energy projections to 2010 on a business as usual scenario. In relation to the supply of the total primary energy requirement (TPER), the projections to 2010 indicate:

- some reduction in coal;
- a significant reduction in peat;
- an increase in oil by about one third;
- more than doubling of natural gas;
- an approximate doubling of renewable energy.

The projections were for TPER to grow a further 37 per cent by 2010 over the 1998 figure (DPE, 1999). In relation to total final consumption (TFC) the projections indicate substantial increases in the industry, residential, transport and services sectors. Further work on energy projections for Ireland has been undertaken subsequently for the

purposes of the forthcoming National Greenhouse Gas Abatement Strategy.

The projected more than doubling of gas input to electricity generation follows an international trend, due largely to the current wide availability of cheap natural gas coupled with its lower emissions level relative to other fossil fuels. In relation to indigenous natural gas, the positive results of tests carried out on the Corrib field off the west coast, while requiring further evaluation, appear to have demonstrated enough reserves to begin development feasibility studies. Clearly the availability of gas from the Corrib field would reverse the declining trend in the contribution of indigenous reserves.

In relation to renewables, the potential wood biomass resource for electricity and heat production in Ireland is large. Energy from municipal waste can also contribute to renewable energy in Ireland. There is scope to expand low cost solar thermal technology, as the total installed surface is well below the potential resource. Geothermal energy is only a modest resource in Ireland. The principal use at present for heat pumps is in the commercial buildings sector (Source: Irish Energy Centre).

Ireland also has one of the best onshore and offshore wind energy resources in Europe. In many areas, particularly along the west coast, wind resources are being widely evaluated with a view to installing more wind farms. The prospects for the wind energy sector in the medium term indicate that it can exceed the output level obtained by hydropower stations by 2005 (Source: Irish Energy Centre).

Wind power can now compete with the price of fossil fuel based electricity in many countries and the proportion of wind power is rapidly increasing in Europe. About 10 per cent of Denmark's electricity consumption is now met by wind power (Auken, 1999).

Challenges Ahead

Integrated energy planning across all sectors is imperative if Ireland is to satisfy its own rapidly increasing energy demands and yet ensure a clean environment and meet international commitments. Sustainable development of the energy sector should maximise efficiency of energy generation, emphasise the use of renewable resources and promote a culture of energy conservation by all users, whilst minimising environmental impacts.

Future development of the energy sector in Ireland will be heavily influenced by the Kyoto agreement on Climate Change. The Kyoto limit has already been exceeded (Chapter 4). Significant reductions in greenhouse gas emissions from relevant sectors, including the energy sector, must be achieved, in the context of the forthcoming National Greenhouse Gas Abatement Strategy.

A recent report on greenhouse gases stated that the largest single emissions reduction could be achieved by the energy sector, with large reductions obtained through switching fuels for electricity, especially from peat or coal to gas (ERM, 1998). It is important to note that the Kyoto Protocol represents one step towards combating climate change. Ireland will face an even greater challenge in positioning its economy to deal with stronger targets which will be agreed for the post Kyoto period (DPE, 1999). This will require further radical measures.

Ireland is also committed to reducing and limiting SO₂ emissions and NO_x emissions under other international agreements (the Oslo and Sofia Protocols respectively). Limits set for NO_x have not been achieved, and future emissions reductions (of for example SO₂ and NO_x) required under the proposed EU national emissions ceilings Directive and the multi-pollutant multi-effects Protocol

will have significant implications for the energy sector (Chapter 4).

All of these considerations raise questions in particular over the future of the large coal burning power station at Moneypoint and emphasise the general need for fuel switching to natural gas along with measures such as maximising the potential for combined heat and power (CHP). Much greater use of renewables must be achieved in the longer term.

An issue that has been researched for more than two decades is the possible health effects of electromagnetic fields (EMF), and yet there is still great uncertainty concerning whether certain EMF exposure is safe or unsafe. For this reason, further research has been recommended.

INDUSTRY

The National Development Plan notes that the manufacturing industry in Ireland has performed exceptionally well in recent years. Ireland's impressive manufacturing performance has been driven by its ability to attract large-scale high-tech, high value-added projects of foreign direct investment. Key challenges facing the indigenous sector include lack of scale and low productivity. The Plan includes provision for capital investment in the food sector including fish processing.

The services sector is now the dominant sector of economic activity in all developed economies, including Ireland, and four out of every five new jobs are generated in this sector. Services accounted for 63 per cent of national employment in 1996. The greater Dublin area has been a major beneficiary of the growth in internationally traded services.

There will be a strong emphasis on attracting high value-added projects to the Border Midland and Western (BMW) Region and the weaker areas in the Southern and Eastern (S&E) Region in line with a policy of

balanced regional development. As noted earlier, the aim is towards delivering more than half of all new jobs from future green-field projects into the BMW Region. In this context, there will be a special focus on 'gateway towns' which will be catalysts for overall regional growth.

The report of the Health and Life Sciences Panel for Technology Foresight Ireland states that virtually all analysts predict that biotechnology is the basis for major economic growth. The report notes the need to consider ways of dealing with the pressures that are created between public demand for products/processes that enhance the quality of life and public concerns about the long term effects of genetically modified products/processes. Also, as pressure for higher EU standards increases, and as legislation is increasingly applied, the environmental industry looks set to grow steadily (ICSTI, 1999).

Challenges Ahead

In the future, sustainable industrial development will depend on optimised use of non-renewable resources and the development of substitutes. This will be largely facilitated through increased application and enforcement of IPC licensing and extension of cleaner production technology and environmental management systems to a wider variety of industry. Manufacturing industry faces the particular challenge of delivering

environmentally friendly products taking into account the full life cycle of a product.

Changes to the licensing provisions of the EPA Act, 1992 are expected shortly, to comply with the European Directive on integrated pollution prevention and control (IPPC). However, the general principles of the IPPC Directive are broadly in line with the IPC licensing system currently operated by the EPA.

The adherence to international agreements on hazardous substances and the development of tools nationally such as the Pollution Emissions Register to track these substances will help improve industrial environmental performance. Greater application of aspects of the Waste Management Act, 1996, in relation to areas such as producer responsibility obligations (which is limited to packaging waste and farm plastics at present) and the polluter pays principle will have future consequences for industry. In addition, as industry is the largest producer of hazardous wastes in Ireland, the National Hazardous Waste Management Plan, being prepared by the EPA, will have implications for the industrial sector.

Industry, like all relevant sectors, will need to play an increased role in achieving control of the emissions of greenhouse gases. The cement industry is a particularly significant source of these emissions among Irish industries.

TRANSPORT

Projections have been made (ERM *et al.*, 1998) of the numbers of cars and of goods vehicles up to the year 2010. These are shown in Figures 16.2 and 16.3. The projections are that by 2010 the number of cars will rise to almost 1.5 million and the number of goods vehicles will exceed 0.25 million. The recent pattern is of car numbers exceeding the projections.

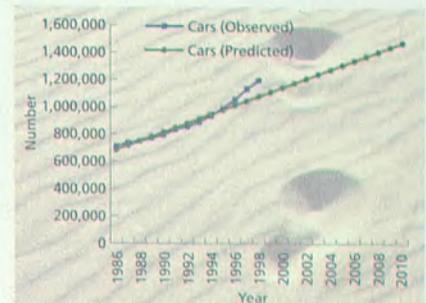


Fig. 16.2 Projections of Cars to 2010 (Sources: ERM *et al.*, 1998; DELG)

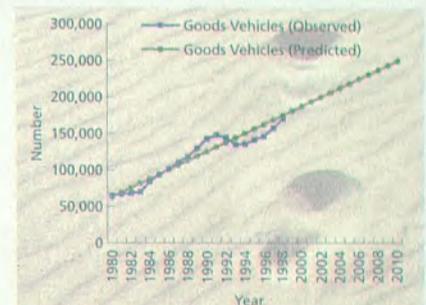


Fig. 16.3 Projections of Goods Vehicles (Sources: ERM *et al.*, 1998; DELG)

For the Dublin Transportation Initiative (DTI), transport demand assessments were undertaken for the year 2011 for a number of land use scenarios. An overall growth in transport demand of over 40 per cent was envisaged for a number of scenarios of projected increases in population, employment and car ownership.

The technology for alternative fuel options such as liquid petroleum gas (LPG) and compressed natural gas (CNG) is already quite widely available. Bio-diesel, ethanol/methanol, and electric and fuel cell technologies, while developing towards commercial



Box 16.5 Sustainable Transport

The measures considered a priority (DPE, 1999) for sustainable transport include the following:

In the short term:

- vehicle efficiency and emissions standards;
- investigating alternative fuels and new technologies;
- taxation and other fiscal measures;
- higher quality public transport;
- telecommuting and implementation of Green Commuter Plans;
- traffic management initiatives;
- encouraging cycling and walking.

