

Appendix I

Some Economic, Social and Environmental Trends

Strategic Framework

Economy

- 1 General Government Deficit and General Government Deficit as a Percentage of GDP
- 2 Consumer Price Index
- 3 General Government Debt as a Percentage of GDP
- 4 Trends in Gross Domestic Product (GDP) and Gross National Product (GNP)
- 5 Percentage change in GNP and GDP (Volume change)
- 6 Unemployment

Population and Housing

- 7 Population in Ireland
- 8(1) Annual Infant Mortality Rate
- 8(2) Birth Rate
- 9 Life Expectancy
- 10 Population Living in Towns of 1,500 or Greater
- 11 Housing Completions
- 12(1) Housing Stock (Dwellings)
- 12(2) Dwellings per 1,000 Population

Strategic Sectors

Agriculture

- 13 Land Cover in Ireland (excluding Northern Ireland)
- 14(1) Gross Agricultural Output
- 14(2) Commodity Value as a Percentage of Gross Agricultural Output, 1995
- 15 Livestock Numbers
- 16 Trend in P fertiliser use and soil P availability
- 17 Consumption of nitrogenous fertilisers

Forestry

- 18 Afforestation
- 19 Broadleaves and Conifers in EU National Forest Estates
- 20 Broadleaf Afforestation
- 21 Timber Production

Marine Resources

- 22 Bathing Water Quality Monitoring Results for Sea Water Bathing Areas
- 23 Total Allowable Catch
- 24 Growth in Aquaculture Production

Energy

- 25 Energy Demand and Economic Growth (GDP)
- 26(1) Energy Consumption
- 26(2) Energy Intensity
- 27 Fuel Mix in Total Primary Energy Requirement
- 28 Total Final Energy Consumption by Sector

Transport

- 29 Vehicle Numbers
- 30 Heavy Goods Vehicles
- 31 Ratio of Road Travel to Population
- 32 Estimated Millions of Vehicle Kilometres of Travel in Ireland, 1995

Tourism

- 33(1) Overseas Tourist Numbers
- 33(2) Overseas Tourism Revenue
- 33(3) Overseas Tourists by origin
- 34 Employment Sustained by Tourism (full-time job equivalents)
- 35 Domestic Tourism Numbers

Supporting the Strategy

Environmental Quality

Water

- 36 River Water Quality (recent trends)
- 37 River Water Quality (long-term trends)
- 38(1) Lake Water Quality
- 38(2) Lake Water Quality (by surface area)
- 39 Bathing Water Quality Monitoring Results (Freshwater Bathing Areas)

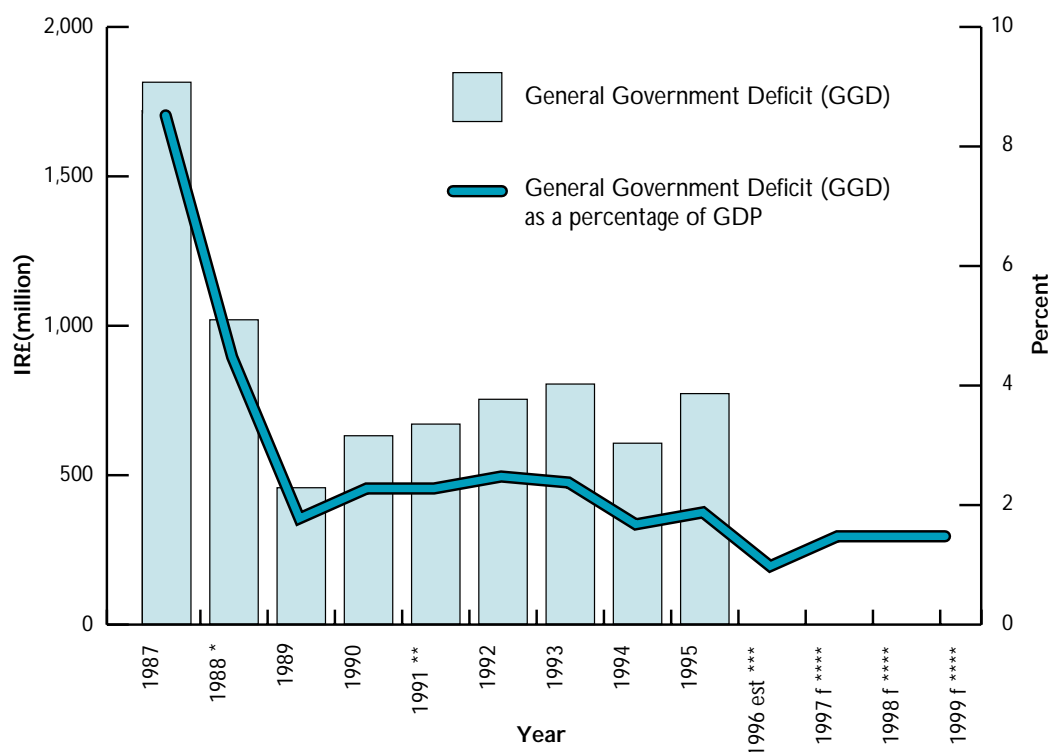
Waste Management

- 40(1) Household and Commercial Waste collected by, or on behalf of, Local Authorities (Landfilled)
- 40(2) Quantities and Composition of Waste in 1995
- 41 Recycling Rates for Materials Recovered from the Household and Commercial Waste Stream
- 42 Estimated Hazardous Industrial Waste Arisings

Air

- 43 CO₂ Emissions
- 44 SO₂ Emissions
- 45 NO_x Emissions
- 46 VOC Emissions
- 47 CO Emissions
- 48 Smoke Emissions

Table 1 **General Government Deficit and General Government Deficit as a Percentage of GDP**



* Exclusive of once-off tax amnesty receipts
 ** Excluding £270 million received from the floatation of Irish Life plc.
 *** Dept. of Finance estimate of GGD as a percentage of GDP is 1% for 1996.
 **** Budget forecasts

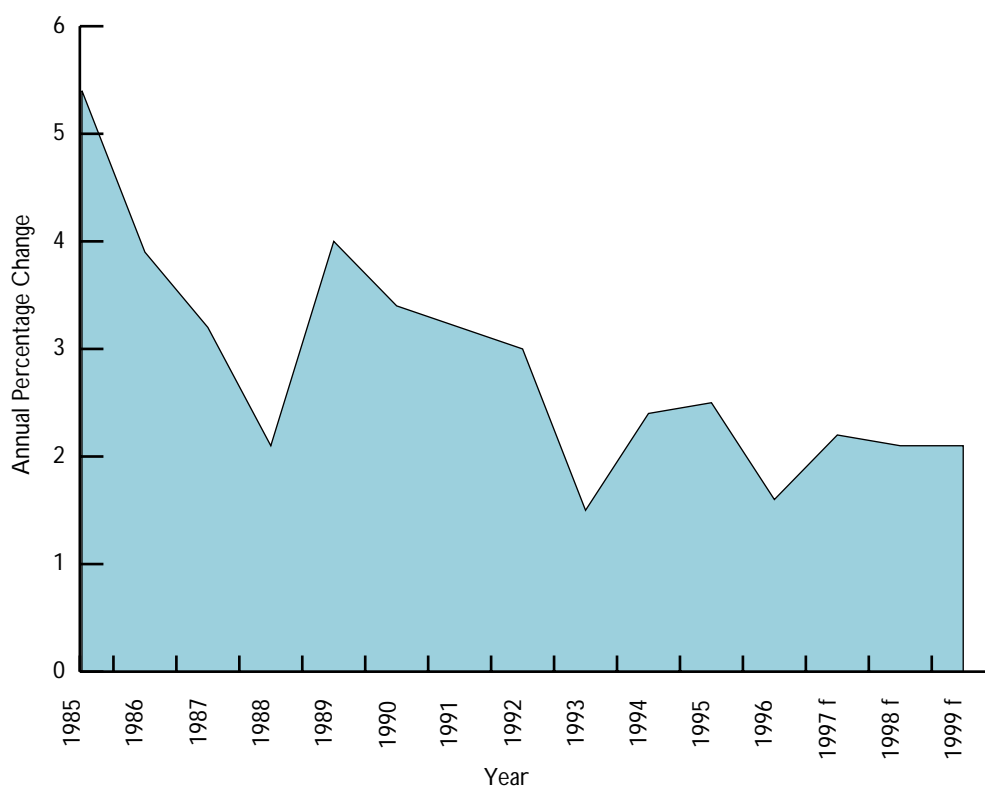
Source: Department of Finance, *Economic Background to the Budget, 1997*, p. 3.

The General Government Deficit (GGD) is a measure of the Government's annual borrowing and a measure of its fiscal policy.

Maintaining the GGD at a level at or below 3% of GDP is one of the Maastricht Treaty criteria for participation in Economic and Monetary Union. Strong growth rates, low inflation and buoyant tax revenues in recent years have ensured that Ireland's fiscal position meets this criterion. With the 1996 GGD outturn estimated at 1.0% of GDP, this was the eighth consecutive year in which Ireland satisfied the 3% reference value. A GGD of 1.0% in 1996 compares with 8.6% in 1987. The Exchequer Borrowing Requirement (EBR) in 1996 was £437 million or 1.2% of GNP - £292 million below the £729 million targeted in

the 1996 Budget. Fiscal stability over the long-term is Government policy. The 1997 Budget was designed to maintain fiscal discipline while facilitating the economy's potential for sustainable economic growth in the medium and long term. GGD is forecast at 1.5% of GDP for each of the years 1997-1999. (These figures include a contingency provision to be included in government finances under the new Multi-Annual Budget process). A buoyant economy, including a resurgence in employment, is likely to yield total tax revenues ahead of Budgetary expectations and therefore should not pose a constraint on government policy.

Table 2 Consumer Price Index



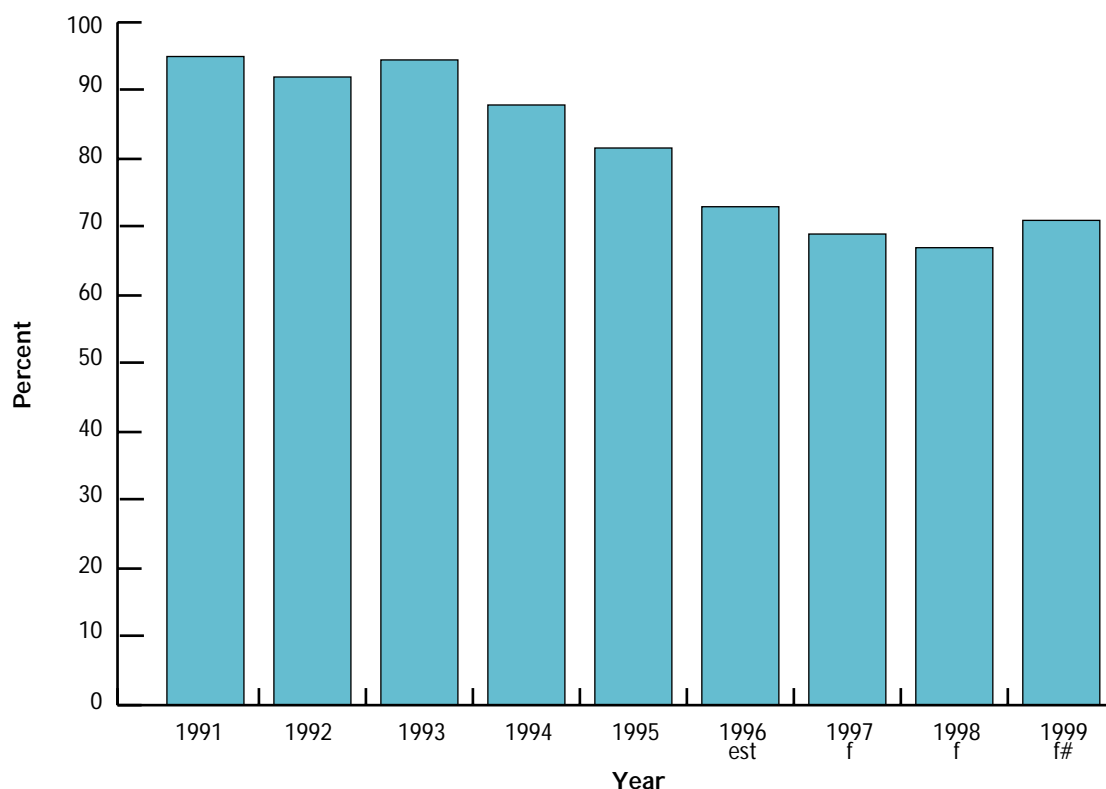
Sources: CSO Statistical Releases and *Economic Background to the Budget, 1997*, p. 4.

Irish inflation averaged 1.6% for 1996, down from 2.4% in the previous year. Measured by EU Interim Index of Consumer Prices (IICP), inflation averaged 2.2% last year, compared with 2.5% in 1995. The annual percentage change in the Consumer Price Index for the year to January rose by 0.9%, with the percentage change for the period November 1996 to January 1997 showing a drop of 0.5%.

Over the past decade, Ireland's inflation rate has remained at or below 4%. Inflation is relevant to sustainable growth as economies work most effectively when inflation is low and stable.

High inflation rates tend to distort economic decisions and the allocation of resources. A consistently low inflation rate indicates that the economy is on a sound sustainable growth path. Maintaining inflation below the 3% level is one of the Maastricht criteria for participation in Economic and Monetary Union. Inflation is likely to remain moderate over the coming years as inflationary pressures worldwide remain subdued. Low inflation will allow the economy to continue on a sustainable growth path over the coming years, facilitating sustainable development.

Table 3 General Government Debt as a Percentage of GDP



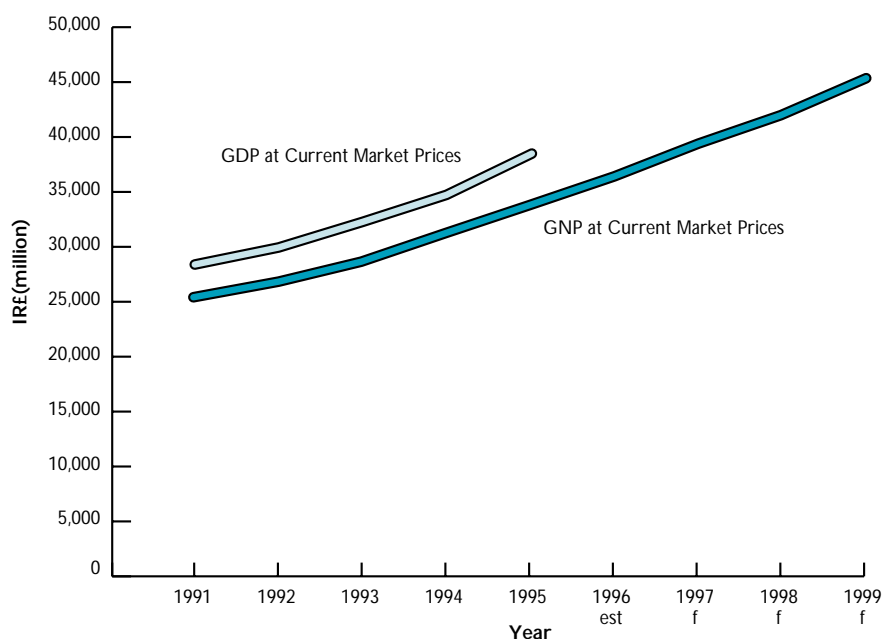
These percentages take account of new measurements of debt service, debt and GDP in 1999 for Maastricht definition purposes. The measurements have the effect of adding 0.4% to the General Government Deficit calculation in 1999. They also increase the General Government Debt measure by 7% of GDP in 1999.

Sources: National Treasury Management Agency, *Report and Accounts for the year ended 31 December, 1995*, p. 13, and Department of Finance, *Economic Background to the Budget, 1997*, p. 3.

The ratio between General Government Debt and national output has declined significantly over recent years. Apart from a temporary increase in the ratio in 1993 as a result of the currency crisis, the trend has been on a long-term downward path. 1996 saw a fall of almost £300 million in the national debt in absolute terms, reflecting the relative strength of the Irish pound. This was the first time a reduction had occurred in the nation-

al debt in almost forty years. The policy of keeping the Debt/GDP ratio on a downward path increases budgetary flexibility and is in keeping with key factors affecting future budgetary positions, in particular Economic and Monetary Union. The decline in the ratio is expected to continue in 1998 and 1999 on an underlying basis. The above table is based on definitions of Maastricht debt criteria and GDP.

Table 4 Trends in Gross Domestic Product (GDP) and Gross National Product (GNP)



Sources: CSO, *National Income and Expenditure 1995*, p. 3 and *Economic Background to the Budget, 1997*, p. 3.

The rate of growth of GDP/GNP is the main indicator of how fast the economy of a country is expanding. If growth is sustainable over time, the well-being and living standards of citizens will increase. However, the relationship between growth and sustainable development is complex. It is Government policy to promote economic growth, but not at any cost. Higher growth reflected in standard growth measures may be the result of increased investment in pollution control or may involve a depletion of natural resources. On the other hand, there is much activity to improve the environment which is not registered in the growth figures. The growth figures which have been published to date reflect monetised transactions and do not give a true picture of social well-being.

Traditional national income as set out in the national accounting framework does not take account of the depletion of natural resources or the impact on welfare of environmental damage which has not been repaired. The measure is also potentially overstated by expenditures by gov-

ernment and households which are made to remedy environmental damage caused by the production process. The weaknesses in traditional accounts have led to attempts to develop "satellite environmental accounts" to integrate environmental considerations into the traditional national accounts framework. Satellite environmental accounts are intended to qualify, in the long term, the standard information of traditional national accounts and to provide a better measure of total welfare. There are, however, substantial difficulties which need to be addressed in their production. Monetary valuation of environmental depletion and degradation, judgment on whether human-made capital can substitute for natural capital and methods for integrating defensive expenditure into the national accounts framework remain at an experimental stage. A EUROSTAT project towards a matrix for the integration of environmental accounts into the national accounts framework, to be carried out by the CSO, is commencing in 1997.

Table 5 Percentage change in GNP and GDP (Volume change)



Sources: CSO, *National Income and Expenditure Accounts, 1995* and *Economic Background to the Budget, 1997*, p. 3.

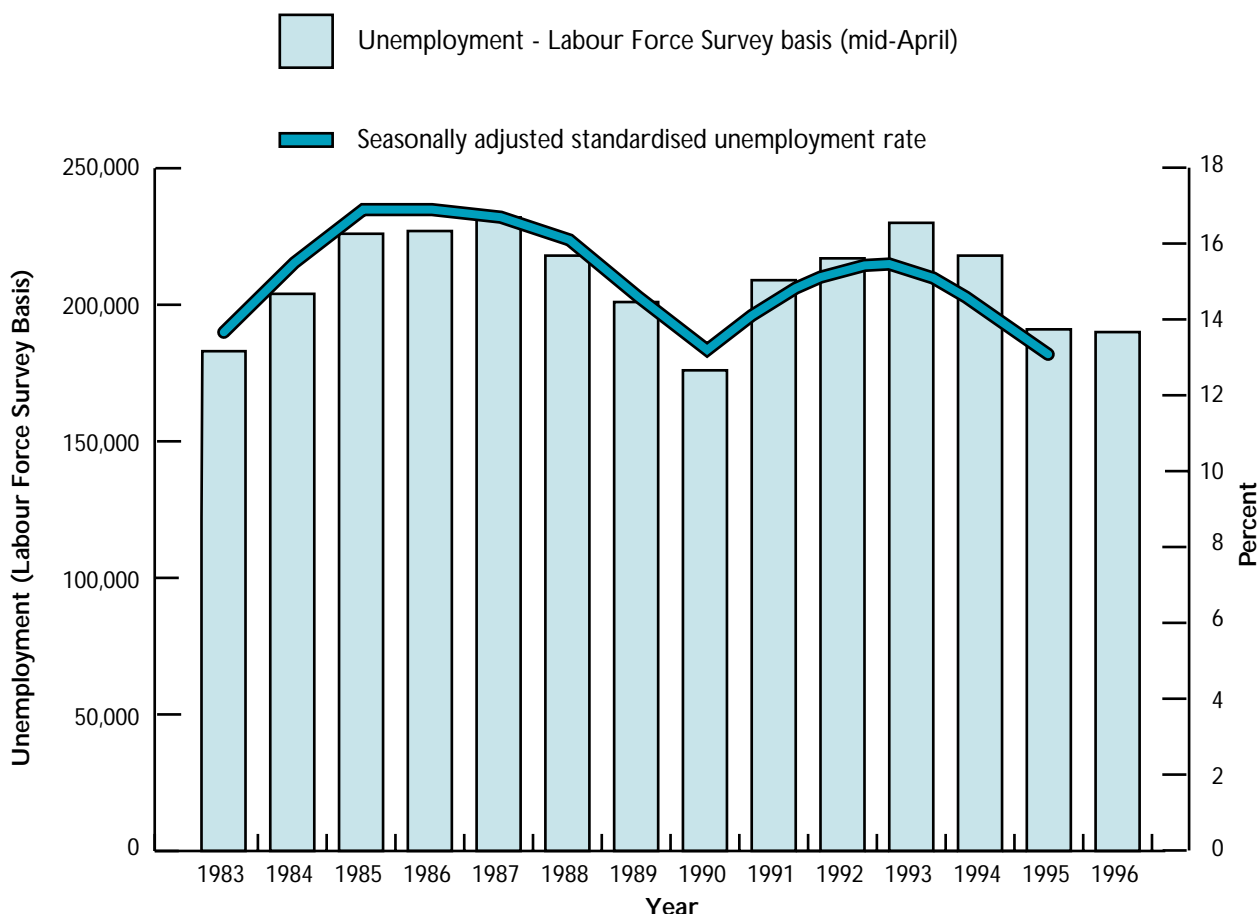
Strong economic growth continued in 1996. Gross Domestic Product increased by an estimated 7.25% with Gross National Product rising at an estimated 6.25%. The difference between the two measures of growth is net factor income from the rest of the world. Principal among outflows are profit repatriation by multi-national enterprises and repayment of interest on the foreign element of the national debt. Principal inflows are from European Union funding and direct investment by multi-national firms. Manufacturing output is estimated to have grown by approximately 9%, with significant production increases being recorded in the computer and pharmaceutical sectors.

Since the end of 1994, GNP has grown by over 15% with a very substantial expansion of domestic demand and exports. Ireland's GDP per head has risen from 76% of the EU average in 1991 to approximately 100% in 1996. GNP per head however, a more appropriate measure of economic well-being for Ireland, is still significantly below the EU average. Low interest rates and

inflation, combined with modest wage increases and tax concessions, have led to increased growth and hence increased real disposable incomes. More balanced international growth has also contributed to the improvement. Consumer expenditure has risen by more than 10%, a strong indication of improved living standards. The strong growth record has translated into a substantial increase in the number of people at work.

The pattern of low-inflationary growth is set to continue with GDP forecast to increase by about 6.5% in 1997. This would constitute a very strong performance by international standards with average growth in EU and OECD countries expected to be around 2.5%. GNP is forecast to grow by 5.5% in 1997, and 4.5% in both 1998 and 1999. As in 1996, the domestic economy is expected to make a greater contribution than the external sector to overall growth this year. Real disposable incomes are forecast to rise by 5% for the year.

Table 6 Unemployment



Sources: CSO, *Labour Force Survey, 1996*, p. 24 and CSO, *Statistical Bulletin*, Vol LXXI No. 4, pp. 765-766, 772-773.

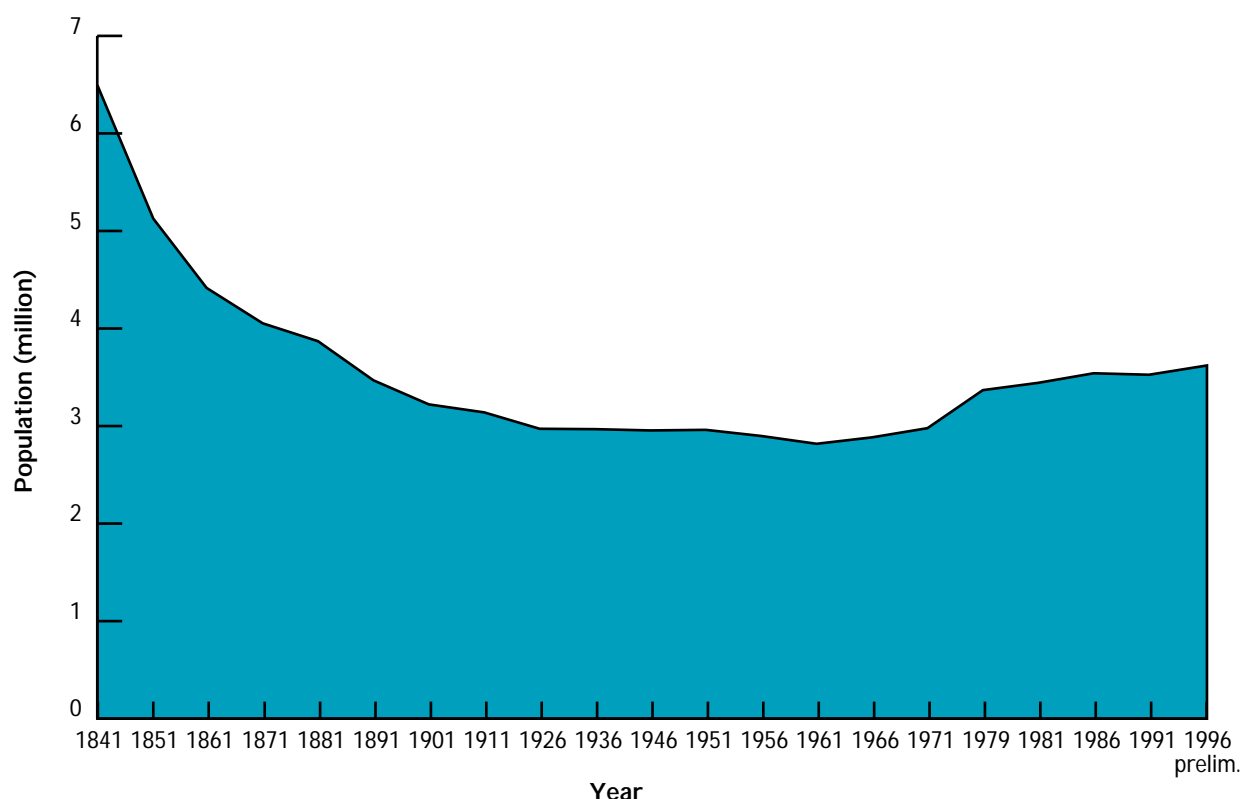
Exchange is the basis of all economic activity, which generates employment. The workforce in Ireland has increased from just over 1.3 million in 1988 to 1.475 million in 1996.

The results of the 1996 Labour Force Survey published in January 1997, show that employment increased by 46,000 between April 1995 and April 1996 to a figure of 1,285,000, the highest number of people at work in the history of the State. For 1996 as a whole, it is estimated that total employment grew by 50,000. Taken in conjunction with other macro-economic indicators, this, the third year of substantial growth in numbers at work, is a sign of the current strength of the Irish economy. Budgetary forecasts indicate

that total employment may rise by approximately 45,000 in 1997 and on average by 35,000 *per annum* over the years 1997-99. These increases will result from a continuation of the strong growth of recent years which has seen employment rise by over 100,000 since the end of 1994.

Unemployment, as measured on the Labour Force Survey basis, fell to 190,000 as at April 1996, a reduction of 28,000 since 1994. Unemployment on the Labour Force Survey basis is estimated to have been 182,000 for the calendar year 1996 and is forecast to fall to 175,000 in 1998 and 168,000 in 1999.

Table 7 Population in Ireland



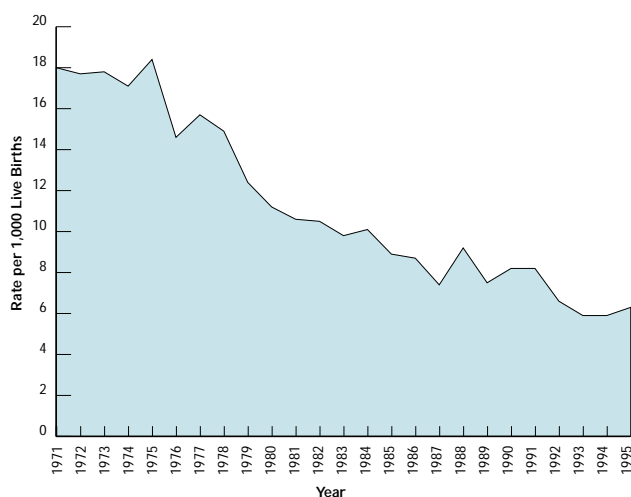
Source: CSO, *Census 96 (Planning for the Ireland of tomorrow) - Preliminary Report*, p. 6.

The above table illustrates population change from 1841 to date. After a long period of decline up to the 1960s, the population rose substantially during the 1970s. The population growth rate has now slowed. However, preliminary 1996 Census figures indicate a total population of 3,621,035, the highest figure since the foundation of the State.

Average population density of 51 persons/sq. km is low in comparison with other EU coun-

tries. The population density varies from 100 persons per sq. km in parts of the east and south to less than 25 persons per sq. km in many parts of the west. Population distribution trends over the past century have seen a decline in population in rural areas and an increase in urban populations, both as a result of emigration and of migration to towns. In 1991, 57% of the population lived in towns with 1,500 inhabitants or more compared with 28.3% in 1901 (see Table 10).

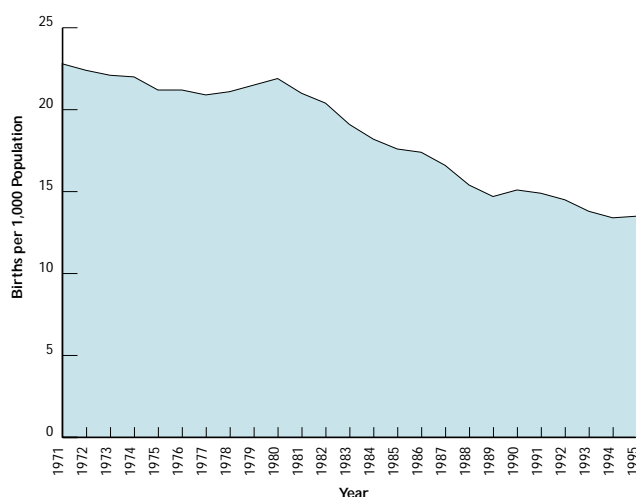
Table 8(1) Annual Infant Mortality Rate



The infant mortality rate in Ireland was 18 per thousand in 1971. By 1995, this had fallen to 6.3 per thousand, a drop of 65%. Current infant mortality levels are amongst the lowest in Europe although lower rates in Finland and Sweden show that there is further potential for improvement.

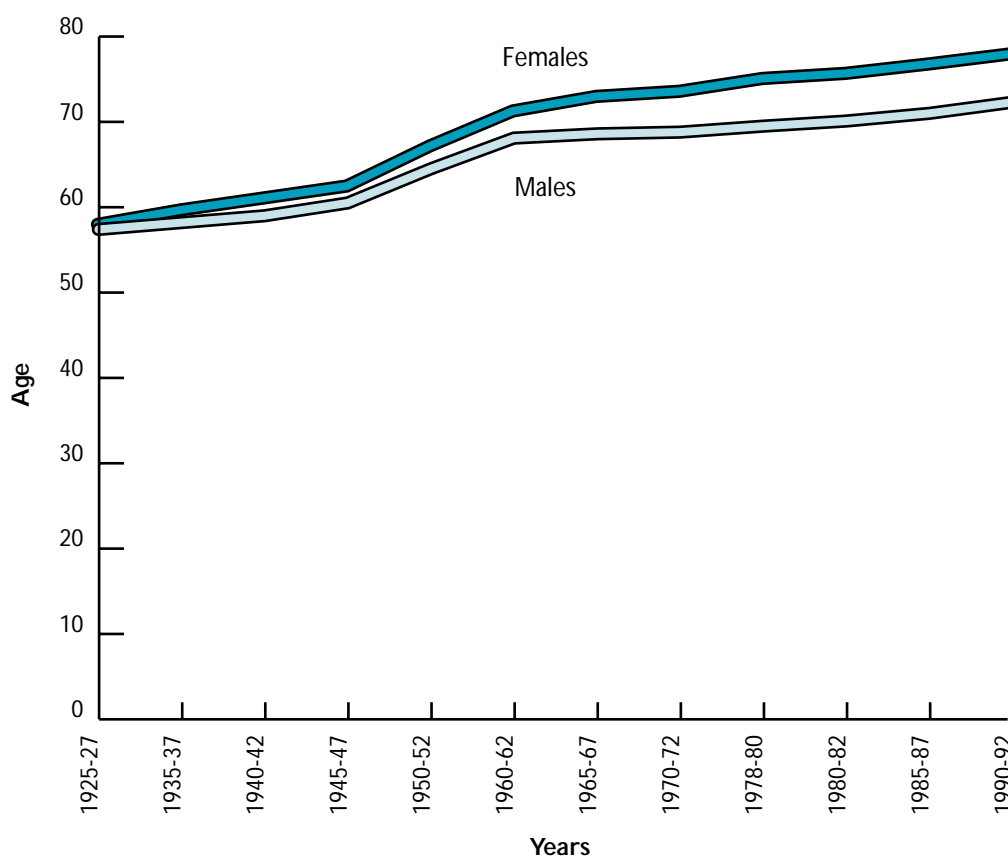
Birth rate per 1,000 population has also declined considerably since 1971, falling by over 40%. The trends in birth and fertility rates indicate that in the future, Ireland's age profile will generally converge towards the European average. The proportion of the population in the 0-14 age group is above the European average with the proportion in the working age group of 15-64 years being below the EU-15 average. The increase in the average age of the population due to take place over the next 15 years as a result of the decline in fertility rates will enable convergence of Irish living standards with the EU-15 average.

Table 8(2) Birth Rate



Source: CSO, *Statistical Bulletin*, Vol LXXI No. 4, pp. 796-797.