In the medium term:

- promoting new technologies and alternative fuels;
- further development of public transport;
- encouraging 'green fleets' in the public and private sectors and voluntary agreements on freight transport management;
- road charging.

In the long term:

- continuing development of transport infrastructure to ensure a more sustainable balance between road, rail, public and private transport;
- the promotion of appropriate land use options.

DPE, 1999

availability, are still at the research and development stage with a large emphasis on potential application in the commercial fleet (DPE, 1999). CNG and LPG fuelled buses are undergoing trial demonstration in Dublin. A Study Group has been formed to investigate the issue of alternative fuels in the public transport bus fleet.

The National Roads Authority has carried out a National Road Needs Study (1999). The Study identified deficiencies and devised a summary of national road development needs (2000 – 2019) that would provide essential road infrastructural support for economic development and sustainable

employment. Given the emphasis in national development policy on development of the regions, transport demand in rural areas is likely to increase into the future.

Challenges Ahead

The Green Paper on Sustainable Energy, notes that measures need to be identified that improve efficiency and reduce emissions in the transport sector without restricting access and mobility in real terms. Measures likely to be successful in meeting this objective fall into two main categories as follows:

- technological developments in vehicle production leading to better energy efficiency and lower emissions in the national fleet;
- increasing the availability of alternatives to current vehicle usage trends through the development of public transport networks and travel demand management policies.

A series of European Directives (CEC, 1994; CEC, 1996a, 1996b) has been aimed at motor vehicles, in terms of reducing emissions, and Ireland complies with all EU vehicle emission control standards. The EU Auto Oil Programme has set more stringent fuel specifications to come into effect in 2000 and 2005. Also, voluntary agreements have been

reached between the European Commission and the European, Korean and Japanese automobile manufacturers to limit CO₂ emissions for new cars by 2008/2009, which will represent a significant reduction on 1995 new car emissions (Chapter 14). However, these measures are not expected to compensate for the increase in traffic growth and fundamental changes in transport management will be required if Ireland is to meet its commitments under the Kyoto agreement on Climate Change and international air quality limits.

The rapid increase in road traffic volume is environmentally unsustainable. A greater effort is necessary to provide alternative modes of transport, that car trips are discouraged and that both measures are applied simultaneously, particularly in urban and suburban areas. Demand management and integrated land use and transportation planning are required to achieve this goal. Recent guidelines (BSM, 1999; DELG, 1999a) favour the minimisation of the potential growth in transport through the planning system and aim at bringing benefits in terms of the economic use of existing infrastructure, sustainable commuting patterns and reduced need for investments in new infrastructure. However, much work remains to be done to counteract previous policies





which led to the proliferation of unsustainable, sprawling low density housing estates (Gribben, 1999).

A more advanced information technology based logistics and transport sector is advocated by Forfas because of the contribution of the sector to a competitive industrial structure. Modern information technology must be promoted for traffic management and intermodal integration (Forfas, 1999). As noted previously, the Government has stated that it will eco-audit individual operational programmes within the National Development Plan.

TOURISM

The National Development Plan notes that over the past 10 years visitor numbers to Ireland have doubled and foreign exchange earnings have tripled. An important factor has been the emergence of Dublin as a popular city breaks destination. The current spatial spread of tourism is a major problem. There is a recognition within the industry of significant untapped potential in many counties that to date is largely ignored by tourists, while it is generally accepted that the infrastructure of those counties that have been successful in attracting tourists is in need of investment to protect their product. As international tourism expenditure is

forecast to grow by close to 6 per cent per annum in real terms over the next decade, further considerable growth in market share by Ireland is achievable. Helping the industry to achieve a wider seasonal and regional distribution of tourist business can contribute to sustainable development. The strategy to achieve these objectives includes the following:

- to market Ireland internationally on an all-Ireland basis as a tourism destination;
- international marketing of niche special interest products.

Such special interest products (including golf, cruising, angling, marine tourism, walking and gardens) are regarded as particularly important in developing a sustainable tourism industry.

Challenges Ahead

The main challenge for the tourism industry is to develop and promote a product that is environmentally sustainable within the context of a currently rapidly expanding sector. This will require ensuring that existing and new developments for tourist use incorporate adequate environmental protection measures. The maintenance of a clean environment will be one of the major

strengths of Ireland in a very competitive EU tourism market.

The Department of Arts, Heritage, Gaeltacht and the Islands is currently developing management plans for all the National Parks and managing tourism and recreation in these areas should form a fundamental part of the plans. Management plans are also being developed for conservation of designated sites (e.g., SACs and SPAs) and it is important that sustainable tourism management is incorporated into these plans where this is an issue. While tourism may adversely affect biodiversity and the environment in general, biodiversity and the environment are important assets for tourism. Eco-tourism (for example dolphin watching) is on the increase. Given the rapid increase in tourist numbers (Chapter 3) careful planning and management of tourism and recreation is required nationally so that environmental damage is prevented. In this context the publication and implementation of a National Coastal Zone Management Policy is particularly important.

TRADE

The Department of Enterprise Trade and Employment has noted that for Ireland, it is necessary to plan on the assumption that the trend towards global economic liberalisation will continue. In a scenario of global free movement of goods, services and investment and further limits on State intervention, competitiveness will become the vitally important ingredient to continued success in trade.

Even in a situation of global free trade, an expanded EU Single Market is likely to remain our main market. However, there could be changes in the composition of our trade with non-EU markets arising especially from the rapid economic development of major countries such as China and India. There is also likely to be a significant impact arising from the

process of globalisation of production and distribution and the rapid development of electronic commerce.

The ESRI (Duffy *et al.*, 1999) has noted that world trade growth slowed substantially in recent years, reflecting the decline in activity as a result of various crises, particularly the Asian crisis. As these regions recover world trade growth is expected to pick up to an annual average of 6.8 per cent in the first five years of the decade, with a further improvement to 7.2 per cent in the following five years. Exports have played a major role in fuelling much of the recent growth, with Irish products being extremely competitive on international markets throughout much of the 1990s. The growth in exports is forecast to be far less rapid over the next decade as the growth in the volume of industrial output slows down. The ESRI expect that the growth rate in exports will slow to an annual average rate of 6.2 per cent between 2000 and 2005 and 5.3 per cent per annum thereafter to 2010.

Challenges Ahead

International co-operation is particularly important in addressing transboundary and global environmental challenges beyond the control of any individual nation. Increasing international economic integration and growth reinforce the need for sound environmental policies at the national and international level. Possible measures suggested to increase trade sustainability include the removal of trade barriers on environment-friendly goods and services, for example, goods that reduce the costs of investing in clean production technologies and environmental management systems. In addition, subsidies that harm the environment, for example in areas such as energy, agriculture or fishing, should be reduced or removed (WTO, 1999).

However, there are concerns that a general increase in trade liberalisation

may adversely impact on the environment and society, particularly of developing economies, as evidenced by protests at the controversial World Trade Organisation (WTO) negotiations in Seattle, in 1999. While liberalising trade may have certain economic benefits, it is important that Multilateral Environmental Agreements are recognised and respected and that sound national environmental protection measures - including, for example, restrictions on trade to protect endangered wildlife, and eco-labelling schemes that promote environmentally friendly products - are accepted by all.

THE MAJOR ENVIRONMENTAL CHALLENGES - OUTLOOK

The main issues relating to Ireland's environment at the turn of the millennium have been outlined in Chapter 13, and the present responses to them in economic terms and in respect of management and control have been set out respectively in Chapters 14 and 15. In this chapter, projections on the future prospects for the economy as a whole and for the individual strategic sectors have been presented. The environmental challenges facing each sector have been outlined. Finally, a brief overview is presented of the future prospects for the challenges that have been identified.

Eutrophication of Inland Waters

The full implementation of the urban waste water treatment Directive will result in secondary treatment serving around 89 per cent of the overall EU population, and nutrient removal serving around 45 per cent. (Differing figures will apply in individual countries). As a consequence, nitrogen and phosphorus loading of European rivers and lakes is expected to decrease by about 20 and 30 per cent respectively between 1995 and 2010.

If measures are not taken simultaneously to reduce the diffuse inputs of phosphorus from agriculture, it is likely that eutrophication of rivers and lakes located in intensively farmed regions will remain a problem (EEA, 1999a).

In Ireland, eutrophication is probably our most serious environmental pollution problem (Chapter 13). This threat to our widespread game fish populations has resulted mainly from economic growth giving rise to increased use of phosphorus in various sectors. Around three-quarters of all inputs of phosphorus to inland waters are from agriculture. While there are some mitigating factors in the nature and timing of agricultural phosphorus emissions, they are nevertheless the major cause of increasing eutrophication.