Table 9 Life Expectancy

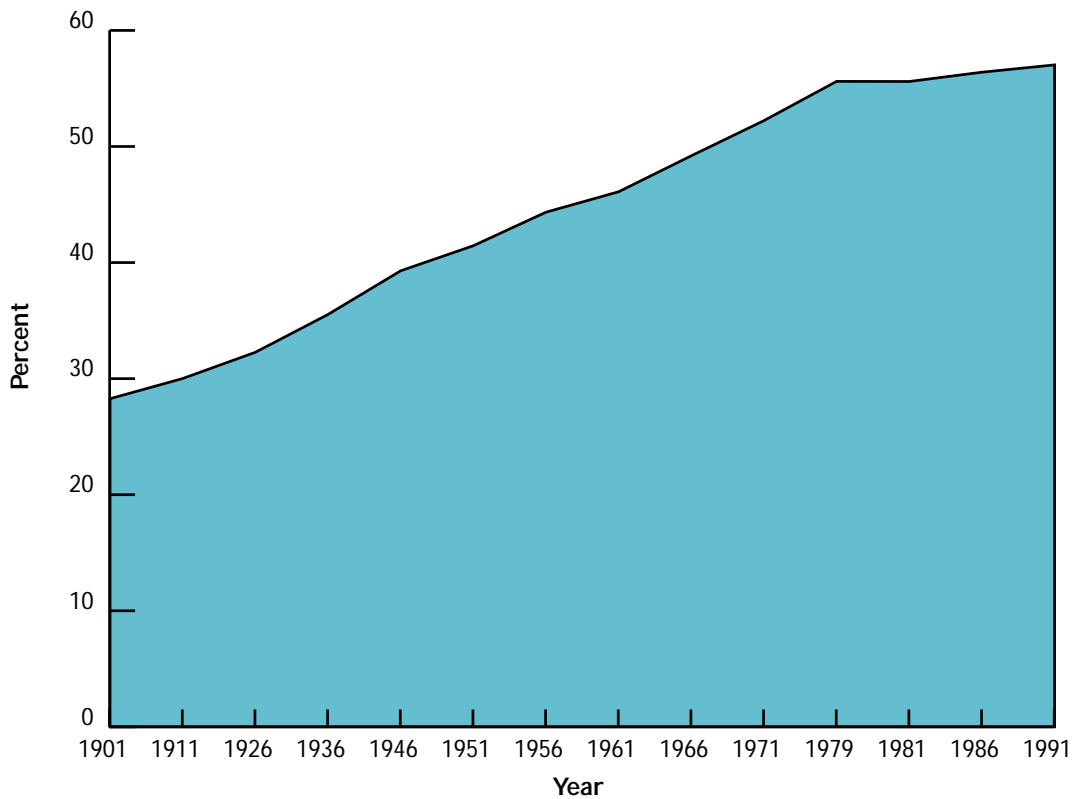


Source: CSO, *Irish Life Tables, 1985-1987 and 1990-1992*.

Advances in medical treatment and improvements in standards of living have contributed to significant changes in life expectancy. This is an indication of a healthier population but it also has many social, economic and environmental implications. More people living longer means a larger population of elderly people relative to those of working age.

Average life expectancy in the period 1970-72 was 68.8 years for men and 73.5 for women, a difference of 4.7 years. By the period 1990-92, life expectancy had increased to 72.3 years for men and 77.9 years for women, increases respectively of 5% and 6%. Greater longevity still is predicted in future years. Increasingly, the period during which individuals can expect to live healthy, independent lives is being seen as a more important indicator than total life expectancy. The definition and quantification of healthy life expectancy is a matter of future development.

Table 10 Population Living in Towns of 1,500 or Greater

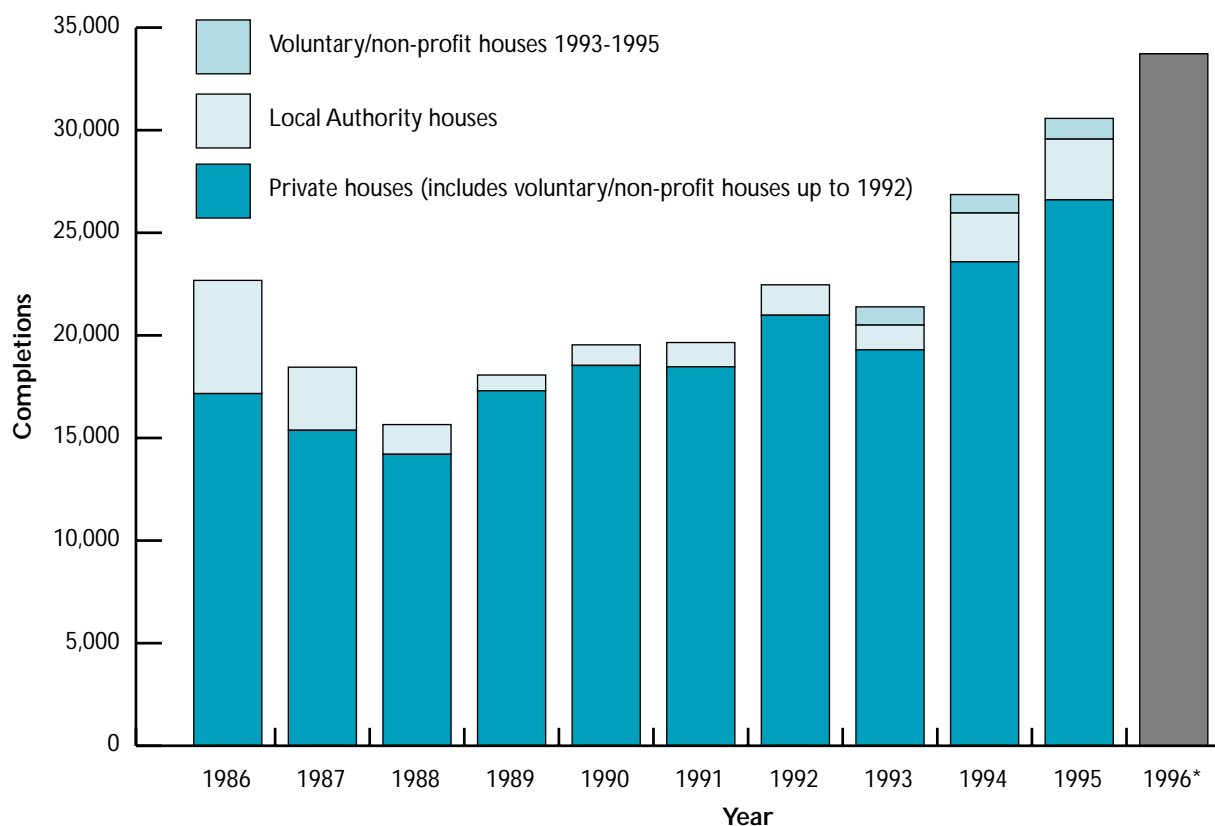


Source: CSO, *Census 1991, Volume 1 - Population classified by area*, p. 10.

The many changes in legally defined boundaries of towns and the practice since the 1961 Census of including the population or environs in determining town size, make it difficult to give comparable population figures extending back over a long period of years for areas defined in the 1991 Census as aggregate town or aggregate rural. In the above table, figures are given for each Census date for aggregate town and aggregate rural areas as they are defined at the Census date in question. The practice over the recent past has been to give strictly comparable figures

for the immediately preceding Census only, with the exception of the 1981 Census where comparable figures are available for both 1971 and 1979. Despite the lack of strictly comparable figures, there is a clear pattern of increasing concentration of population in towns of 1,500 and over in the period 1901-1991. In 1901, only 28.3% of the total population was in aggregate town areas whereas by 1936 this proportion had risen to 35.5%. At the 1991 Census, 57% of the population lived in aggregate town areas.

Table 11 Housing Completions



* Breakdown of 1996 figure between the three categories not available.

Footnotes:

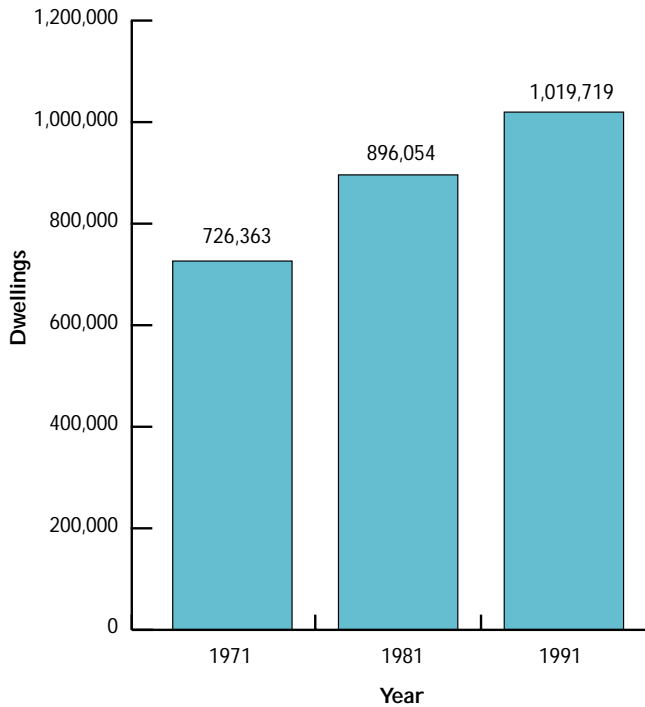
- The local authority figures include demountables and pre-fabricated houses.
- Local authority house completions for the years up to and including 1992 include a small but unquantified number of houses acquired by the authorities. The local authority house completions from 1993 onwards do not include houses acquired by them.
- The figures for private houses from 1993 onwards are not directly comparable with those for previous years which contained an unquantified number of "voluntary/non-profit houses".
- "Voluntary/non-profit houses" consists of completions under the rental subsidy and capital assistance schemes.

Source: Department of the Environment, *Housing Statistics Bulletin, September Quarter, 1996*, p. 9.

Department of the Environment figures for 1996 indicate a continued strong performance in housing activity. Housing completions for the year at 33,721 increased by 10% over 1995, and represent the highest number of annual completions ever recorded in Ireland. The lead indicators for private housing output during 1996 showed strong growth compared with the corresponding periods in 1995. Continuing demand for housing constitutes a significant pressure on land for development. The re-use of land in urban areas for housing and commercial devel-

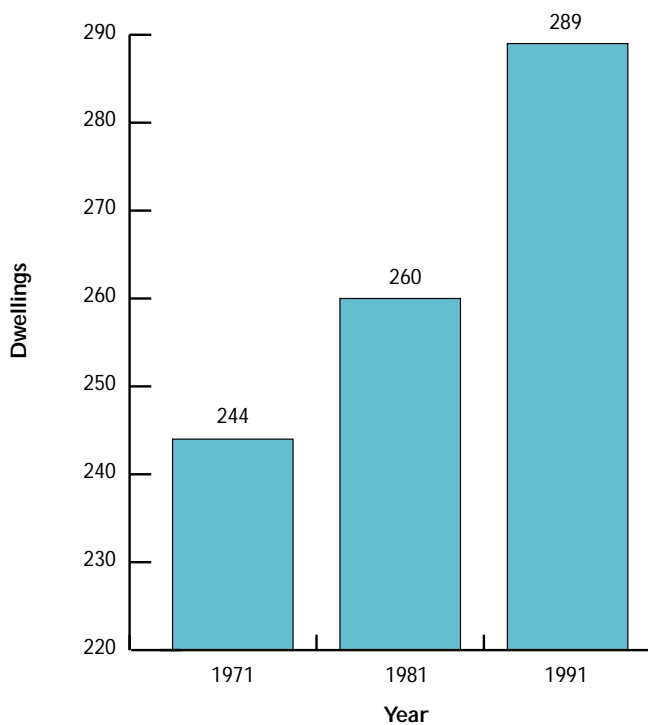
opment can contribute to a reduction in pressures on the countryside to accommodate new development. Current levels of house building consume an estimated 2,000-2,300 hectares of serviced land annually. In recent years, greater emphasis on infill developments and increased apartment building in the private housing sector has resulted in higher density developments and a considerably more intensive use of land by the housing programme. In 1994 and 1995, less than 10% of new local authority housing was on greenfield sites.

Table 12 (1) Housing Stock (Dwellings)



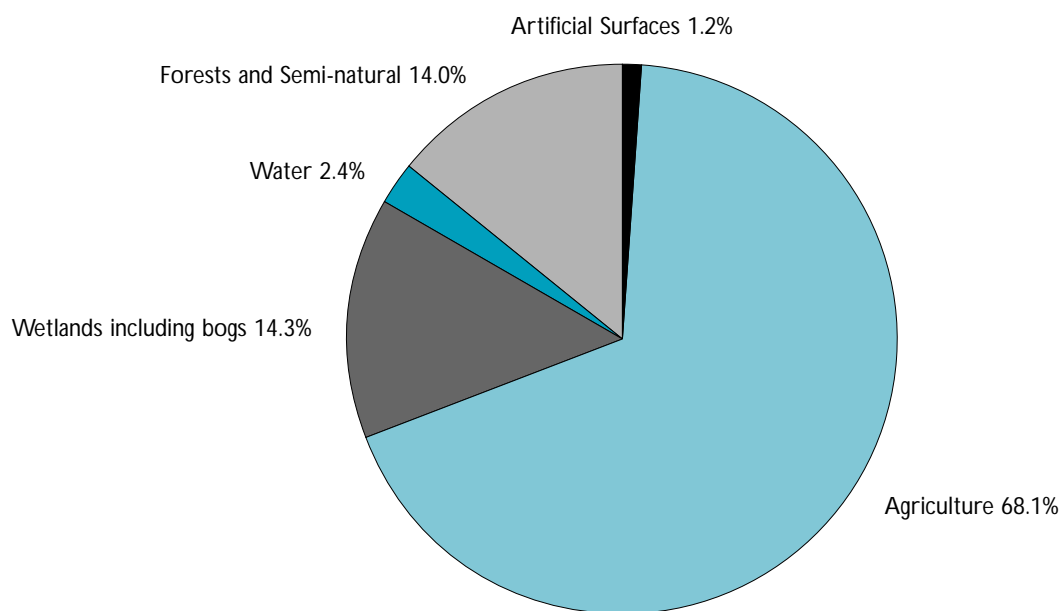
The housing stock increased by 40% over the period 1971 to 1991, an average percentage increase of 1.7% per annum. Over the same period, the population increased by 18.4%. Increased longevity, changes in household size and changes in social preference have also had an effect on housing demand. Forecast trends in population and household size will continue to exert pressures for new housing into the next century and will increase total dwelling numbers.

Table 12 (2) Dwellings per 1,000 Population



Source: Department of the Environment

Table 13 Land Cover in Ireland (excluding Northern Ireland)

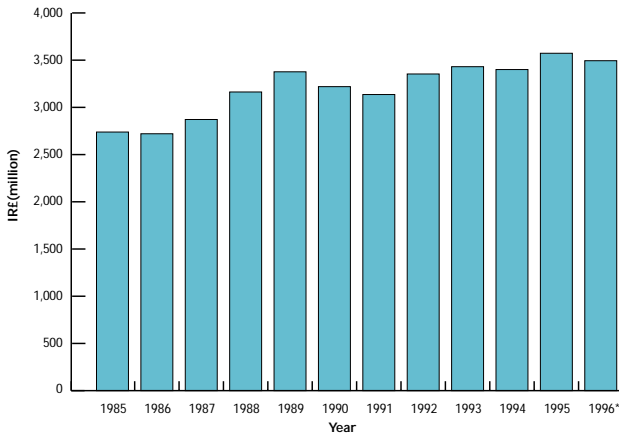


Source: CORINE Land Cover Statistics for Ireland (1989/90), excluding Northern Ireland (O'Sullivan, 1994)

Land cover statistics reflect a range of factors including geological history, national climate, and land usage. Land cover statistics have changed over time. By the start of the twentieth century, once extensive forest cover had been

virtually eliminated. Forestry now represents 8% of the land cover, and is increasing at a rate of 0.33% per year. Agriculture remains the primary land use with 68.1% of land cover.

Table 14(1) Gross Agricultural Output



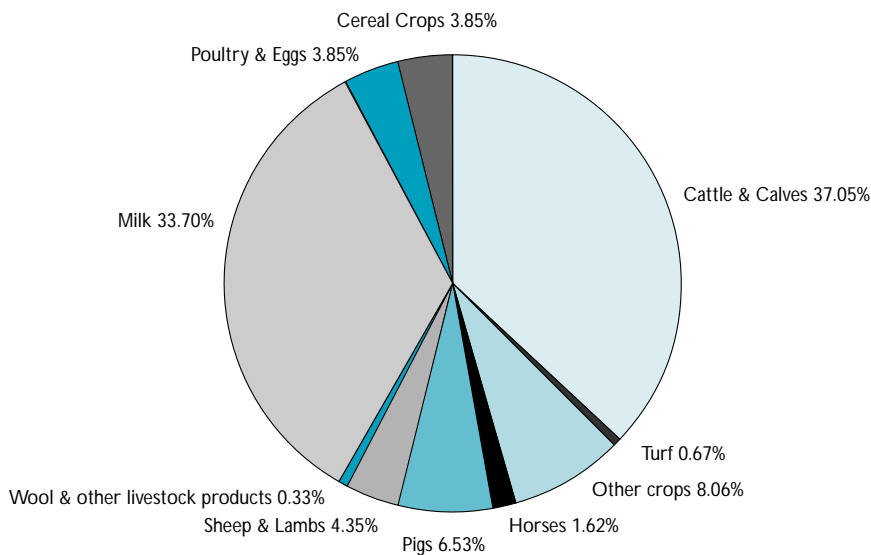
* Preliminary Estimate

Sources: CSO, *Preliminary estimate of output, input and income in agriculture 1996* (January 1997 estimate); CSO, *Statistical Abstract 1996*, p. 76; and EireStat, the Data Bank of the CSO, Ireland.

Gross Agricultural Output (GAO) is the sum of final sales of livestock, livestock products and crops from the "National Farm" and includes the increase or decrease in livestock numbers over a year. The increases in livestock numbers experienced in recent years have been one factor contributing to the steady growth of GAO. However, CSO figures (February 1997) on GAO indicate that while there was an overall increase in the volumes of output in 1996 (+1.9%), which included increases in the volume of pigs (+7.2%) and of cereals (+8.5%), there was a decline in the overall value of GAO by an estimated 2.2%. This arose particularly from declines in prices experienced in the cattle and cereals sectors during the year.

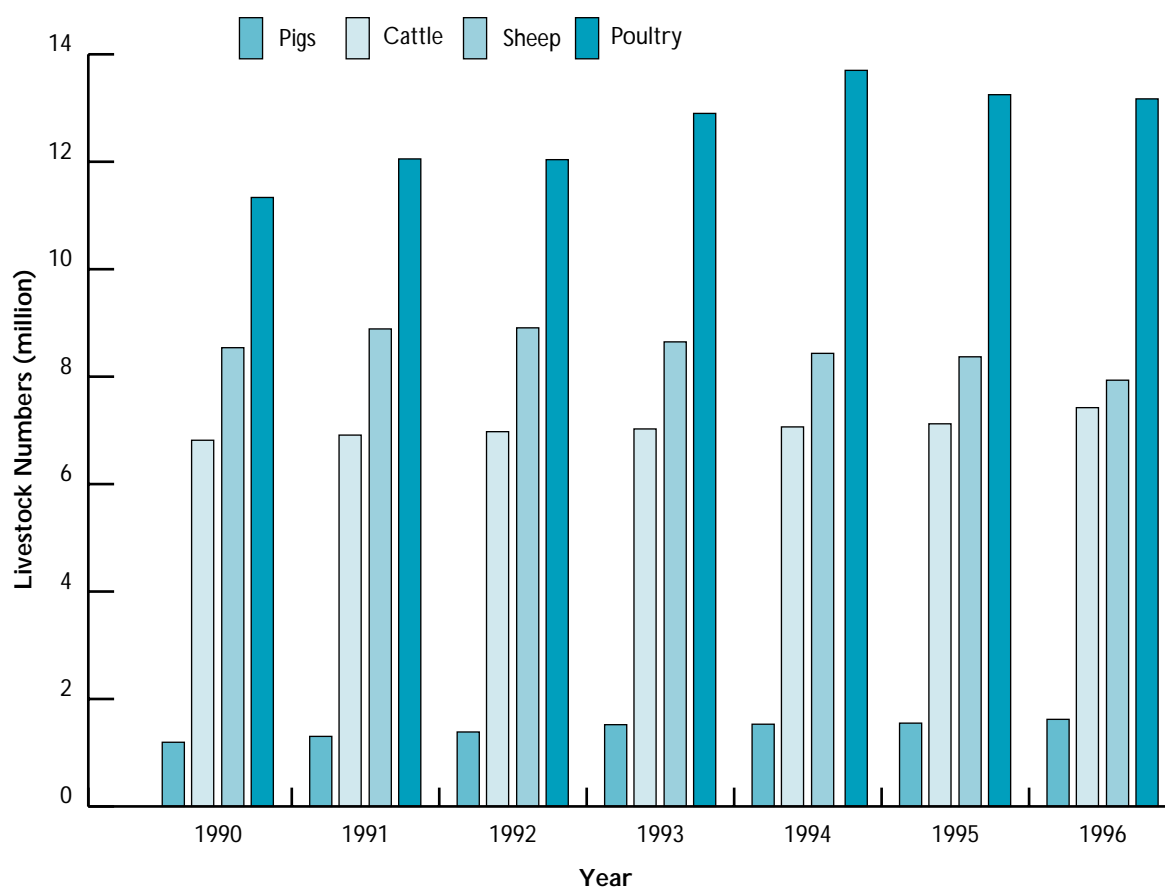
The breakdown of the 1995 GAO figure indicates that livestock related agriculture including dairying, meat and poultry production accounts for approximately 87% of total GAO. Gross Agricultural Product at market prices (i.e. GAO minus inputs of materials and services) for the year is estimated to have dropped by 7.8%.

Table 14(2) Commodity Value as a Percentage of Gross Agricultural Output, 1995



Source: CSO, *Statistical Abstract 1996*, p. 76.

Table 15 Livestock Numbers



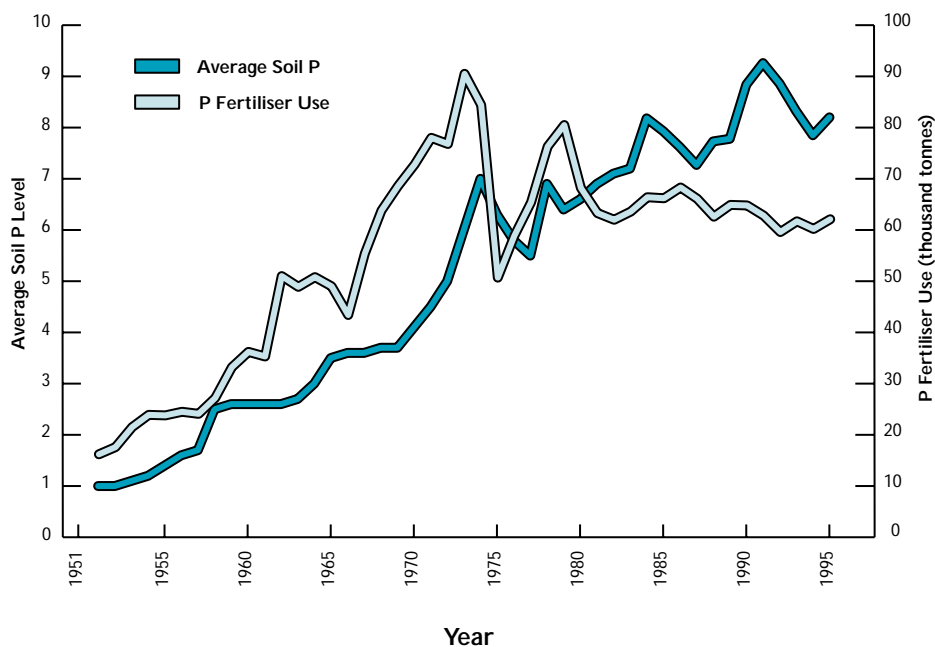
Source: CSO, June Livestock Survey (1990-1996).

There have been changes in recent years in farm livestock population. During the period from June 1995 to June 1996, cattle numbers rose by 4.2%. The number of cattle in the country is now similar to the herd levels of the mid-1970s. There was also an expansion in the Irish pig herd, with a rise of 4.5% in pig numbers between June 1995 and June 1996.

The sheep flock declined by 5.2% over the same period, continuing the reduction from the peak in numbers of the early 1990s. Overstocking of sheep occurred in the 1980s and early 1990s affecting the environmental quality of peatlands, heaths and wildlife habitats.

Poultry numbers changed little between June 1995 and June 1996 (-0.6%) reflecting the continued high consumption pattern displayed by this sector. When aggregated, total animal numbers over the four sectors have increased in recent years. The changes in numbers between sectors have occurred in response to EU measures designed to restrict expansion of surplus production sectors. The continued expansion in animal numbers over time has resulted in increased pressure on the environment.

Table 16 Trend in P fertiliser use and soil P availability



Note: Fertiliser year calculated on a July to June basis for the period 1951-1992, thereafter it is calculated on an October to September basis.

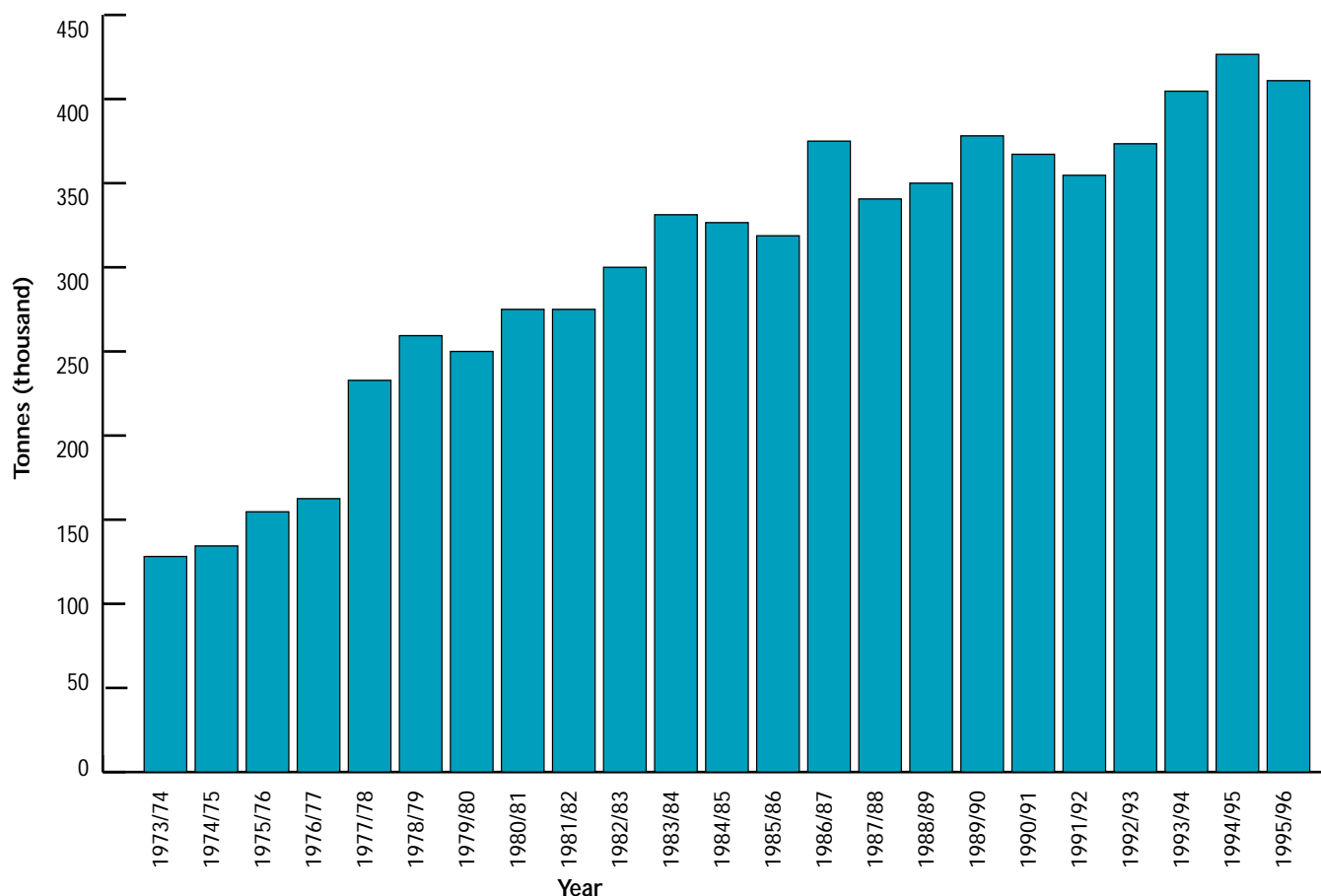
Source: Teagasc

One of the principal environmental impacts of agriculture is the eutrophication of inland waters by Phosphorus (P) from organic (animal wastes) and anthropogenic (chemical fertiliser) sources. P is a requirement for both plant and animal growth, but its application in the form of mineral fertilisers and as manures/slurries has important consequences for water quality. National trends show a steady increase in soil P levels between 1950 and 1991 when the average P level increased from 0.8 mg/l to 9.3 mg/l. Since 1991, the average P appears to have dropped to about 8 mg/l and to have stabilised around that level. Approximately 60,000 tonnes, from a total P input of some 140,000 tonnes a year, is artificial. Application of artificial P has remained fairly constant in Ireland in the past ten years. Apart

from the environmental costs of excessive soil enrichment, there is also an economic cost where money is being expended unnecessarily on mineral fertilisers. Teagasc has estimated that savings in excess of £25 million nationally could be achieved annually if fertiliser applications were tailored more closely to crop requirements.

A study by Teagasc/TCD on agricultural soil phosphorus losses to water has been commissioned under the *Operational Programme for Environmental Services, 1994-1999*. The aim of the study is to develop a model to predict soil P losses given soil type, soil P level and precipitation amounts so as to facilitate better targeting of pollution control resources.

Table 17 Consumption of nitrogenous fertilisers



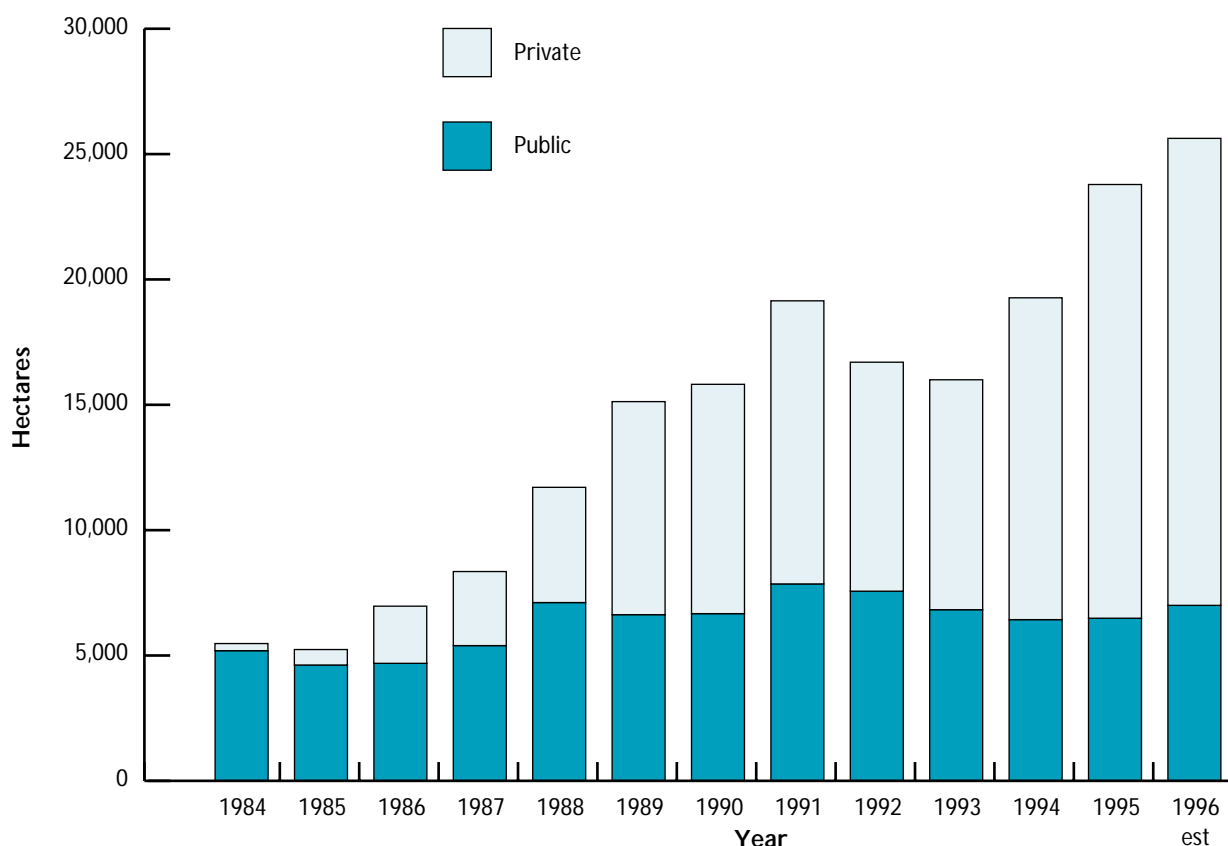
Note: Fertiliser year calculated on a July to June basis for the period 1973/74 to 1991/92; thereafter it is calculated on an October to September basis.

Sources: Department of Agriculture, Food and Forestry; N. Culleton *et al*, "Sustainability in Irish Agriculture" in *Irish Geography* 27(1), (Dublin: Geographical Society of Ireland, 1994), pp. 36-37; and M. Sherwood and H. Tunney, "Land application of manure and nutrient loading: the legislation in Ireland and Europe", proceedings of the *Environmental Impact Conference*, (Teagasc/The Institution of Engineers of Ireland, Johnstown Castle, Wexford, 1991).

As illustrated in the above table, consumption of nitrogenous fertilisers has exhibited a continuously increasing trend over the past twenty years reflecting increased agricultural production. As environmental awareness has increased, questions have been raised on the role of nitrogen as a pollutant of water and air. Losses of nitrogen to water and air in Ireland have been estimated at over 70% of nitrogen input used. These losses can have significant environmental effects and represent a financial loss to farmers. Despite a close relationship between agricultural output and nitrogen inputs, studies by Teagasc have indicated that efficiency in usage of nitrogen is decreasing as quantities used increase.

Good farm management responses can reduce and prevent water pollution from agricultural sources. The *Code of Good Agricultural Practice to Protect Waters from Pollution by Nitrates*, launched in 1996, includes recommended nitrogen application rates to grasslands to prevent the pollution of groundwaters and surface waters by nitrates from agricultural sources. The Code also addresses existing pollution problems from organic and chemical fertilisers containing nitrogen. Preventing build-up of nitrates in waters will maintain and improve the quality of waters for a range of uses including drinking water supply.

Table 18 Afforestation



Sources: Department of Agriculture, Food and Forestry, *Growing for the Future: A Strategic Plan for the Development of the Forestry Sector in Ireland*, p. 27 and Department of Agriculture, Food and Forestry.