The recent reduction in the sales of phosphorus fertilisers (Chapter 3) is an encouraging signal. However, nutrient management planning is necessary on a broad scale, and in some catchments there is likely to be a need for restriction on certain forms of intensive farming. At a time when agriculture as a sector is facing many challenges, preventing eutrophication is one further challenge that the sector must be encouraged and supported in addressing as a matter of urgency.

While urban and industrial inputs of phosphorus are much smaller, the nature and timing of them tend to counterbalance this to some extent. There is a strong case for the incorporation of phosphorus removal on all significant treatment plants discharging to inland waters (Chapter 13).

The further development of catchment monitoring and management systems, undertaken to date in the L. Derg/L. Ree catchment and ongoing for the catchments of L. Leane and the Boyne, Liffey and Suir (The Three Rivers Project), can provide the necessary detailed

information and methodologies to address the problem. It is evident that effective management across the many river catchments where eutrophication is an issue will require a significant co-operative effort by local authorities, the agriculture sector and all other players.

Much depends on how local authorities succeed in implementing the Phosphorus Regulations (Chapter 15). Local authorities have significant tools available to them to limit diffuse pollution including powers to adopt bye-laws controlling agricultural activity and powers to require nutrient management planning on farms. These powers will need to be applied more widely if the problem of eutrophication is to be tackled effectively.

The recent voluntary agreement between the Government and the Irish Detergents and Allied Products Association to effectively provide for the phasing-out of phosphate based domestic laundry detergent products is one further encouraging signal. However, the scale of the effort required, across all sectors, to overcome the challenge of eutrophication should not be underestimated.

Waste

Between 1990 and 1995, when economic growth was about 6.6 per cent at constant prices, reported waste generation within the EU increased by nearly 10 per cent. It has been concluded that most forms of waste will probably increase in Europe. It is predicted that by 2010 the generation of paper and cardboard, glass and plastic waste will increase by around 40 to 60 per cent compared with 1990 levels (EEA, 1999a).

Thus, the challenge of de-linking waste generation from economic growth is considerable. Waste prevention and minimisation are essential, with an emphasis on cleaner

production and reduced resource use in manufacturing (for example smaller, lighter products) and reduced waste. The materials used should be recycled or recyclable wherever possible. Improved information and labelling are needed to help bring about changes in attitudes and lifestyles that will ensure that such products will be favoured by consumers.

Projections for population growth, household sizes, sewage treatment and general economic growth in Ireland suggest a continued trend of increased volumes of waste. In recent local authority waste management plans, household waste has been projected to increase by between 1 and 3 per cent per annum in the short term, falling somewhat to between 0.5 and 2 per cent per annum from 2005 onwards. These plans and the proposed National Hazardous Waste Management Plan place strong emphasis on waste prevention and minimisation. They can only succeed if adequate staffing and resources are provided for their implementation. Waste prevention must be a priority in all control functions; for example, in the full use of all available planning controls on proposed developments (for example supermarkets) likely to give rise to large amounts of waste.

Currently Ireland has relatively low levels of materials recycling, no significant biological waste treatment capacity and no infrastructure for thermal treatment with energy recovery. Recovery rates for packaging waste in 1998 remained well short of the targets for 2001 and 2005, and much better progress is needed. Considerable development of centralised composting for organic waste is strongly recommended (Chapter 6). The recently established Task Force on recycling of construction and demolition waste (DELG, 1999a) is an important initiative for one of the largest waste categories.

Across Europe, landfilling is expected to decrease and recycling and incineration with energy recovery are likely to increase over the coming decade. These trends are likely to be repeated in Ireland. It is essential that the necessary investment is made in an appropriate waste management infrastructure, with the highest operating standards.

The ubiquitous problem of litter must be tackled through education, penalties and their enforcement. Its adverse impact on tourism is frequently quoted, but it must also come to be considered entirely socially unacceptable in a country at Ireland's present level of development.



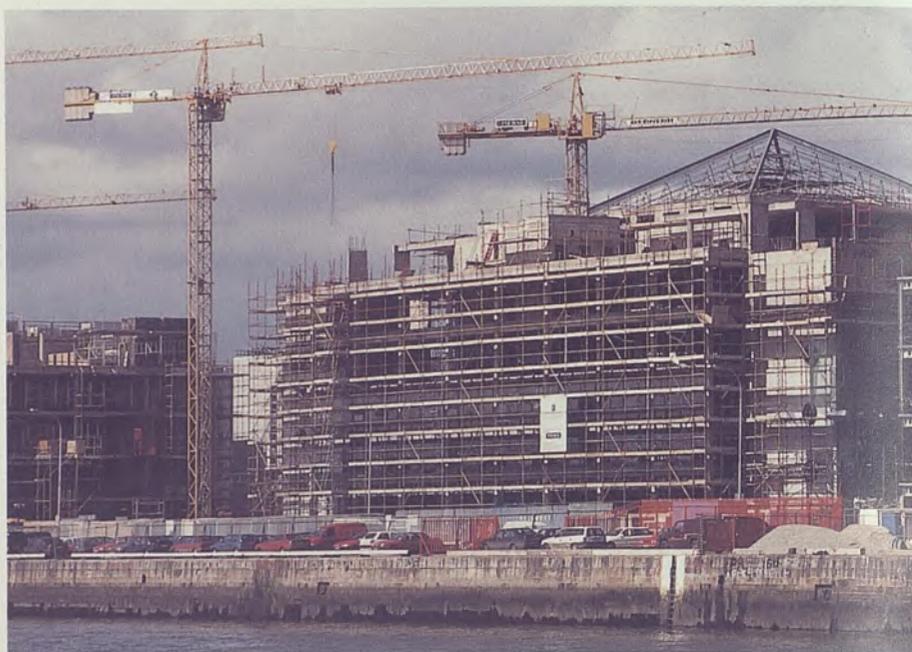
Further and more radical measures will be needed to tackle the problems of waste and litter. Deficiencies in the waste management infrastructure need to be remedied in a co-ordinated manner. A heightened sense of civic responsibility must be developed in order to minimise both waste and litter.

The Urban Environment and Transport

In Europe as a whole urban air quality is expected to continue improving up to 2010. The number of city inhabitants exposed to concentrations above the recommended levels is expected to fall by 50 per cent between 1990 and 2010. In 2010 the most significant exceedances are expected to be fine particles (PM₁₀), ozone, NO_x and benzo(a)pyrene, while substantial improvements can be expected across Europe for benzene and SO₂ (EEA, 1999a).

Road traffic is the greatest threat to urban air quality in Ireland, with NO_x and particulate matter being the major problem pollutants. New standards adopted under the air framework Directive will be challenging with regard to these pollutants, particularly in heavily trafficked areas.

As noted earlier, increases of population in Dublin and other Irish cities are expected to continue. Projections of future vehicle ownership in Ireland (see above) are also for a continuing increase. There is a need to evaluate all aspects of how these increases may impact on the urban environment and to actively develop demand management strategies to restrict vehicle use and to encourage more sustainable commuting patterns. A comprehensive and environmentally friendly public transport system is the most urgent need. Infrastructure to divert heavy vehicles away from city and town centres is also essential. The Dublin Transportation Initiative



(DTI) strategy is currently considerably behind initial targets but this initiative and additional measures (Chapter 15) should eventually help to alleviate traffic congestion when completed. More sophisticated traffic management and control systems will need to be utilised fully in terms of their potential environmental benefits. Some encouraging signals towards easing pressures on the urban environment include suburban office parks and prospects for telework.

It is a matter of some concern that most Irish cities are significantly larger in surface area than European cities of similar population (Gribbin, 1999). Such 'suburbanisation' of our cities leads to increased reliance on the private car and results in associated problems with air quality, noise and congestion. The application of recent planning guidelines will be important in this regard (BSM, 1999; DELG, 1999b). Well-planned measures to increase the density of residential developments and encouraging the use of derelict sites can help to prevent further extensive urban sprawl and associated transport problems. Higher residential densities will increase the importance of preserving and enhancing the urban environment including existing

green space. As note above, education and enforcement must be redoubled to deal with the problem of urban litter.

Finally, it is clear that continuing failure to deal with this challenge has consequences that are as much socio-economic as environmental.

Climate Change and Greenhouse Gases

Despite concerted international efforts to stabilise greenhouse gas emissions at 1990 levels, such emissions are projected to increase in the EU by 6 per cent from 1990 to 2010. For the period 1990 to 2050, atmospheric concentrations of CO₂, CH₄ and N₂O could increase respectively by as much as 45, 80 and 20 per cent. Temperatures are forecast to rise by 1 to 2 degrees C for the Northern Hemisphere by 2050. The rate of sea level rise is predicted to accelerate, amounting to an increase of about 15 - 20 cm by 2050 and 40 - 50 cm by 2100 (EEA, 1999a).

While initial temperature increases could give rise to some benign effects, there is evidence that in a relatively brief period, no more than a few decades, a larger change can happen, which would have serious

consequences in terms of extremes of temperature, flooding and storms - and the possibility that an alteration in the Gulf Stream would make Europe's climate much colder.

For Ireland, the projected increase in greenhouse gas emissions in a business as usual scenario of 30 per cent compared to our Kyoto target of 13 per cent (Chapter 4) underlines the scale of this challenge. If growth projections for the Irish economy are exceeded (as has happened in recent years) the magnitude of the challenge will further increase accordingly.

The Green Paper on Sustainable Energy outlines how the Government proposes to meet the State's future energy requirements in an environmentally and economically sustainable way (DPE, 1999). A draft National Greenhouse Gas Abatement Strategy has been prepared by the Department of the Environment and Local Government, and the strategy is due to be published shortly after the publication of the present report.

The key sectors in respect of carbon dioxide emissions are energy, transport, services, households and industry (Chapter 4). The greatest scope for abatement of emissions is likely to be in the energy sector. Reducing energy intensity and improving energy efficiency are clearly major issues.

Switching to less carbon-intensive fuels (peat being the most carbon intensive, followed by coal and oil) and particularly reducing Ireland's high level of dependence on fossil fuels will be important. In this regard, a concerted effort is likely to be needed to harness Ireland's renewable resources, such as wind energy and biomass. The largest projected percentage increase in greenhouse gas emissions, in a business as usual scenario, is for transport. Limiting future growth in transport demand (e.g., through integrated transport and land use planning) and reducing dependence on private road transport are major issues.

With emissions of the greenhouse gases methane and nitrous oxide making agriculture the largest single source of greenhouse gas emissions (Chapter 4), reducing stocking levels in the context of CAP reform and controlling the use of nitrogenous fertilisers are likely to be key considerations. The role of forestry, in its different forms, in the long-term as well as short-term sequestration of carbon will need to be established.

Overall, abating Ireland's greenhouse gas emissions will require a rapid and far-reaching mobilisation of effort and effective tracking of progress. It is likely to require restricting and discouraging (e.g., through greenhouse

gas emission taxes) certain forms of activity but this cannot succeed unless more acceptable alternatives are made available. In addition, consideration will need to be given to the role of mechanisms such as emissions trading. Innovative and well thought-out solutions will be needed, so that:

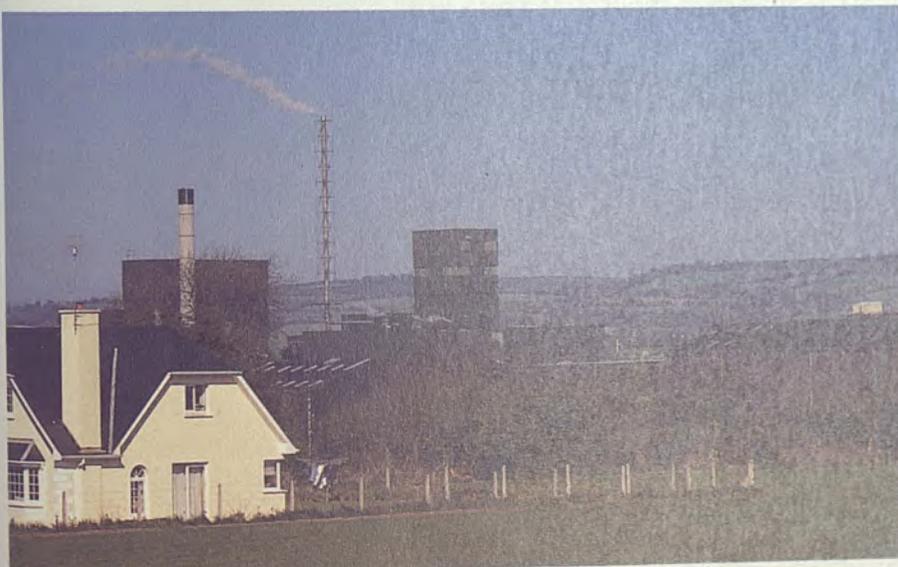
- there is an equitable sharing of the burden as far as possible;
- both long-term and short-term needs are taken into account;
- possibilities for synergies are fully explored and utilised, including benefits to the economy and opportunities for ameliorating other environmental problems;
- dealing with this environmental problem does not seriously affect the environment and natural resources in other ways.

The significance of this issue for Ireland's future is such that all major sectors of society and the economy are likely to have to play a significant role.

Protection of Natural Resources

Ireland's natural resources are coming under increasing pressure (Chapter 13). In some cases this is a direct result of technological developments that increase the capacity to exploit certain resources, while in other cases the issue is one of a steady rate of loss and damage owing to diverse factors.

Ireland's landscape has long been influenced by human activity, and is a blend of natural and cultural features (Chapter 11). Factors that can impact increasingly on the landscape in future years include increased housing in those areas convenient to towns and cities, and in areas generally attractive for tourism and recreation such as the coast (see below). With unprecedented levels of new housing proposed, landscapes in these areas are now at greater risk than ever from intrusive housing development. Accordingly, the conservation of landscapes must receive high priority. A pilot study of landscape character in Co. Clare,





initiated by the Heritage Council, is an example of the type of work needed to inform landscape conservation.

Other activities that pose a challenge in relation to maintaining landscape quality in Ireland include wind farms and the proposed expansion of forest cover from 9 to 17 per cent of the area of the country. These activities may have significant environmental benefits if undertaken appropriately. Careful planning is needed also on the future uses of cutaway bogs.

Over half the population of Ireland now lives within 10 km of the coast and this proportion looks set to rise. Satellite imagery shows that the proportion of the coastal zone covered by discontinuous urban fabric (including industrial and commercial units) has increased by over 25 per cent in 15 years. Coastal development can be an insidious problem, steadily eroding natural assets. Scenic coastal landscapes warrant particular attention to ensure the sensitive siting of buildings, roads, car parks, camping/caravan sites and commercial operations. Although much of Ireland's coastline is still relatively undisturbed, there is insufficient information on the

environmental implications of coastal development (Boelens *et al.*, 1999). The Government published a draft policy on coastal zone management in 1997 and details regarding its implementation are expected. Experience shows that rigorous planning and strict regulation are needed to ensure that the spatial scale of development is consistent with the ecological values to be protected.

The extent of Ireland's marine territory greatly exceeds the land area and the use of this resource must be sustainable. As elsewhere in the world's oceans, modern technology has hugely increased the pressure on fish stocks. By-catch must be minimised by using appropriate gear and practices. Developing the sea-fishing sector in a sustainable way is now a major challenge, aspects of which have been discussed earlier in this chapter. More effort needs to be directed towards the development of aquaculture in an environmentally friendly manner. New potential pressures may include the use of areas of the seabed as sources of aggregates for construction. Action in Ireland targeted specifically at the conservation of biodiversity in the marine environment is limited.

Overall, Ireland's natural heritage appears to be better resourced in some respects now than in the past (Chapter 12). Significant resources have been devoted to the protection of areas of importance in the national and European context and further resources will be needed. Little attention has been given, however, to sites of significance in a local context; these may be of small size and so at greater risk, and now require attention. While small individually, when taken together these sites constitute an important part of Ireland's natural heritage. The diverse threats to biodiversity deriving from the economic sectors and urban development are now giving rise to accelerating rates of loss. As noted in Chapter 12, it has been reported that coastal habitats have been damaged by a variety of causes (Fig. 16.4). The impact of overgrazing by sheep on upland areas has been discussed in earlier chapters. The increase in motorised recreational vehicles is an example of a new threat, increasing the potential for access and hence disturbance and damage to remote wilderness or semi-wilderness areas. Tourism now includes wilderness activities, which while raising awareness can also cause harm if not managed properly.