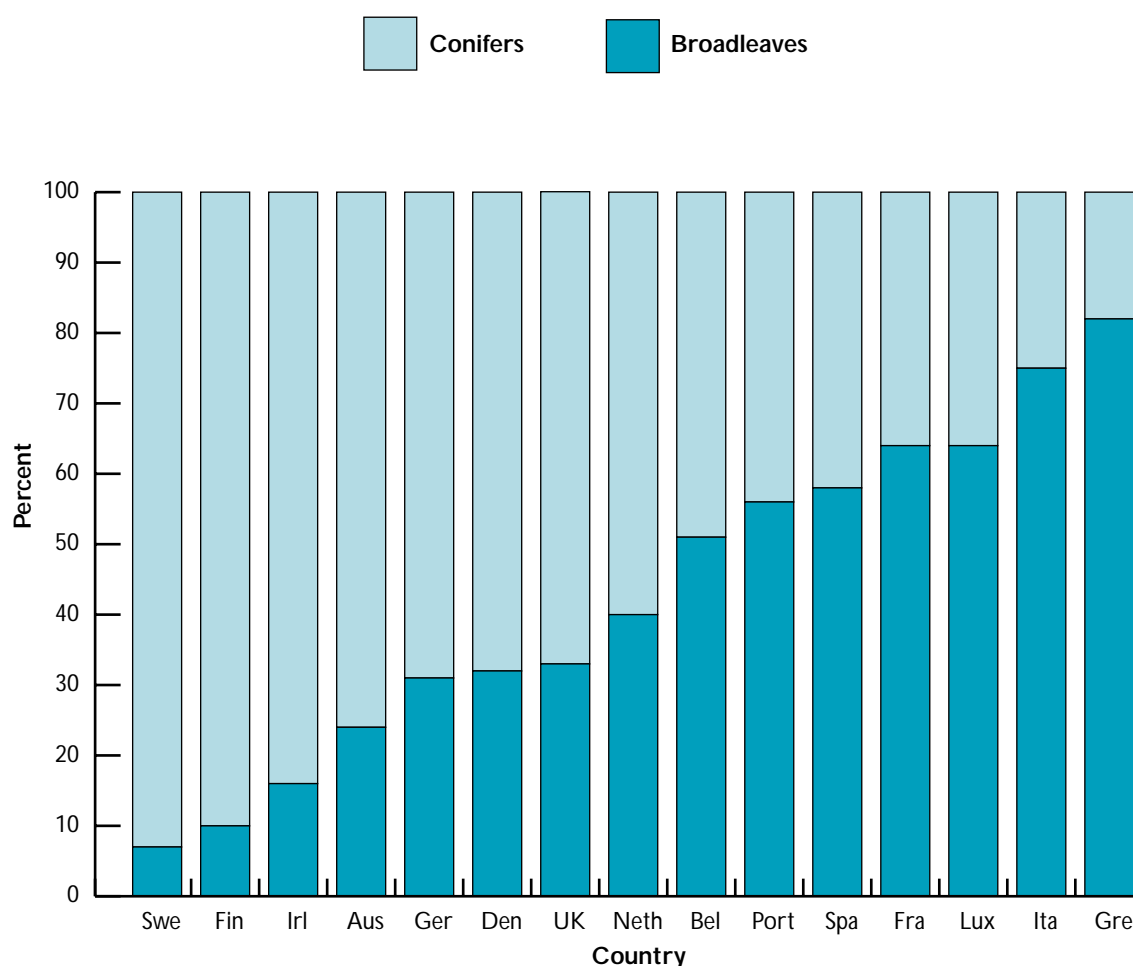
Afforestation levels in Ireland are now estimated at over 25,000 hectares (ha) *per annum*. The most dramatic change in relation to planting has been in private sector planting which has increased from 300 ha *per annum* in the early 1980s to over 17,000 ha in the mid-1990s. Tree planting *per capita* is now higher in Ireland than in many other developed countries. Forest cover as a percentage of total land area is presently increasing at a rate of 0.33% *per annum*, a reflection of Ireland's comparative advantage in Europe in respect of the rate of tree growth. Planting targets of 25,000 ha/*per annum* were set under the current afforestation programme.

A target of 17% of total land cover has been set for forestry by the year 2035. Annual planting by private operators (including farmers) reached 73% of total planting in 1995 with 85% of all private afforestation being undertaken by farmers.

Planning permission/Environmental Impact Assessment requirements allow for the protection of sensitive environments from over-afforestation.

It is estimated that up to 7,000 are employed directly in forestry with a further 9,000 employed in related sectors.

Table 19 Broadleaves and Conifers in EU National Forest Estates

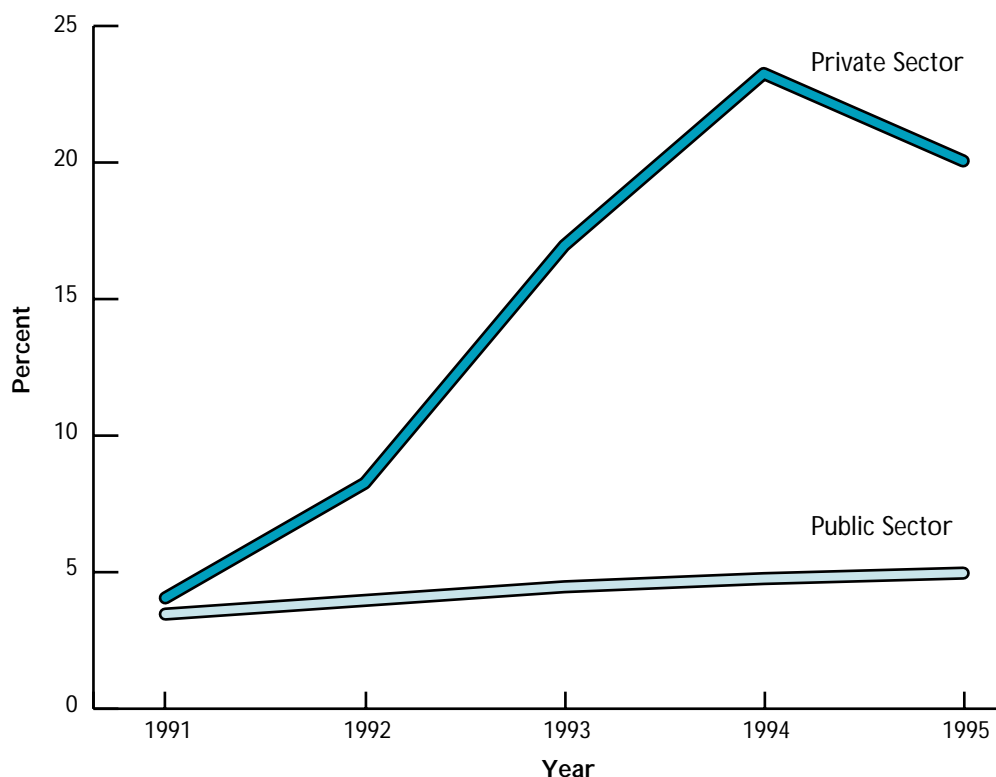


Source: Department of Agriculture, Food and Forestry, *Growing for the Future: A Strategic Plan for the Development of the Forestry Sector in Ireland*, p. 10.

The predominant species in Ireland is the Sitka spruce, representing 60% of the forest estate and 65% of current annual afforestation. Broadleaves account for an estimated 16% of the forest estate and 20% of the current annual afforestation compared to 3-4% in the late 1980s. The predominance of Sitka spruce afforestation is due to the high growth rate of

this species of tree in Ireland in comparison with EU growth rates. A considerable amount of research has been carried out on the genetic, silvicultural and wood quality aspects of the Sitka spruce whereas knowledge of broadleaf establishment and management has been limited because of the scarcity, until recently, of suitable sites for broadleaf afforestation.

Table 20 Broadleaf Afforestation

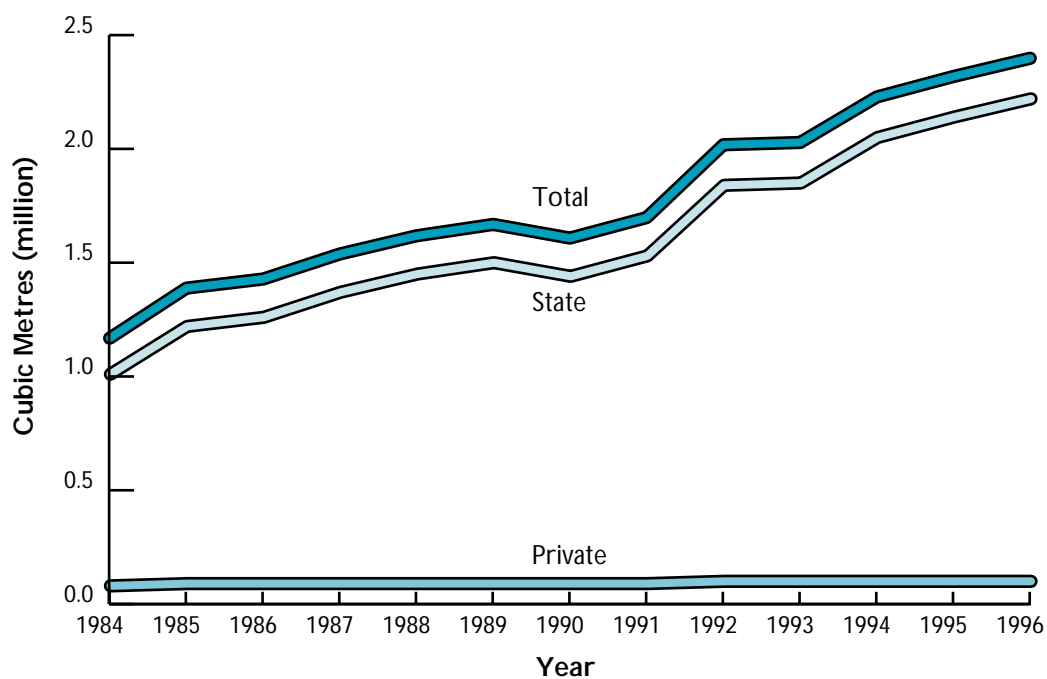


Source: Department of Agriculture, Food and Forestry

Trends in past afforestation have seen the predominant planting of coniferous rather than native and broad-leaved species, to the extent that 84% of forests comprise coniferous species. The 16% of the Irish forest estate which is made up of broadleaves is considerably less than in practically all other EU Member States, where the average proportion of broad-leaved forestry is 40% of the total. The emphasis on quick-growing softwoods reflected the exceptionally suitable conditions of the Irish climate for such species, supporting rapid growth and providing quick returns on investment.

Current policy places greater emphasis on the planting of broad-leaved species, with the target for annual broadleaf afforestation set at 20% of total annual afforestation. This has particular value in terms of landscape, heritage, amenity and habitats. In economic terms, it also offers long-term opportunities for the production of hardwood timber, allowing greater diversity of associated industries and products.

Table 21 Timber Production

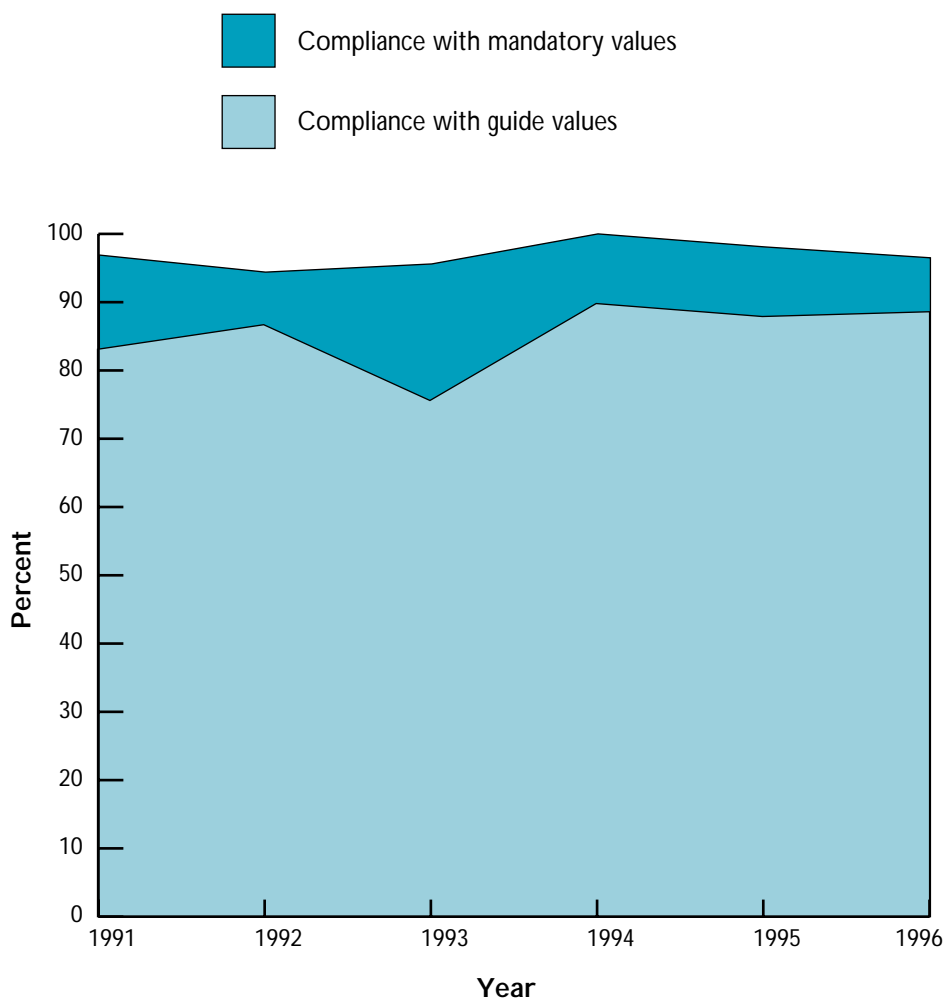


Source: Department of Agriculture, Food and Forestry

Annual timber production in 1996 was 2.3 million cubic metres and supported some 100 sawmills and three panel board mills. The value of the contribution of the sawnwood and panel board processing sectors to the national economy was estimated in 1993 at £87 million. The value added to industrial input timber and

wooden furniture was estimated at £166 million. Irish forests supply around 60% of domestic requirements for structural and construction grade timber, while exports, comprising some 250,000 cubic metres, consist mainly of palletwood destined for the UK market.

Table 22 **Bathing Water Quality Monitoring Results for Sea Water Bathing Areas**

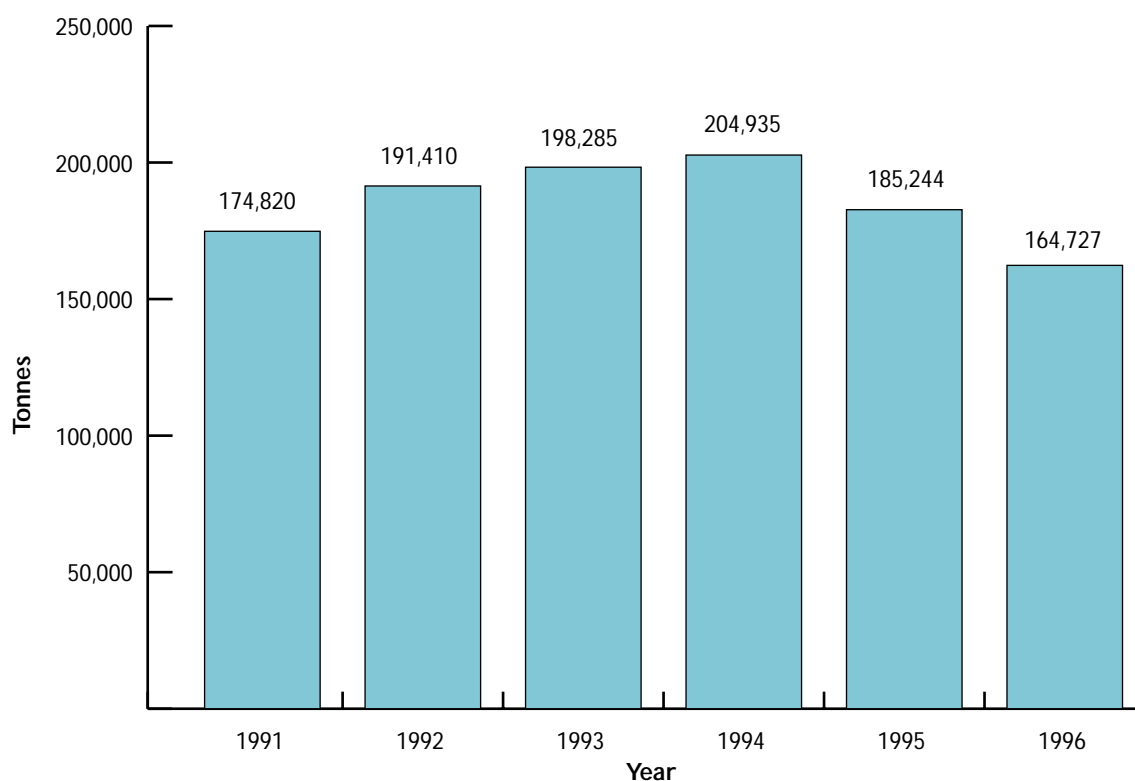


Note: For 1991-95, the parameters for which the compliance rate is calculated are total coliforms and faecal coliforms. For 1996, the parameters for which the compliance is calculated are total coliforms, faecal coliforms, mineral oils, surface active substances and phenols.

Source: Environmental Protection Agency, *Report to the European Commission on the Quality of Bathing Waters in Ireland for the 1996 Bathing Season*, p. 5.

The quality of bathing water in Ireland is generally very high, with most designated bathing areas (96%) complying with statutory quality requirements. The bathing season runs from 1 June to 31 August each year. The number of sea water bathing areas sampled in 1996 was 115, an increase of 7 on 1995. 114 of the 115 sampling points (99.13%) had sufficient sampling frequen-

cy and of these, 110 (96.5%) complied with mandatory values for total coliforms, faecal coliforms, mineral oils, surface active substances and phenols. In addition, 101 of the 114 sampling points (88.6%) complied with the guide values specified in Directive 76/160/EEC for these parameters.