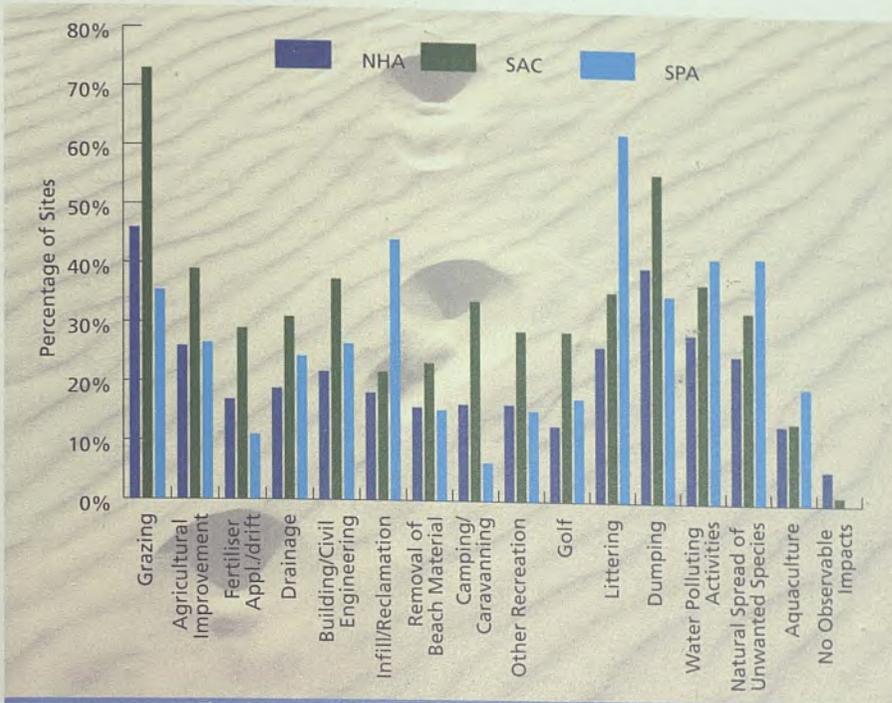


Fig. 16.4 Impacts on Coastal Habitats (Neff, in press)

Peatland soils in Ireland have been drastically affected by modern development including mechanised turf extraction schemes, commercial forestry, overgrazing, drainage and agricultural intensification. There is concern that many of these unique ecosystems may be lost in the near future unless such development is controlled effectively (Foss, 1998). Many important peatland areas in Ireland remain proposed NHAs, which currently affords them little protection against certain types of development. The Wildlife Amendment Bill currently before the Dail, aims at providing protection for

these areas. Given that Ireland's peatlands are of such international importance, it is imperative that remaining peatlands of ecological significance are conserved and managed appropriately.

Over the past five years the number of deliberate releases of genetically modified organisms (GMOs) into the environment within the European community has increased considerably, and much of this involves similar releases at different sites all across Europe. This underlines the need for improved information transfer and harmonised

inspection and enforcement among the European competent authorities dealing with this sensitive subject.

With increased economic resources deriving from economic growth, there is an opportunity now to take the necessary measures to halt the erosion of natural heritage and perhaps to regain some of what has been lost. For example, there is a plan to reintroduce golden eagles to Ireland at Glenveagh National Park in a five-year programme. Success will depend on a carefully managed introduction programme, especially consultations with farmers and effective control of poisons. The last eagles bred in north Mayo in 1912. If the re-introduction programme is a success, there is the prospect that after a century's absence, eagles will rear their young again on the remote cliffs and mountains of Ireland.

Overview of Sectors and Challenges

In Table 16.3 an attempt is made to summarise the way that the five key challenges outlined above apply to the strategic sectors discussed in this report. It is to be expected that all sectors will become more and more involved in integrating all aspects of the environment into their sectoral plans and decision-making. Nevertheless, it is clear that in some sectors, particular attention must be focused on certain issues.

Table 16.3 Key Environmental Challenges for Strategic Sectors

Sector	Control of Greenhouse Gases	Reducing Eutrophication	Preventing and Managing Waste	Protecting the Urban Environment	Protecting Natural Resources
Agriculture	■	■	■	-	■
Forestry	■	■	■	-	■
Marine Resources	-	■	■	-	■
Energy	■	-	■	■	■
Industry	■	■	■	■	■
Transport	■	-	■	■	■
Trade	■	-	■	■	■
Tourism	-	■	■	■	■

■ highest priority needed
 ■ high priority needed
 ■ priority needed
 ■ benefit to be realised

Table 16.4 Key Environmental Challenges for Public Authorities and Households

Sector	Control of Greenhouse Gases	Reducing Eutrophication	Preventing and Managing Waste	Protecting the Urban Environment	Protecting Natural Resources
Public authorities	■	■	■	■	■
Households	■	■	■	■	■

■ highest priority needed
 ■ high priority needed
 ■ priority needed

For the most part, these challenges apply also to the public authorities (including in particular local authorities) and to households and individuals, as indicated in Table 16.4.

IN CONCLUSION

Overall, Ireland's environment has been subject to fewer pressures than the environment of most of Europe and consequently is of a relatively high standard in most respects. However, many pressures on the environment, such as those from transport and energy growth, changed agricultural practices, urbanisation and, in particular, the general acceleration of economic development, are increasing in Ireland at higher rates than in most European countries. This means that 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. Furthermore, emissions, e.g., from agriculture and the growth in traffic, are occurring at levels that will make it extremely difficult to meet our international obligations. The magnitude of the environmental challenges that Ireland now faces should not be underestimated.

Improvements will be needed to meet existing and proposed more stringent standards set by the EU. The recent EU framework Directive on air quality and its 'daughter directives' are setting stricter requirements for air quality in future years. The proposed framework Directive on water will also set more demanding standards and will introduce a

comprehensive approach to monitoring and managing our water resources. Achieving the full implementation of both directives will not be easy but can lead to significant benefits for Ireland's environment.

Towards the end of the twentieth century, international acceptance of the concept of sustainable development represented a major step forward. Making this concept a reality will require many further shifts in thinking, attitudes and behaviours. It has been argued, for example, that there remains an underlining assumption that nature and mankind are two separate systems, man versus nature where one side always has to lose. Bringing mankind and nature back into alignment will require more than just improved environmental management systems leading to increased eco-efficiency. Quantity, in terms of materials and energy used and products purchased, is not the

only issue. Quality, in terms of the preferred use of renewable energy resources and safe and recyclable materials, has a particular role to play. People's natural need to consume can be quite compatible with the environment when it is used in this way (Datschefski, 2000).

Ireland's environmental challenges include, in particular, the five challenges discussed in this final part of the report. Meeting these challenges will require a broadly based approach including

- ensuring that the problems are fully understood through monitoring, research and assessment;
- ensuring that policies, incentives and actions across all sectors take environmental considerations fully into account; (businesses worldwide are becoming increasingly aware that a bad environmental record can be bad for business);
- developing infrastructure and services that meet development



needs and are consistent with environmental protection objectives; this will require better integration of physical planning and environmental protection.

Ireland's increased economic prosperity entails certain threats to the environment, as outlined above, but also opportunities. We now have a greater opportunity than ever to make the necessary public and private investment in all aspects of environmental protection.

The challenges will not be overcome, however, unless there is a sea change in attitudes to the environment in Ireland (see Chapter 2). Education on the environment is needed across a broad front and more co-operation is needed at different levels: national, sectoral, regional and local. Part of that investment, therefore, must be made towards obtaining and disseminating information on the environment.

Timely and relevant information is essential to understand environmental problems and to orient decision-making towards their solution. Such information must be widely disseminated and acted upon before it is too late to prevent processes becoming irreversible (EEA, 1999b).

Accordingly, this report and its proposed associated products (pocket book, posters, exhibition, website information and proposed video series) are intended not just to inform but also to inspire and guide action on protecting and conserving Ireland's environment and natural resources. The time has come for us all to take the environment into account and to act accordingly. It should be a factor in how we manage our homes, in how we travel, in our working lives and in our consumer choices. The difference between the new environmental challenges and many of those encountered previously is that the solution to overcoming them lies with many different key players and, for

most of the challenges, each person has a role to play.

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Acronyms & Abbreviations
and
Glossary

AER	Annual Environmental Report	DTO	Dublin Transportation Office
APE	Alkylphenol ethoxylate	DTSR	Department of Tourism, Sport and Recreation
BAT	Best Available Techniques	EA	Environment Agency, UK
BATNEEC	Best Available Technology not Entailing Excessive Costs	EAGS	Energy Audit Grant Support Scheme
BIM	Bord Iascaigh Mhara	EAGGF	European Agricultural Guidance and Guarantee Fund
BMW	Border, Midland and Western	EC	European Communities/Commission
BOD	Biochemical Oxygen Demand	ECU	European Currency Unit
Bq	Becquerel	EEA	European Environment Agency
CAP	Common Agricultural Policy	EEISS	Energy Efficiency Investment Support Scheme
CEC	Council/Commission of the European Communities	EIA	Environmental Impact Assessment
CFB	Central Fisheries Board	EIS	Environmental Impact Statement
CFC	Chlorofluorocarbon	EMAS	Eco-Management and Audit Scheme
CFP	1) Common Fisheries Policy 2) Control of Farmyard Pollution	EMEP	European Monitoring and Evaluation Programme
CH ₄	Methane	EMS	Environmental Management System
CHP	Combined heat and power	ENFO	Environmental Information Service
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora	EQO	Environmental Quality Objective
CLRTAP	Convention on Long-Range Transboundary Air Pollution	EQS	Environmental Quality Standard
CNG	Compressed Natural Gas	ERDF	European Regional Development Fund
CO	Carbon Monoxide	ERU	Environmental Research Unit
CO ₂	Carbon Dioxide	ESB	Electricity Supply Board
COP	Conference of the Parties	ESF	European Social Fund
CSF	Community Support Framework	ESRI	Economic and Social Research Institute
CSO	Central Statistics Office	EU	European Union
DAF	Department of Agriculture and Food	FCCC	Framework Convention on Climate Change
DAFF	Department of Agriculture, Food and Forestry	FIFG	Financial Instrument for Fisheries Guidance
DAFRD	Department of Agriculture, Food and Rural Development	FIPS	Forest Inventory and Planning System
DAHGI	Department of Arts, Heritage, Gaeltacht and the Islands	FRC	Fisheries Research Centre
DART	Dublin Area Rapid Transit	GE	Genetic Engineering
DDT	Dichlorodiphenyltrichloroethane	GIS	Geographic Information System
DELG	Department of the Environment and Local Government	GMM	Genetically Modified Micro-organism
DETE	Department of Enterprise, Trade and Employment	GMO	Genetically Modified Organism
DMNR	Department of Marine and Natural Resources	GNP	Gross National Product
DO	Dissolved Oxygen	GDP	Gross Domestic Product
DoE	Department of Environment	GWP	Global Warming Potential
DPE	Department of Public Enterprise	HCFC	Hydrochlorofluorocarbon
DTI	Dublin Transportation Initiative	HFC	Hydrofluorocarbon
		IBEC	Irish Business and Employers Confederation
		ICES	International Council for the Exploration of the Seas
		ICSTI	Irish Council for Science, Technology and Innovation

ICT	Information and Communication Technologies	PFC	Perfluorocarbon
IDA	Industrial Development Authority	PM _{2.5}	Particulate Matter measuring less than 2.5 microns in diameter
IFFPG	Irish Farm Film Producers Group	PM ₁₀	Particulate Matter measuring less than 10 microns in diameter
IMES	Irish Marine Emergency Service	POP	Persistent Organic Pollutant
IMO	International Maritime Organisation	ppb	parts per billion
IPC	Integrated Pollution Control	R&D	Research and Development
IPCC	1) Intergovernmental Panel on Climate Change 2) Irish Peatland Conservation Council	REPS	Rural Environment Protection Scheme
IPS	Informal Priority Setting	RPII	Radiological Protection Institute of Ireland
ISO	International Standards Organisation	RTDI	Research, Technological Development and Innovation
IUCC	Information Unit on Climate Change	S&E	Southern and Eastern
kW	kiloWatt	SAAO	Special Amenity Area Order
LIFE	Community Financial Instrument for Environment	SAC	Special Area of Conservation
LCP	Large Combustion Plant	SCI	Site of Community Importance
LPG	Liquid Petroleum Gas	SEA	Strategic Environmental Assessment
MARPOL	Marine Pollution Monitoring and Research Programme	SIL	International Society for Freshwater Research
mSv	milliSievert	SF ₆	Sulphur Hexafluoride
MW	MegaWatt	SO ₂	Sulphur Dioxide
N ₂ O	Nitrous Oxide	SPA	Special Protection Area
NAB	National Accreditation Board	TAC	Total Allowable Catch
NAPS	National Anti-Poverty Strategy	TAM	Tourism Angling Measure
NESC	National Economic and Social Council	TBT	Tributyltin
NGO	Non-governmental organisation	TDS	Tonnes Dried Solids
NH ₃	Ammonia	TOE	Tonnes of Oil Equivalent
NH ₄	Ammonium	TPER	Total Primary Energy Requirement
NHA	Natural Heritage Area	UN	United Nations
NO	Nitric Oxide	UNECE	United Nations Economic Commission for Europe
NO ₂	Nitrogen Dioxide	UNEP	United Nations Environment Programme
NO ₃	Nitrate	UNESCO	United Nations Educational, Scientific and Cultural Organisation
NO _x	Nitrogen Oxides	UV	Ultraviolet
O ₃	Ozone	VOC	Volatile Organic Compound
OECD	Organisation for Economic Co-operation and Development	VRT	Vehicle Registration Tax
OP	Operational Programme	WTO	World Trade Organisation
OPW	Office of Public Works	WWF	Worldwide Fund for Nature
OSPAR	Oslo and Paris Convention		
p.e.	population equivalent		
PAH	Polyaromatic Hydrocarbon		
PCB	Polychlorinated Biphenyl		
PER	Pollution Emissions Register		

Acidification

Continuing loss of capacity to neutralise acid inputs indicated by declining alkalinity and increasing hydrogen ion concentration (i.e., the decrease in pH of water or soil resulting from increases in acidic anion inputs such as sulphate).

Acid Sensitive

Surface water and soils that, due chiefly to their low calcium concentration, have little or no resistance to acid inputs.

Algae

Simple aquatic plants that may be attached or free floating (planktonic) and occur as single cells, colonies, branched and unbranched filaments.

Algal Bloom

Dense growth of planktonic algae or most commonly Cyanobacteria (blue-green bacteria formerly classified as algae) in nutrient enriched lakes causing discoloration of the water.

Algal Cysts

Thick walled resting algal cells.

Ammonia (NH₃)

A simple form of nitrogen primarily originating in waste discharges. It can be toxic to fish under certain circumstances and is a source of nitrogen for plants and algae.

Anthropogenic

Produced as a result of human activities.

AOT₄₀

The sum of the differences between hourly ozone concentration and 40 ppb for each hour when the concentration exceeds 40 ppb during a relevant growing season, e.g., for forests or crops.

Aquaculture

The breeding and rearing of freshwater or marine fish in captivity.

Aquifer

A rock unit that will yield water in a usable quantity to a well or spring. A geological formation through which water can percolate, sometimes very slowly for long distances.

Becquerel (Bq)

A standard unit of radioactivity of a substance that is decaying spontaneously at the rate of one radioactive disintegration per second.

Beneficial Use

A use of the environment, or some part of it, (e.g., for recreation, agriculture and water storage) that benefits a human population and should be protected.

Biochemical Oxygen Demand (BOD)

A simple measure of the oxygen consuming capacity of a

water sample resulting from the biochemical oxidation of organic matter in the water. BOD is normally measured by incubating a standard volume of water or waste water for five days at 20°C in the absence of sunlight and measuring the amount of oxygen consumed.

Biodegradation

The breakdown of substances by micro-organisms.

Biodiversity (Biological Diversity)

A word that describes all aspects of biological diversity but especially species richness, the complexity of ecosystems, and genetic variation.

Biogenetic Reserves

Network of protected areas with certain characteristic criteria, to guarantee the biological balance and to make the ecosystems available for biological research.

Biomass

The weight of biological matter. Standing crop is the amount of biomass (e.g., algae) in a waterbody.

Biosphere

That part of the land, sea, and atmosphere in which organisms live.

Biosphere Reserves

An area of land or coast that has been designated by IUCN and UNESCO as being of international importance for conservation and study.

Biota

The flora and fauna of an area.

Biotechnology (Bioengineering)

The employment of biochemical processes on an industrial scale, most notably recombinant DNA techniques, to reproduce drugs or (by means of fermentation) bulk foodstuffs for humans or livestock, sometimes by the recycling of wastes.

Biotope

A habitat which is uniform in its main climatic, soil and biotic (living or biological in origin) conditions.

Bivalve

Species consisting of two valves or shells, e.g., cockles and mussels.

Black Smoke

The fraction of total suspended particulates in air determined from the blackness measurement of the stain produced by passing the air through standard filter paper.

Blanket Bog

An area, often very extensive, of acid peatland, found in constantly wet climates, characteristic of broad flat upland areas, which develops where drainage is impeded and the soil is acid.

Brackish Water

Water which contains 0.5 - 30 parts per thousand of salinity.

Bryophyte

A non-woody plant of small size that reproduces by spores, e.g., mosses and liverworts.

Carbon Dioxide (CO₂)

A colourless, odourless, incombustible gas present in the atmosphere.

Catchment Area

The area from which a major river system or lake derives its water (i.e., the area drained by a river system).

CFCs (Chlorofluorocarbons)

A range of compounds of chlorine, fluorine and carbon implicated mainly in the destruction of stratospheric ozone but also in enhancing the greenhouse effect.

Chlorophyll

The green pigment found in algae and higher plants which is involved in photosynthesis.

Cutaway Bog

The peatland area left after peat extraction.

DDT (Dichlorodiphenyltrichloroethane)

A persistent organochlorine insecticide which was introduced in the 1940s.

Decibel (dB)

The unit of measurement of sound intensity.

Demersal

Describes organisms that inhabit the region of the bed of the sea.

Denitrification

The breakdown of nitrates by bacteria resulting in the release of free nitrogen.

Deoxygenation

The reduction of dissolved oxygen in water.

Desmids

Microscopic single-celled green algae, which occur in a wide variety of freshwater habitats typically in neutral or acid waters.

Dioxins

A collective name given to a group of 75 closely related chemical compounds known as polychlorinated dibenzodioxins (PCDDs). Dioxins can form during combustion of organic materials containing chlorine and as undesirable by-products during chemical manufacture and bleaching operations.