Table 23 **Total Allowable Catch**

Source: Department of the Marine

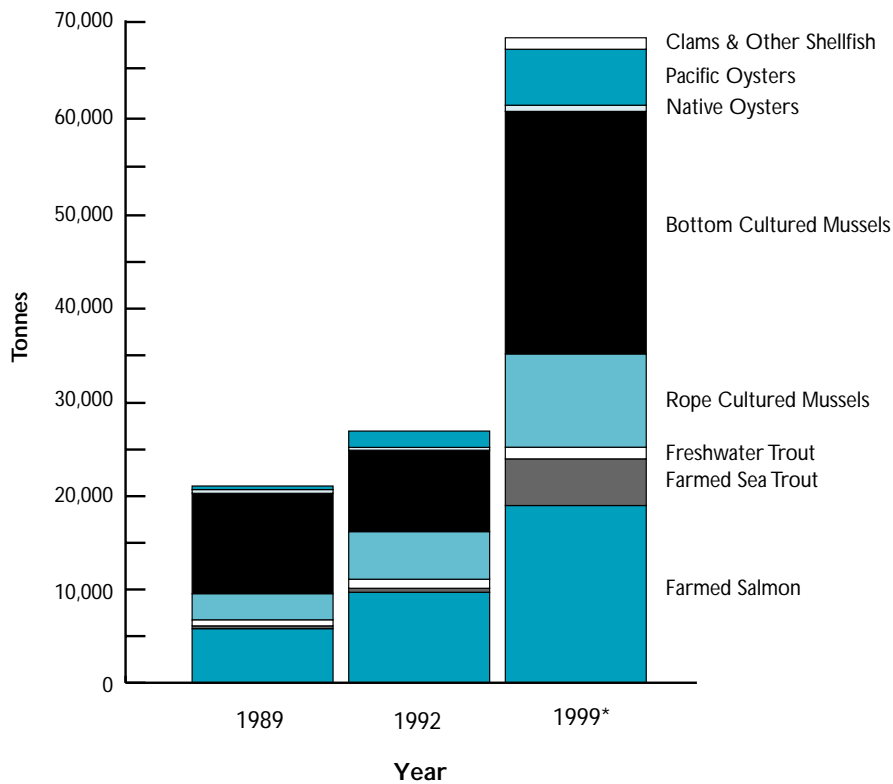
While the global fish catch increased five fold between 1950 and 1990, it has not increased since. The UN Commission on Sustainable Development, at its fourth session in 1996, agreed that significant fish stocks at global level are depleted or overexploited, and noted that urgent corrective action is necessary to rebuild depleted stocks and to ensure their sustainable use. Long term preservation and improvement of stocks, through careful management and responsible fishing practices, is vital for the future of the industry.

At EU level, the Common Fisheries Policy (CFP) already takes account of sustainability requirements in respect of stocks, and imposes quotas on certain traditionally fished key economic species. Total Allowable Catches (TACs) for certain key economic stocks such as Mackerel,

Herring, Cod and Haddock are set each year by the EU Council of Fisheries Ministers. TACs are essentially based on the results of analysis carried out by international fisheries scientists and are indicators of the health of stocks of the species concerned. Setting sustainable overall TACs to allow stocks to replenish is at the core of the conservation principles of the EU Common Fisheries Policy.

In order to maximise fishing possibilities while ensuring that conservation objectives are met, there has been significant diversification into non-TAC species in recent years. Consequently, there has been a significant growth in the level of Irish fish landings from 249,533 tonnes (valued at £95 million) in 1991 to 395,853 tonnes (valued at £129 million) in 1995.

Table 24 Growth in Aquaculture Production



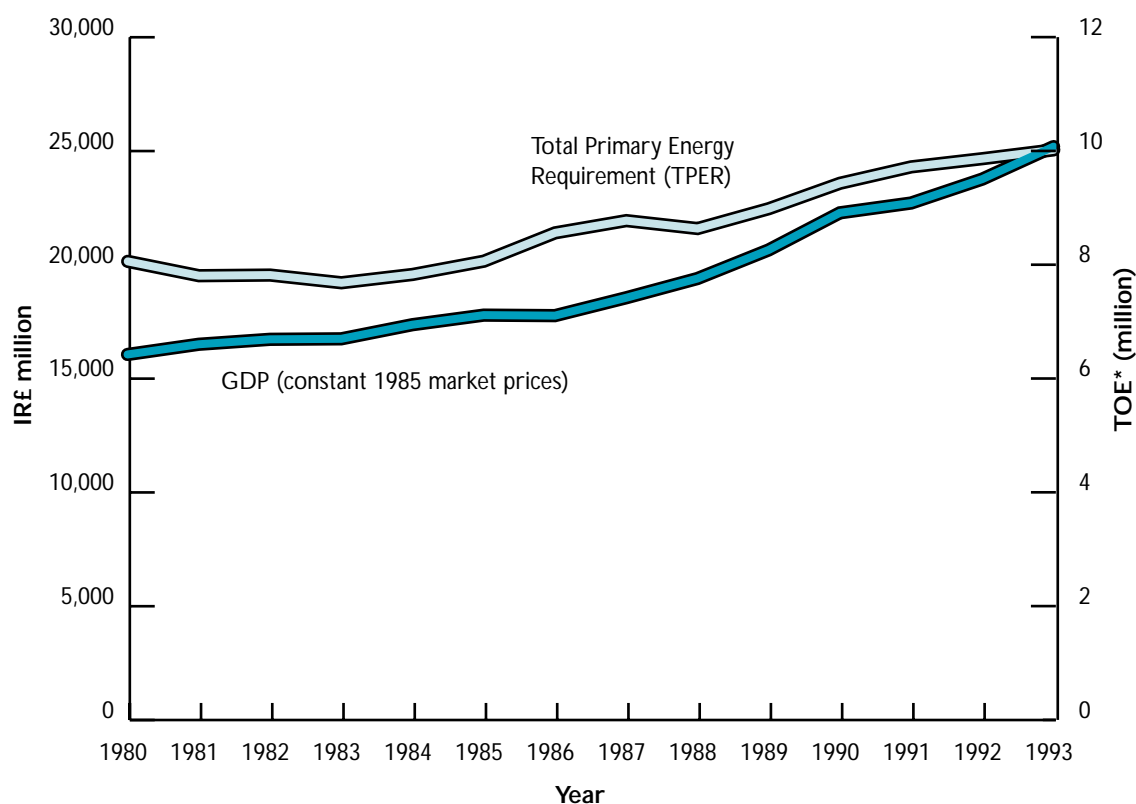
* 1999 projected figures

Source: *Operational Programme for Fisheries, 1994-1999*.

Aquaculture, including finfish and shellfish, is a growing sector of Irish marine industry. It now accounts for 25% of Ireland's fish production, and provides employment for over 2,500 people, mainly in remote coastal communities. The estimated value of the output from the sector in 1995 was £49 million. This represents a doubling of the value of aquaculture production since 1989.

The *Operational Programme for Fisheries, 1994-1999*, targets aquaculture as a key growth area, and the Government is committed to supporting the sustainable development of the industry as a source of jobs and economic activity.

Table 25 Energy Demand and Economic Growth (GDP)



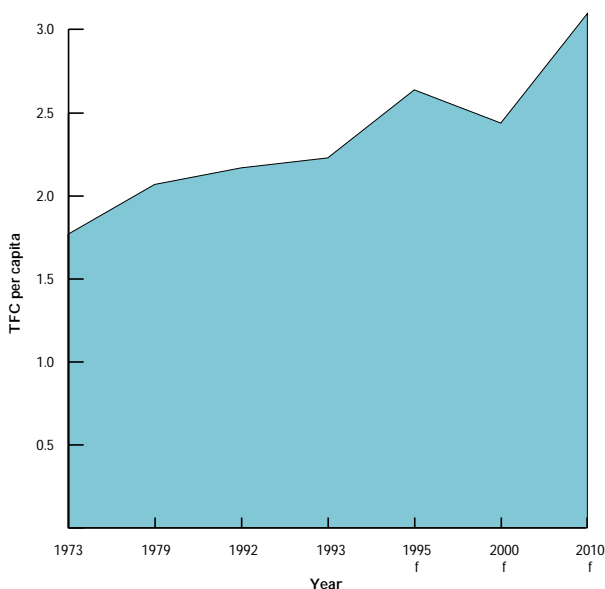
* TOE = Tonnes of Oil Equivalent

Source: Alison Myers, *Energy in Ireland, 1980-1993 - A Statistical Bulletin*.

This table shows the relationship between growth in energy demand and growth in the economy (GDP). Trends in Total Primary Energy Requirement (TPER) illustrate the relationship between energy and economic growth. As the national output of goods and services increased in this period, energy consumption also increased to meet the demands. While there are other factors which affect the level of energy consumption (i.e. weather patterns, energy price movements, etc.) economic growth is the strongest influence of all such factors. Ireland's

energy intensity has been improving over recent years with more units of GDP being produced for fewer units of energy input at the margin. Average annual GDP growth over the period 1980-1993 was almost 3.6% while average annual growth in TPER was 1.7%. However, in the five years from 1988 to 1993, TPER grew relatively more quickly, probably because the stimulus of the huge price rises of 1973 and 1979 had worn off. Overall, this indicates a move towards the decoupling of economic growth from increased energy usage.

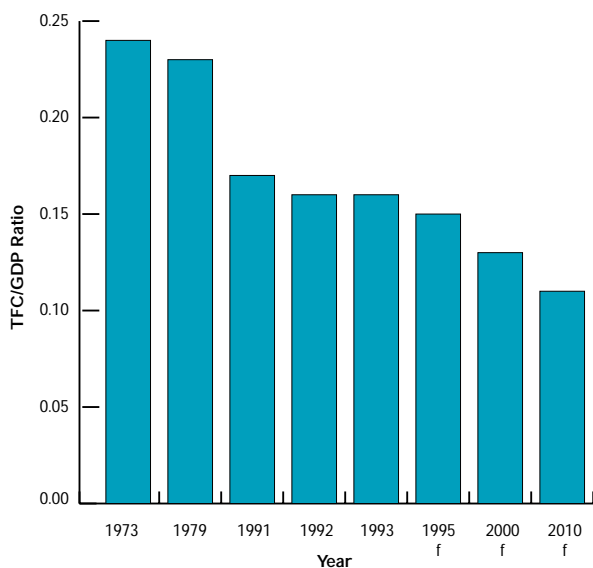
Table 26 (1) Energy Consumption



Total Final Consumption (TFC) is the measure of the amounts of various fuels used after usage in electricity production and other intermediary processes have been accounted for - in other words, the amounts which are used by end-users as final energy.

Ireland's energy intensity rating or TFC *per capita* of 2.23 compares with a European average of 2.37. The trend indicates that TFC is growing faster than the population growth rate. The trend of increasing energy consumption *per capita* is in contrast with the European average which has remained steady since 1980.

Table 26 (2) Energy Intensity

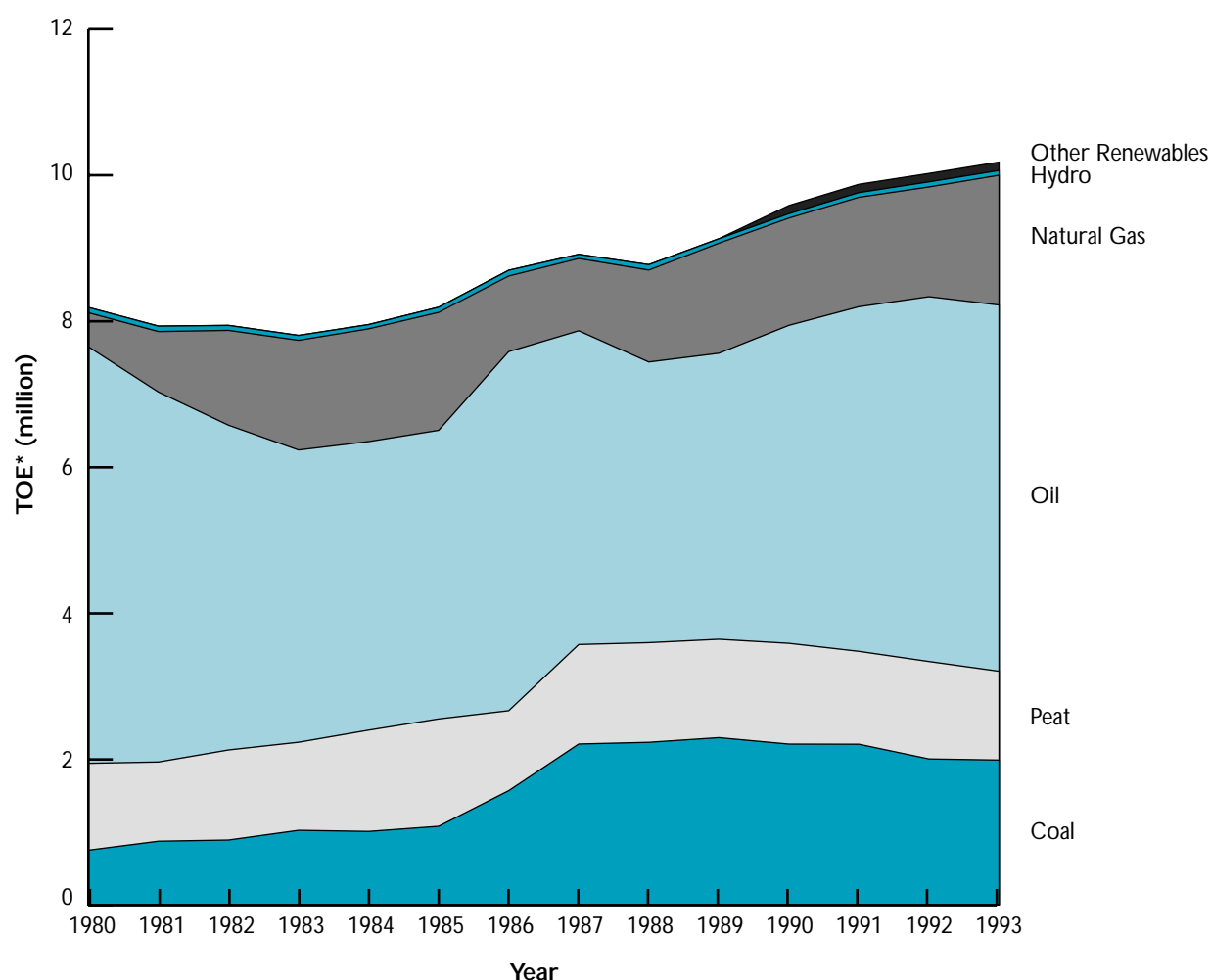


TFC/GDP is a measure of Ireland's energy intensity. Ireland's rate is on a par with the European average, has been improving in recent years and is forecast to decline further in the next century to a level of 0.11 in the year 2010. This is a firm indication illustrating the de-linking of economic growth with increased energy usage. (As TFC/GDP is declining over time, the growth in TFC is slower than the growth rate in GDP).

TFC is measured in Metric Ton of Oil Equivalent (TOE) per thousand US Dollars at 1990 prices and Exchange Rates.

Source: International Energy Agency, *Energy Policies of International Energy Agency (IEA) Countries, 1994 Review*, p. 304.

Table 27 Fuel Mix in Total Primary Energy Requirement



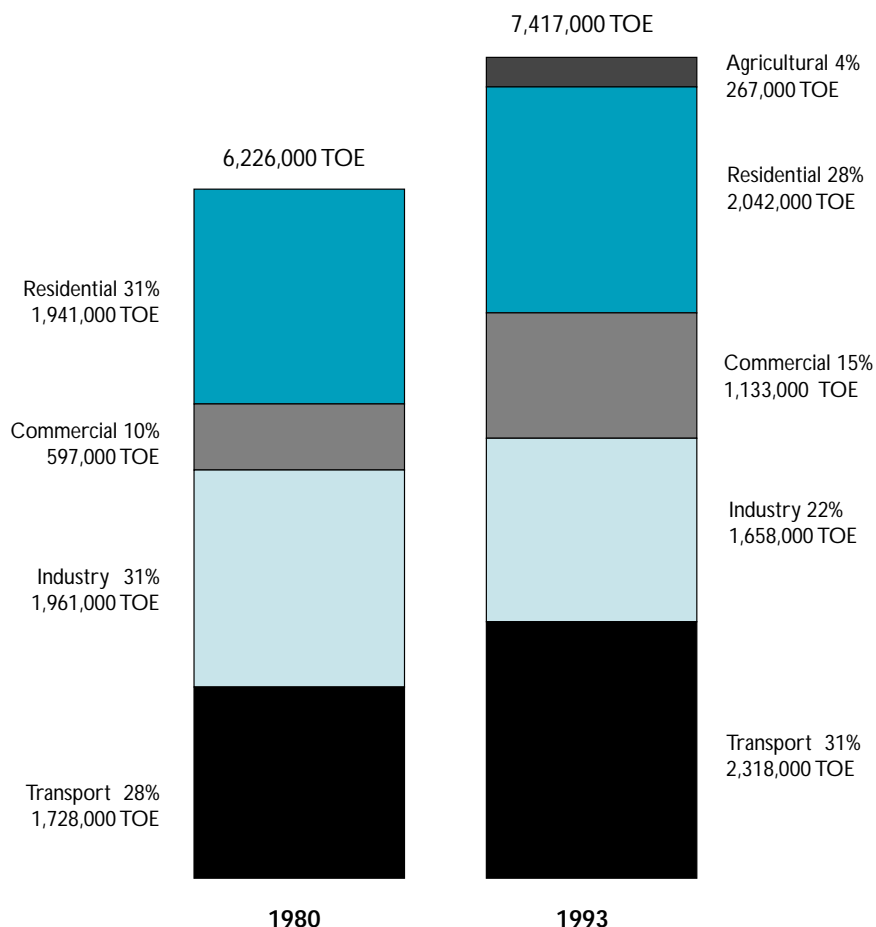
* TOE= Tonnes of Oil Equivalent

Source: Alison Myers, *Energy in Ireland, 1980-1993 - A Statistical Bulletin*, pp. 5-6.