Dissolved Oxygen (DO)

A measure of the concentration of oxygen in a liquid, such as water or waste water, usually expressed in mg/l or per cent saturation.

DPSIR Framework

A conceptual system for the organisation of environmental information, including indicators, into Driving Forces, Pressures, State, Impact and Responses, for the purposes of integrated assessment.

Drumlin

A low hill of glacial boulder clay, considered to have been fashioned beneath an ice-sheet.

Ecology

The study of the relationships among organisms and between those organisms and their non-living environment.

Ecosystem

A community of interdependent organisms together with the environment they inhabit and with which they interact, and which is distinct from adjacent communities and environments.

Effluent

Liquid wastes.

Emission Limit Values (ELVs)

Legally enforceable limits on the physical, chemical or biological characteristics of a point source of emission to water or air, normally expressed as a maximum permissible concentration of a specified substance.

Endocrine Disrupters

Chemicals that disturb the endocrine system and the organs that respond to hormonal signals.

Environmental Medium

Major compartment of the environment, e.g., air, water and soil.

Environmental Quality Objectives (EQOs)

Descriptions of the intended use of an environmental medium; the use to which the medium is to be put defines the quality required to be maintained.

Environmental Quality Standards (EQSs)

The concentrations of specific parameters in an environmental medium required to achieve or sustain a particular EQO.

Esker

A long, sinuous ridge of sand and gravel, formed by a sub-glacial stream but which, after the melting of the ice-sheet, was left unrelated to the surrounding topography.

Eutrophic

Greek for well nourished. Applied to waterbodies with high nutrient concentrations leading to large algal standing crops.

Eutrophication

The changes associated with enrichment of a waterbody with inorganic plant nutrients particularly nitrogen and phosphorus.

Evapotranspiration

The loss of water from the earth's surface as a result of the combined effects of evaporation directly and transpiration, which is the loss of water from the pores in the leaves of plants.

Exotic Organism

A species found in a region to which it is not native.

Fauna

Animals

Fen

An area of waterlogged peat which, unlike bog, is alkaline or only slightly acid.

Fertiliser

Any substance that is applied to land as a source of nutrients for plant growth.

Flora

Plants

Furans

Derivatives of furan, a heterocyclic compound of chemical formula C_4H_4O comprising a ring of four carbon and one oxygen atom, with a hydrogen atom attached to each carbon atom.

Geographical Information System (GIS)

A set of integrated techniques for storing, retrieving, transforming and displaying spatially referenced thematic data in map form.

Geomorphology

The study of the form and development of the Earth, and especially of its surface and physical features, and of the relationship between these features and the geological structures beneath.

Genetically Modified Organisms (GMOs)

Bacteria, viruses, fungi, plant and animal cells, plants and animals capable of replication or of transferring genetic material in which the genetic material has been altered in a way that does not occur naturally by mating and/or by natural recombination.

Green Accounting

Accounting methods which take into consideration positive or negative impacts on the environment and natural resources.

Greenhouse Effect

Warming of the atmosphere due to the reduction in outgoing solar radiation; resulting from concentrations of gases such as CO_2 .

Groundwater

Water that occupies pores and crevices in rock and soil, below the surface and above a layer of impermeable material (see aquifer).

Growth Limiting Nutrient

Essential element of a food chain, supplies of which are readily exhausted, thus a factor which controls the growth of organisms.

Habitat

The dwelling place of a species or community, providing a particular set of environmental conditions (e.g., forest floor, sea shore).

HCH (Hexachlorocyclohexane)

An organochlorine insecticide used to control insect soil pests, aphids, mites.

Heathland

Any tract of land which is typically the habitat of many of the ericaceous (woody) shrubs.

Heavy Metal

A metal with a high relative density.

Herbicide

A chemical which is used to kill weeds.

HCFCs (Hydrochlorofluorocarbons)

Compounds which have been substituted for CFCs as the latter become phased out by international agreement.

HFCs (Hydrofluorocarbons)

See HCFCs

Integrated Pollution Control (IPC)

A system of licensing which covers all emissions to air, water and land, including noise and is intended to minimise the impact on the environment by taking account of pollution that may be transferred from one environmental medium to another.

Invertebrates

Animals which do not possess a backbone.

Leaching

The removal of the soluble constituents of a rock, soil or ore (that which is leached being known as the leachate) by the action of percolating waters.

Lichen

A 'plant' without stem or leaves, usually greyish in colour, growing, for example, on rocks or tree bark, and formed by an association between a fungus and algae.

Littoral

The area between the low and high spring tide levels (marine) or the shoreline (lakes).

Machair

Herb-rich calcareous (i.e., containing calcium carbonate) grassland which grows on shell sand.

Maërl

Calcareous red algae.

Macrophytes

Rooted and floating aquatic plants.

Methane (CH₄)

The simplest hydrocarbon and an important greenhouse gas. It is a product of anaerobic decomposition.

Mollusc

A member of the Mollusca, a large division of the animal kingdom, including snails, oysters and octopuses.

Natura 2000

A coherent European ecological network of sites comprising SACs designated under the habitats Directive and SPAs designated under the birds Directive.

Natural Pollutant

A substance of natural origin that may be regarded as a pollutant when present in excess (e.g. volcanic dust, particles of sea salt, products of forest fires).

Nitrate (NO₃)

A salt of nitric acid (HNO₃).

Nitrogen Fixation

Any reaction as a result of which gaseous nitrogen forms a soluble compound that is available as a plant nutrient either directly or after it has engaged in further reactions.

Nitrogen Oxides (NO_x)

Usually includes the two pollutants nitric oxide (NO) and nitrogen dioxide (NO₂), produced by high temperature combustion and some natural processes. NO₂ is the most important form, which can contribute to adverse health effects, ozone formation and acid deposition.

Nutrient

Element or chemical essential for growth, e.g., phosphorus, nitrogen, silica, oxygen and carbon.

Organochlorine (Chlorinated Hydrocarbon)

An organic compound containing chlorine. Many organochlorines have biocidal properties and are used as the active ingredients for pesticides with a high persistence, which they derive from their chemical stability and low solubility in water.

Oxidation-Reduction

Chemical reaction involving the transfer of electrons from one chemical species to another. The species from which the electrons are lost is said to be 'oxidised' and the species to which the electrons are transferred is said to be 'reduced'. Compounds which undergo reduction readily, such as molecular oxygen, are called oxidising agents or oxidants.

Ozone (O₃)

A secondary pollutant in which the molecule of oxygen consists of three atoms rather than two.

Ozone Layer

A layer of the atmosphere, over 20 km above the Earth's surface, in which the concentration of ozone is higher than

it is elsewhere in the atmosphere owing to its accumulation through vertical air movements from a higher altitude, where it forms by the dissociation and reformation of oxygen molecules exposed to high frequency ultraviolet radiation.

PCBs (Polychlorinated Biphenyls)

A group of closely-related organochlorines the principal use of which has been as liquid insulators in high-voltage transformers.

Pelagic

Describes organisms which inhabit the open water of a sea or lake in contrast to the sea or lake bed.

Pesticide

A general term for any chemical agent which is used in order to kill unwanted plants ('weeds'), animal pests, or disease causing fungi.

pH

The measure of the acidity or alkalinity of a substance.

Phosphate (PO₄)

The commonly occurring form of phosphorus taken up by plants in the aquatic environment and essential for their growth.

Photochemical Smog

A characteristic, mainly of urban atmospheres, associated with the build up of primary pollutants and photochemical oxidants usually under slow moving, warm, high pressure systems.

Phycotoxin

A compound, toxic to humans and animals, produced by some phytoplankton groups, particularly dinoflagellates, and by cyanobacteria.

Phytoplankton

Microscopically small plants which float or swim weakly in fresh or salt water bodies.

Plankton

Organisms suspended in water by currents, the presence of air sacks or by their own swimming movements. Phytoplankton refers to microscopic plants, and zooplankton refers to microscopic animals.

PM₁₀

Particulate matter measuring less than 10 microns in diameter.

Pollution

The direct or indirect alteration of the physical, chemical, thermal, biological, or radioactive properties of any part of the environment in such a way as to create a hazard or potential hazard to the health, safety, or welfare of living species.

PVC (Polyvinylchloride)

One of the most common plastics, used in the manufacture of clothing, furniture, and containers.

Population Equivalent

The organic biodegradable waste load having a five day biochemical oxygen demand (BOD₅) of 60 grams of oxygen per day is defined as one population equivalent (i.e., the amount produced by one person) in the urban waste water treatment Directive.

Precipitation

The manner by which water and other matter in the atmosphere reach the earth's surface. Wet precipitation includes rainfall, snow, hail, mist and fog. Dry precipitation describes the deposition of gases, aerosols and particles not dissolved in atmospheric borne water.

Primary Pollutant

A pollutant which is emitted directly into air or water.