Total Primary Energy Requirement (TPER) is a measure of all energy consumed including that lost in the transformation and distribution process. These processes include oil refining and the generation, transmission and distribution of electricity. Overall, TPER was 24% higher in 1993 than in 1980. The above graph illustrates significant trends within primary energy consumption over the last 15 years. These include:

- The discovery of natural gas and its use as a natural energy source. Gas did not play any role in TPER in 1978. By 1993 it represented 18% of TPER.
- Ireland's oil dependence declined from 75% in 1978 to 49% in 1993.
- Coal increased from 9% in 1980 to 19% in 1993 as a source of primary energy requirement.

Table 28 Total Final Energy Consumption by Sector

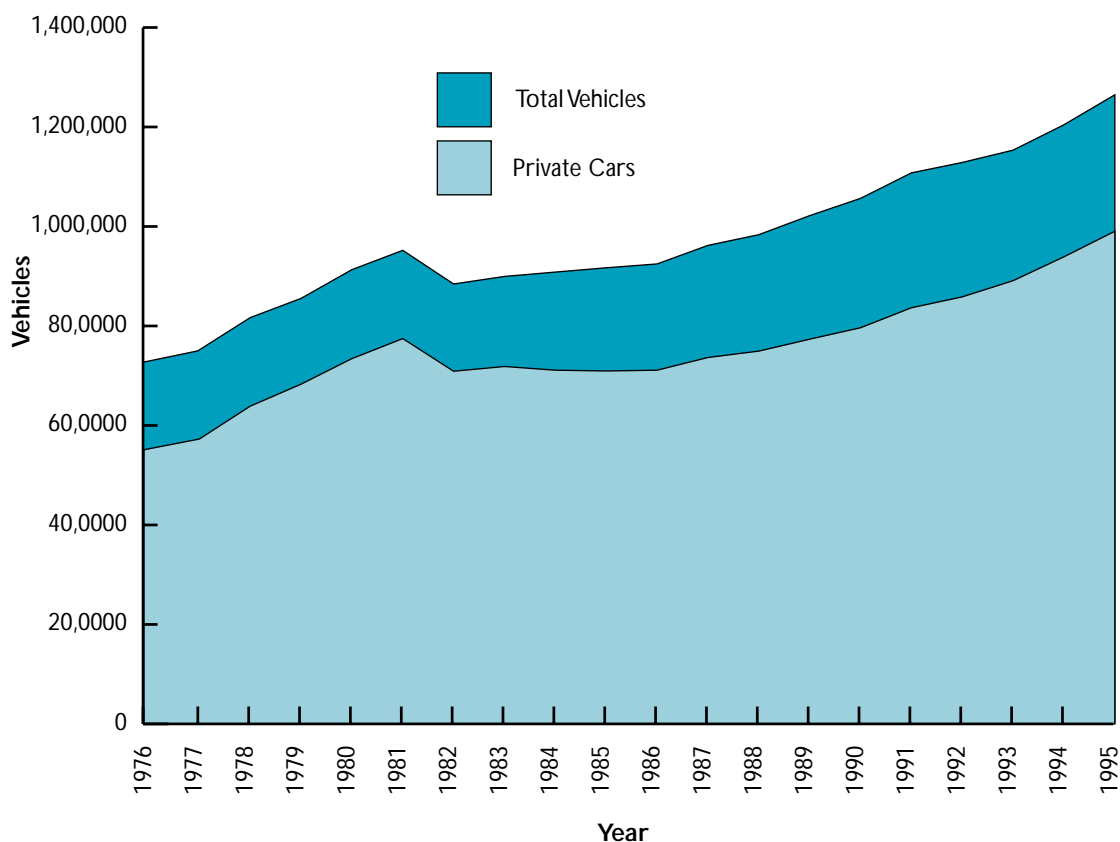


Source: Alison Myers, *Energy in Ireland, 1980-1993 - A Statistical Bulletin*.

Total Final Consumption of energy represented by volume of Tonnes of Oil Equivalent (TOE), increased by 19% between 1980 and 1993, an annual increase of 1.35% on average over the period. (TFC in 1980 totalled 6,226,000 TOE; TFC in 1993 totalled 7,417,000 TOE). This compares with growth in GDP of 58% over the period or almost 3.6% *per annum*. The agricultural sector has only been identified as a separate consuming sector since 1990. Previously, the agriculture figure was contained partially in the domestic and commercial sector numbers. It is estimated that the combined residential, commercial and agri-

cultural sectors accounted for 41% of TFC in 1980 and for 47% in 1993. Growth in consumption has been driven principally by marked increases in energy use in the transport, residential and commercial sectors. On the other hand, there were significant fluctuations in the percentage of TFC consumed in the industrial sector over the period, which exhibited a drop from 31% to 22% of sectoral consumption. Consumption in the transport sector increased from 28% of TFC in 1980 to 31% in 1993. Energy consumed in this sector at the end of the period was virtually all oil.

Table 29 Vehicle Numbers



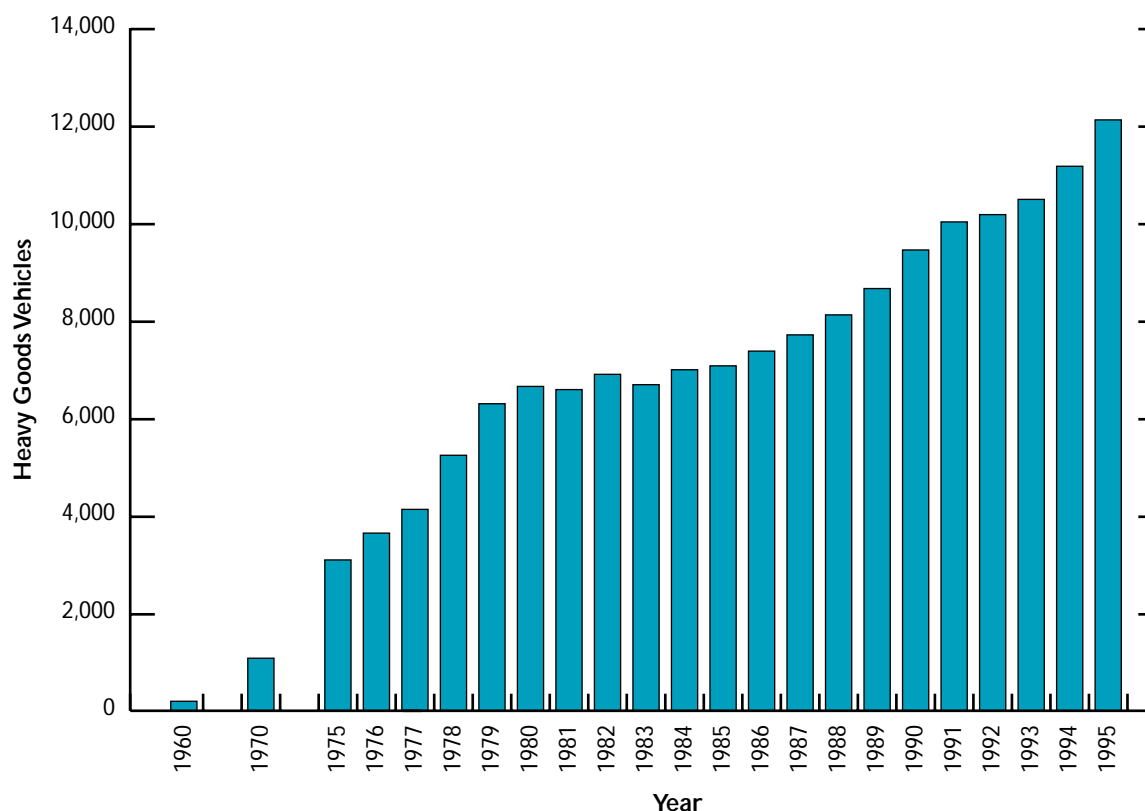
Source: Department of the Environment, *Irish Bulletin of Vehicle and Driver Statistics 1995*, p. 4.

Per head of population, the Irish road network is extensive compared with other European countries at just over 26 km per thousand persons, 92,300 km in total. Public roads are classified into three broad categories; national primary and secondary roads, regional roads and local roads.

With the increases in economic growth in recent years, there has been a continuous increase in the total number of motorised vehicles using the

road network. This has caused serious traffic congestion in certain urban areas and has contributed to noise and air pollution. Sustainable transport policies require that unnecessary movement is minimised with greater efficiency in transport arrangements. The challenge is to break the link between economic growth and increased transport requirements so that transport does not contribute inordinately to environmental problems.

Table 30 Heavy Goods Vehicles



Source: Department of the Environment.

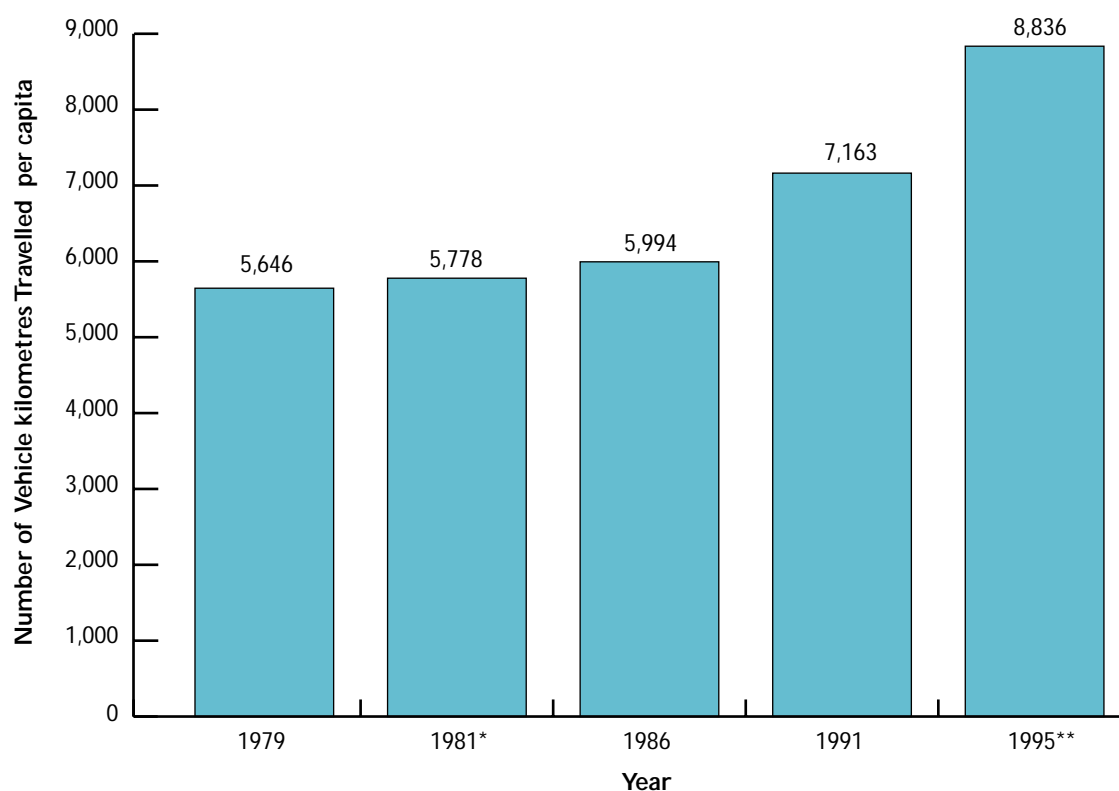
The number of Heavy Goods Vehicles (HGVs) on Irish roads has increased substantially over the last 35 years. From a low level of 195 in 1960, the number of HGVs has grown on average by over 12% *per annum* over the period 1960 to 1995 with a total fleet of some 12,116 in 1995.

89% of all freight traffic is carried on the road network. HGVs required for bulk freight transport impose major demands on road network. It has

been estimated that the effect of one HGV on the road infrastructure is equivalent to 10,000 cars.

The age of the national goods vehicle fleet is relevant in considering pressure on the environment. At 31 December, 1995, 66% of all goods vehicles were 4 years old and over. Mandatory roadworthiness testing is now in force for commercial vehicles.

Table 31 Ratio of Road Travel to Population



* 1981 ratio based on 1981 Census figure and 1980 road travel in million vehicle kilometres.

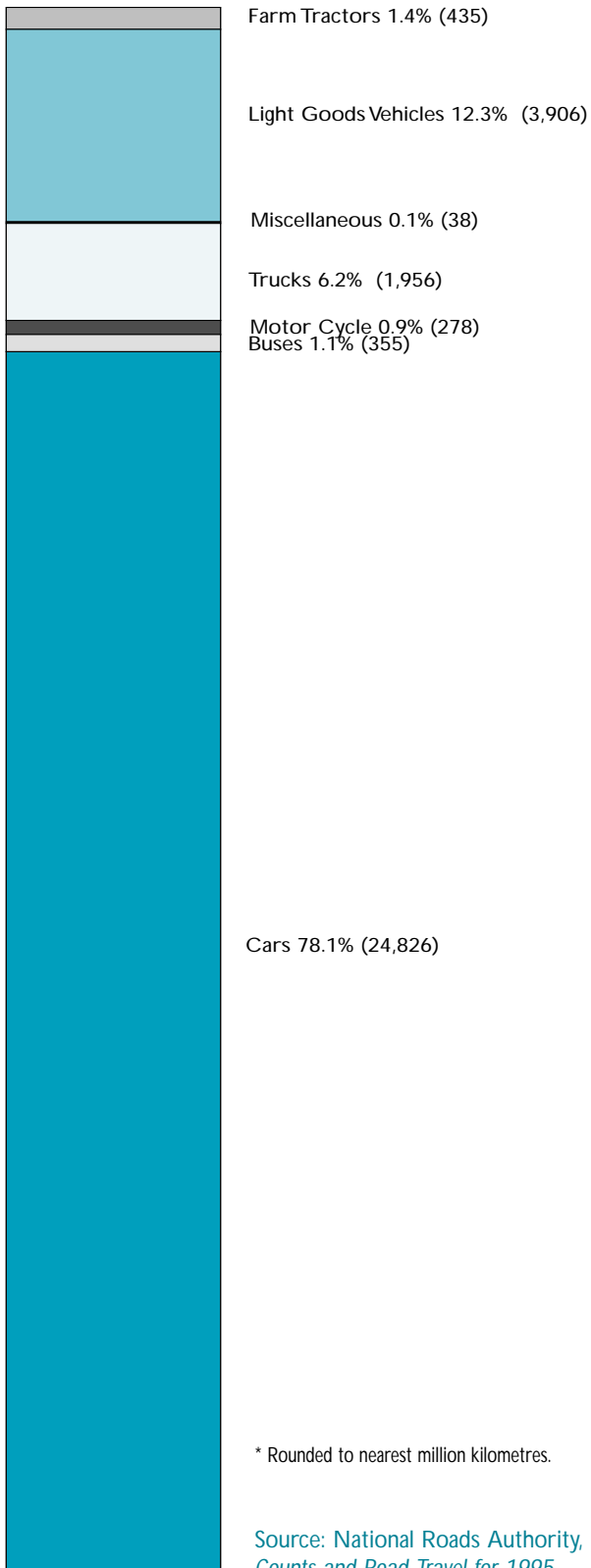
** 1995 ratio based on population estimate for 1995 contained in 1996 Labour Force Survey.

Source: National Roads Authority, *Traffic Station Counts and Road Travel for 1995*, p.12 and CSO, *Census 96 (Planning for the Ireland of tomorrow) - Preliminary Report*.

Transport growth in Ireland is concentrated on the roads. Economic growth, rising disposable incomes and an increased emphasis on personal mobility have all contributed to the increasing traffic. Irish car ownership is around 27 cars per 100 people, reflecting increases in private car numbers of over 5.3% in 1994 and 5.5% in 1995. While still below the EU average of 43 cars per 100 people, the Irish figure has increased from 22 cars per 100 people in 1989.

Growth in traffic volume is reflected in vehicle kilometres of road travel. Measured *per capita*, this increased from some 5,990 km in 1986 to over 8,800 km in 1995, an increase of 47%. Accelerating growth exacerbates transport pressures on the environment, making precautionary environmental measures more urgent.

Table 32 Estimated Millions of Vehicle Kilometres* of Travel in Ireland, 1995

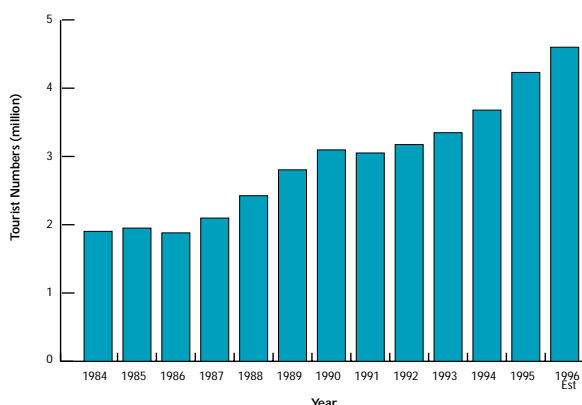


Estimates of vehicle kilometres of travel in Ireland in 1995 are classified by vehicle type in the chart across. Car transport accounts for the largest percentage of vehicle kilometres travelled. In contrast, buses account for just over 1% of vehicle kilometres travelled. Roads account for 89% of all freight transport and 96% of all passenger transport.

* Rounded to nearest million kilometres.