Radon

An element occurring naturally as a colourless, odourless, noble gas, chemically almost inert, which is the immediate breakdown product of radium-226.

Raised Bog

An area of ombrogenous (i.e., originating as a result of wet climates) acid peatland with a convex profile.

Renewable Resource

A resource that can be exploited without depletion because it is constantly replenished, e.g., solar radiation and wind.

Salmonid Waters

High quality waters suitable for the maintenance of viable self-sustaining populations of wild salmon and trout.

Secondary Pollutant

A pollutant created through interactions between primary pollutants and various other components.

Sewage

Liquid wastes from communities, conveyed in sewers. Sewage may be a mixture of domestic sewage effluents from residential areas and industrial liquid waste.

Sewage Sludge

Semi-solid and solid waste matter removed from sewage at sewage treatment plants.

Sewerage

A network of pipes and associated equipment for the collection and transportation of sewage.

Silage

A farm livestock feed made from mown grass or other suitable herbage, which is compressed and partly fermented anaerobically.

Sludge

The suspended matter removed from industrial effluent or sewage.

Slurry

The animal waste generated in animal housing units that

have slatted floors and in which there is no use made of bedding material.

Sulphate (SO₄)

A constituent of rain and acid aerosols produced by oxidation of SO₂, in the atmosphere.

Sulphur Dioxide (SO₂)

A colourless gas produced mainly by oxidising the sulphur in fossil fuels through combustion.

Sustainable Development

Defined by the Brundtland Commission (1987) as 'development that meets the needs of the present without compromising the ability of the future generations to meet their own needs'.

Tailings

Those portions of washed ore that are considered too poor to be treated further.

Trace Element

An element which is necessary in extremely small amounts for the proper functioning of metabolism in plants or animals.

Trophic State

The extent of enrichment of a waterbody as assessed by the nutrient concentrations, amount of planktonic algae and macrophytes, water transparency and oxygen levels. The trophic categories oligotrophic, mesotrophic, eutrophic and hypertrophic are used to describe waters varying from un-enriched to highly enriched.

Turlough

A temporary shallow lake in limestone country which fills and empties through cracks, in response to the local water table.

Volatile Organic Compounds (VOC)

Organic compounds which evaporate readily and contribute to air pollution mainly through the production of secondary pollutants such as ozone.

Waste Arisings

A measure of the amount of waste generated by a specified sector or activity.

Wetland

An area covered permanently, occasionally, or periodically by fresh or salt water (e.g., flooded pasture land, marshland, inland lakes, rivers and their estuaries); also includes bogs.

Wildfowl Sanctuaries

Areas of importance for bird life where the shooting of traditional game bird species is prohibited under the Wildlife Act 1976.

98-percentile Value

The value of a ranked distribution above (or below) which 98 per cent of values in the distribution lie, depending on application.

Reader Comment Form

Note: comments to be forwarded to: *Ireland's Environment - A Millennium Report*, Environmental Monitoring and Laboratory Services, Environmental Protection Agency, PO Box 3000, Johnstown Castle Estate, Co. Wexford, or by email to irenv2000@epa.ie

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COMMENTS

AN GHNÍOMHAIREACTH UM CHAOMHNÚ COMHSHAOIL

Bunú

Achtaíodh an tAcht fán nGníomhaireacht um Chaomhnú Comhshaoil ar an 23ú lá d'Aibreán, 1992 agus faoin reachtaíocht seo bunaíodh an Gníomhaireacht go hoifigiúil ar an 26ú lá d'Iúil, 1993.

Cúraimí

Tá réimse leathan de dhualgais reachtúla ar an nGníomhaireacht agus de chumhachtaí reachtúla aici faoin Acht. Tá na nithe seo a leanas san áireamh i bpríomhfhreagrachtaí na Gníomhaireachta:

- ceadúnú agus rialáil próiseas mór/ilchasta tionsclaíoch agus próiseas eile a d'fhéadfadh a bheith an-truailletheach, ar bhonn rialú comhtháite ar thruailliú (Integrated Pollution Control-IPC) agus cur chun feidhme na dteicneolaíochtaí is fearr atá ar fáil chun na críche sin;
- faireachán a dhéanamh ar cháilíocht comhshaoil, lena n-áirítear bunachair sonraí a chur ar bun a mbeidh rochtain ag an bpobal orthu, agus foilsíú tuarascálacha treimhsiúla ar staid an chomhshaoil;
- comhairle a chur ar údarás phoiblí maidir le feidhmeanna comhshaoil agus cuidiú le húdarás áitiúla a bhfeidhmeannas caomhnaithe a chomhlíonadh;
- cleachtais atá fóna ó thaobh an chomhshaoil de a chur chun cinn, mar shampla, trí úsáid iniúchtaí comhshaoil a spreagadh, cuspóirí cáilíochta comhshaoil a leagan síos agus cóid chleachtais a eisiúint maidir le nithe a théann i bhfeidhm ar an gcomhshaoil;
- taighde comhshaoil a chur chun cinn agus a chomhordú;
- gach gníomhaíocht thábhachtach diúscartha agus aisghabhála dramhaíola, lena n-áirítear líontaí talún, a cheadúnú agus a rialáil agus plean náisiúnta bainistíochta um dhramháil ghuaiseach, a bheidh le cur i ngníomh ag comhlachtaí eile, a ullmhú agus a thabhairt cothrom le dáta go treimhsiúil;
- córas a fheidhmiú a chuirfidh ar ár gcumas astúcháin COS (Comhdhúiligh Orgánacha Shoghlaithe) a rialú de bharr cáinníochtaí suntasacha peitiril a bheith á stóráil i dteirminéil;
- na rialúcháin OMG (Orgánaigh a Mionathraíodh go Géiniteach) a fheidhmiú agus a ghníomhú maidir le húseaid shrianta a leithéad seo d'orgánaigh agus iad a scaoileadh d'aon turas isteach sa timpeallacht;

- clár hidriméadach náisiúnta a ullmhú agus a chur i ngníomh chun faisnéis maidir le leibhéil, toirteanna agus sruthanna uisce in aibhneacha, i lochanna agus i screamhuiscé a bhailiú, a anailisiú agus a fhoilsiú; agus
- maoirseacht i gcoitinne a dhéanamh ar chomhlíonadh a bhfeidhmeanna reachtúla caomhnaithe comhshaoil ag údarás áitiúla.

Stádas

Is eagrais poiblí neamhspleách í an Gníomhaireacht. Is í an Roinn Comhshaoil agus Rialtais Áitiúil an coimirceoir rialtais atá aici. Cinntítear a neamhspleáchas trí na modhanna a úsáidtear chun an tArd-Stiúrthóir agus na Stiúrthóirí a roghnú, agus trí an tsaoirse a dhearbhaíonn an reachtaíocht di gníomhú ar a conlán féin. Tá freagracht dhíreach faoin reachtaíocht aici as réimse leathan feidhmeannas agus cuireann sé seo taca breise lena neamhspleáchas. Faoin reachtaíocht, is coir é iarracht a dhéanamh dul i gcion go míchuí ar an nGníomhaireacht nó ar aon duine atá ag gníomhú thar a ceann.

Eagrú

Tá ceanncheathrú na Gníomhaireachta lonnaithe i Loch Garman agus tá cúig fhoireann chigireachta aici, atá lonnaithe i mBaile Átha Cliath, Corcaigh, Cill Chainnigh, Caisleán an Bharraigh agus Muineachán.

Bainistíocht

Riarann Bord Feidhmiúcháin lánaimseartha an Gníomhaireacht. Tá Ard-Stiúrthóir agus ceathrar Stiúrthóirí ar an mBord. Ceapann an Rialtas an Bord Feidhmiúcháin de réir mionrialacha atá leagtha síos san Acht.

Coiste Comhairleach

Tugann Coiste Comhairleach ar a bhfuil dáréag ball cunamh don Gníomhaireacht. Ceapann an tAire Comhshaoil agus Rialtais Áitiúil na baill agus roghnaítear iad, den chuid is mó, ó dhaoine a ainmníonn eagraíochtaí a bhfuil suim acu i gcúrsaí comhshaoil nó forbartha. Tá réimse fairsing feidhmeannas comhairleach ag an gCoiste faoin Acht, i leith na Gníomhaireachta agus i leith an Aire araon.

Ireland's Environment

Ireland's economic boom has brought dramatic increases in consumer spending, house building, traffic volumes and energy use. There are growing concerns about how all of this is affecting the environment. Does Ireland still merit the 'green image' of having clean air, pure waters and an unspoilt countryside? Are habitats, flora and fauna being destroyed? As Ireland becomes richer, must its environmental quality become poorer?

This report brings together and assesses the available information on the state of Ireland's environment. It examines how we affect it and the steps that we can take, as a society and as individuals, to protect and where necessary enhance the environment - to the benefit of our quality of life and that of future generations.



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