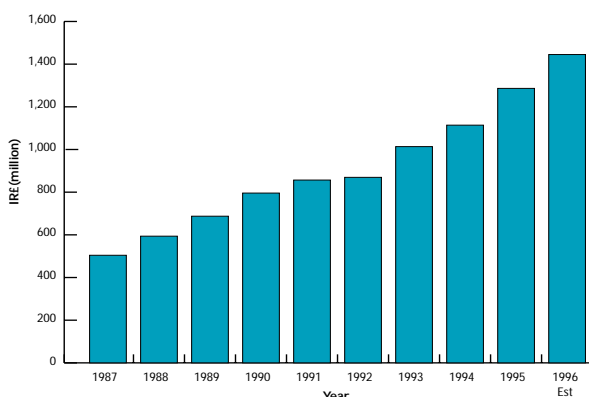
Source: National Roads Authority, *Traffic Station Counts and Road Travel for 1995*.

Table 33(1) Overseas Tourist Numbers



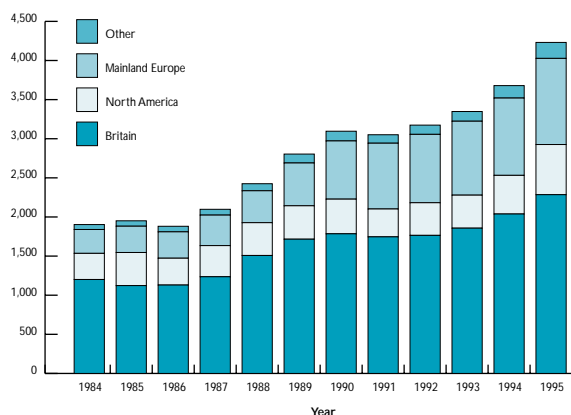
Trends in tourism revenue and numbers have been increasing significantly over recent years. Total earnings from both overseas and domestic tourism showed strong growth between 1985 and 1995, increasing at a rate of over 9% *per annum*. The high rate of growth continued in 1996; preliminary overseas visitor numbers are estimated to have increased by 10% to 4.6 million and earnings from overseas tourists are estimated to have reached £1.45 billion. Employment in the industry was forecast to rise to 107,000 in 1996, an increase of over 5,000 on the previous year. Tourism now employs over 8% of the total working population and is one of the most important sectors of the national economy.

Table 33(2) Overseas Tourism Revenue



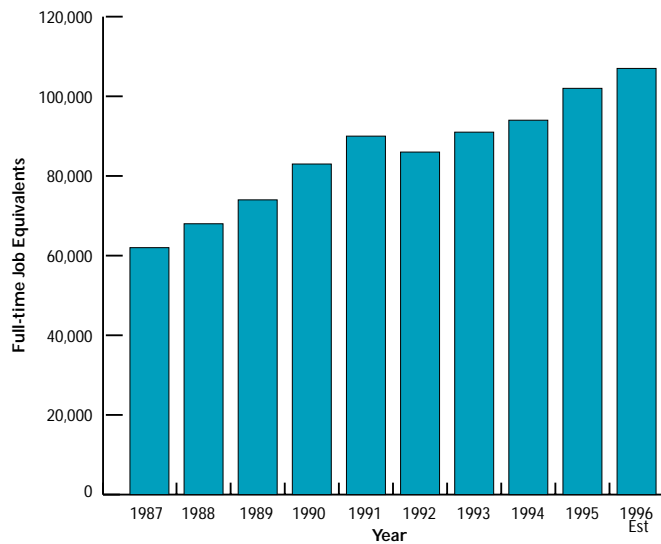
Tourism has been identified by the Government as a major source of continued economic growth for the coming years. To ensure sustainable tourism, Ireland must be able to develop the tourist sector while protecting, and where possible, enhancing the environment. With overseas tourist figures exceeding the resident population from 1994 on, policy now focuses on increasing the revenue value of tourism rather than the number of tourists.

Table 33(3) Overseas Tourists by origin



Source: Bord Fáilte, *Markets, 1991-1995, Perspectives on Irish Tourism*.

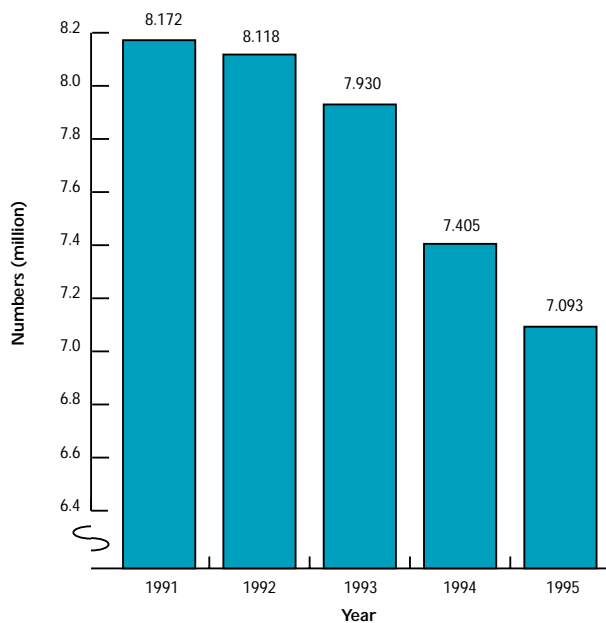
Table 34 Employment Sustained by Tourism (full-time job equivalents)



Tourism provides around 8% of national employment, at some 102,000 full-time equivalent jobs in 1995, with 107,000 forecast for 1996 and 110,000 being forecast by end-1997. The *Operational Programme for Tourism, 1994-1999* is expected to deliver an additional 35,000 full-time job equivalents by 1999. It is likely, however, that these figures are an underestimation of the total employment impact of the tourism sector, as many jobs which are supported by tourism (e.g. in the retail and leisure sectors) are recorded elsewhere in the statistics. Tourism is a growing force for employment; the additional 30,000 tourism-related jobs created between 1987 and 1994 represented half of the net increase in employment in that period.

Source: Bord Fáilte, *Developing Sustainable Tourism, Tourism Development Plan, 1994-1999*, and Bord Fáilte, *Annual Report and Accounts, 1994 and 1995*.

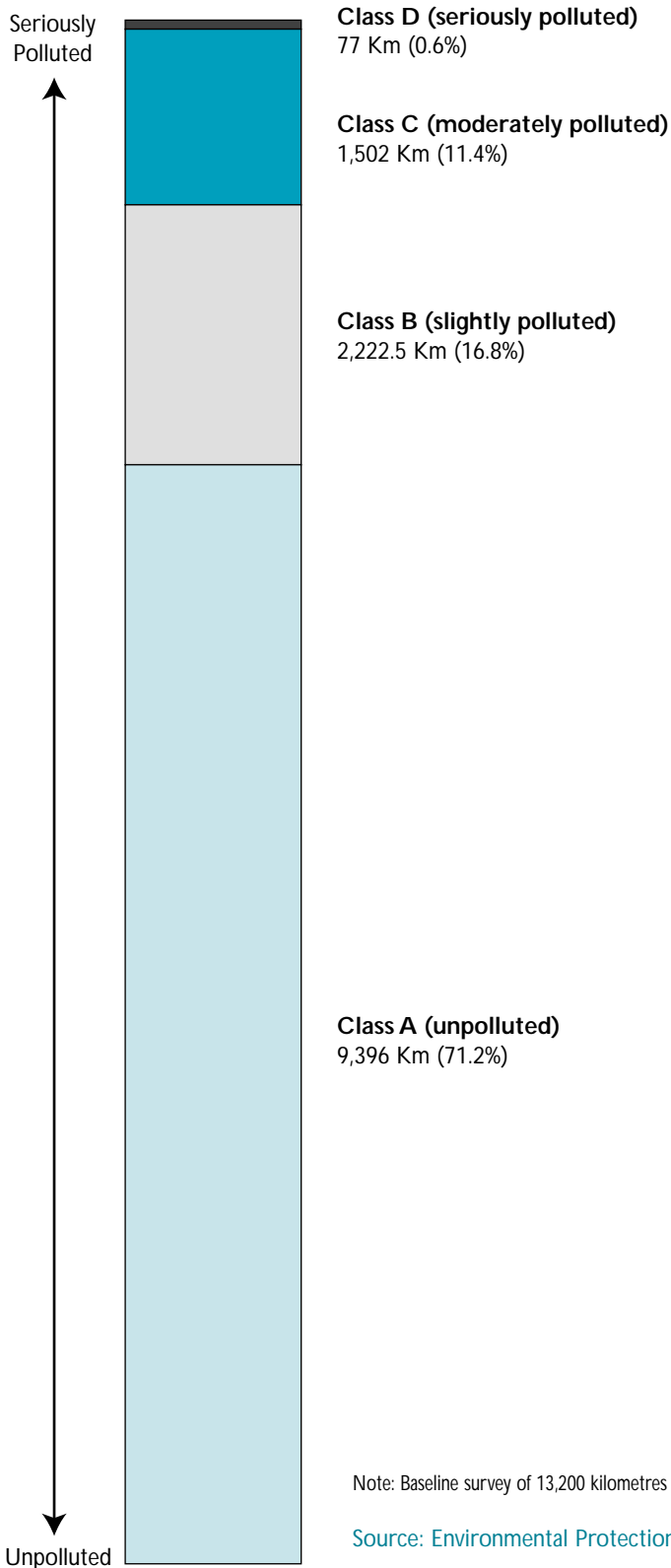
Table 35 Domestic Tourism Numbers



Over the last number of years, domestic tourism numbers have declined in terms of tourist trips. In 1995, domestic tourism numbers were just over 7 million, a drop of over 300,000 on 1994 figures. However, increases in overseas tourism numbers have more than offset the domestic decline and hence, a focus must be maintained on optimisation, taking account of environmental, social and economic considerations.

Source: Bord Fáilte, *Annual Report and Accounts, 1995*.

Table 36 River Water Quality (recent trends)

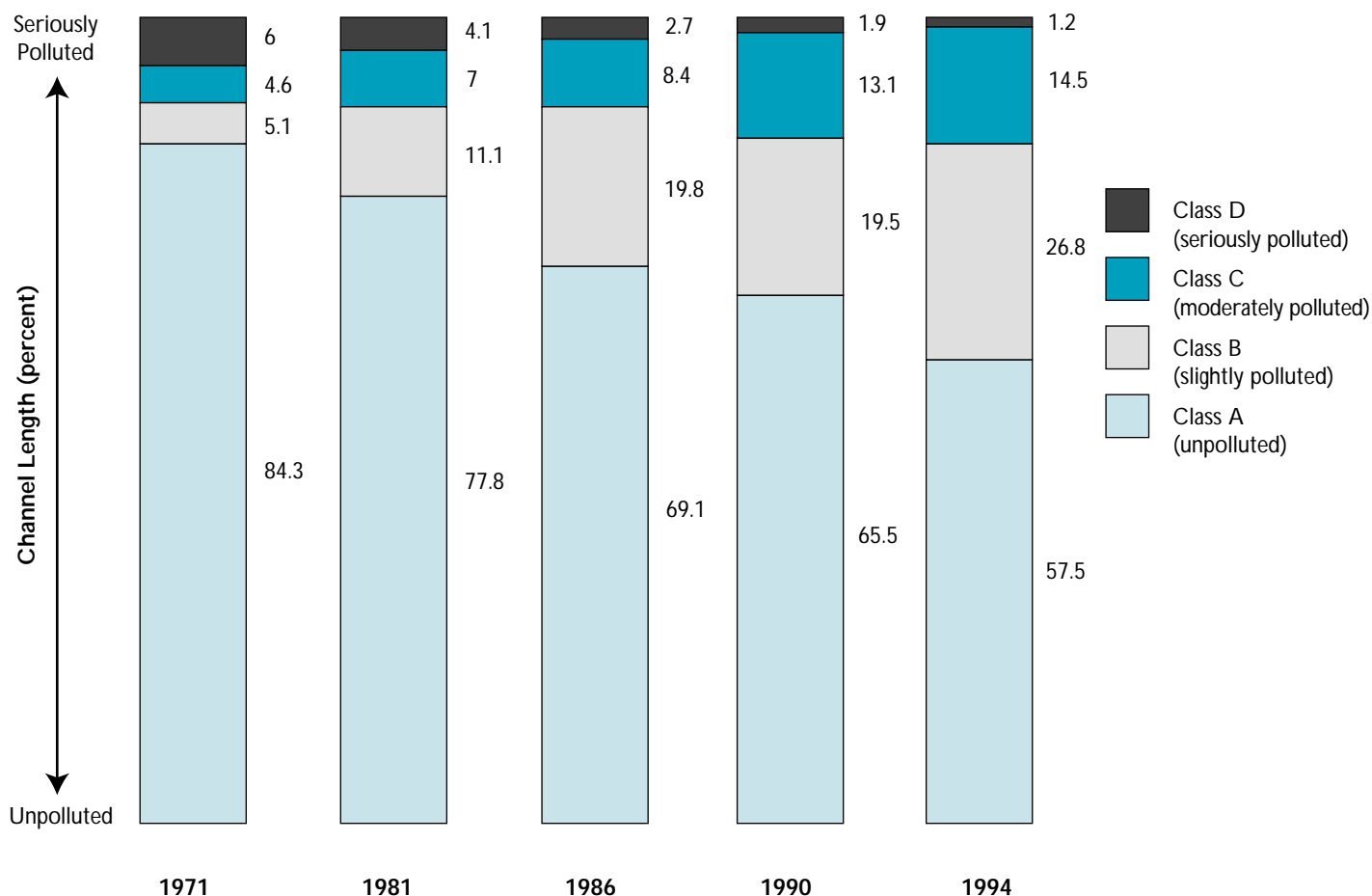


Detailed data on Irish water quality and trends are contained in *Water Quality in Ireland, 1991-1994*. These indicate that the bulk (71.2%) of river channel surveyed is unpolluted; 3724.5 km (28%) is slightly or moderately polluted and 77 km (0.6%) is seriously polluted. As might be anticipated, the most seriously polluted channels are located in the more densely populated and intensively farmed locations within the country. Serious pollution is most evident in the eastern region with more than half of the surveyed channel length slightly or moderately polluted. The Cavan/Monaghan area registered 44.1% of channel either slightly or moderately polluted whereas, in contrast, the Donegal/Sligo region (9.1%) and the southern region (13.1 %) show lower levels of pollution.

Note: Baseline survey of 13,200 kilometres of channel length, 1991-1994

Source: Environmental Protection Agency, *Water Quality in Ireland, 1991-1994*.

Table 37 River Water Quality (long-term trends)



Note: Long-term trend based on surveys carried out on 1971 baseline of 2,900 km (percentage of channel length in four biological quality classes)

Sources: 1971 data - Flanagan & Toner, 1972; 1981 data - Clabby et al, 1982; 1986 data - Toner et al, 1986; 1990 data - Clabby et al, 1992; 1994 data - Environmental Protection Agency, *Water Quality in Ireland, 1991-*

2,900 km of rivers/streams were surveyed in 1971 and this baseline has been re-examined at regular intervals since to assess the long term trend in river quality. There is a continuing decline in the length of Class A waters (unpolluted) from 84% of the total surveyed in 1971 to 57% in the most recent 4 year review undertaken by the EPA. There is also a significant decline in

the length of channel which is affected by serious pollution; this has been reduced from 6% of surveyed channel in 1971 to less than 1% in the 1991-1994 survey. However, there is a five-fold increase in slightly polluted channel and a three-fold increase in moderately polluted channel over the period since 1971.

Table 38(1) Lake Water Quality

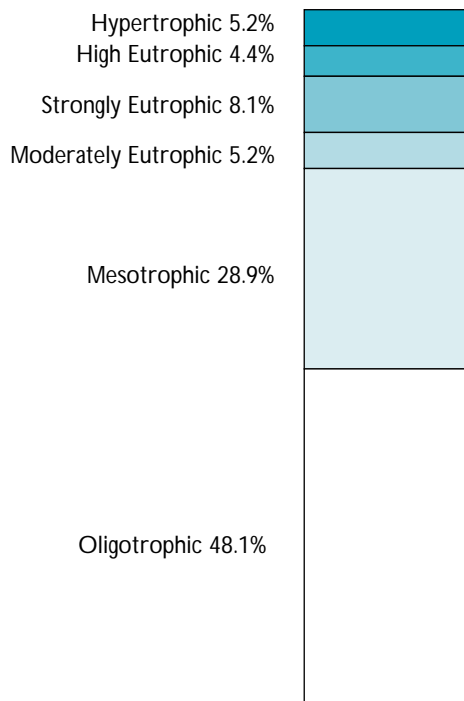
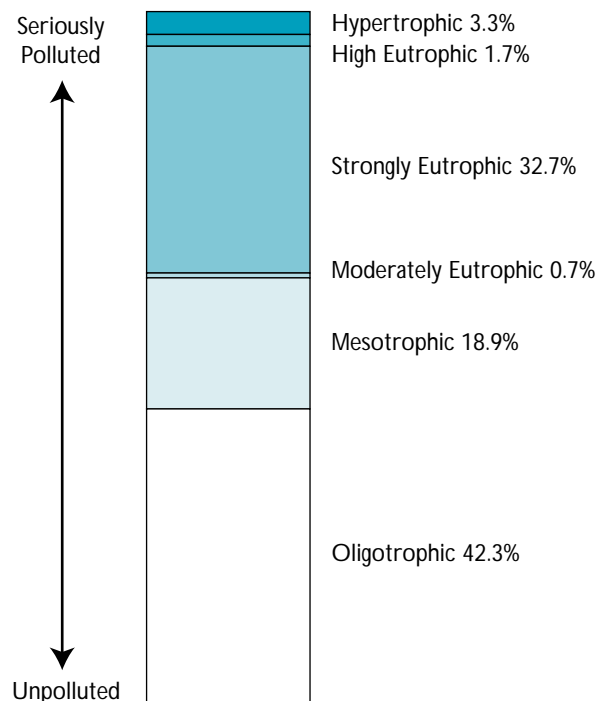


Table 38(2) Lake Water Quality (by surface area)

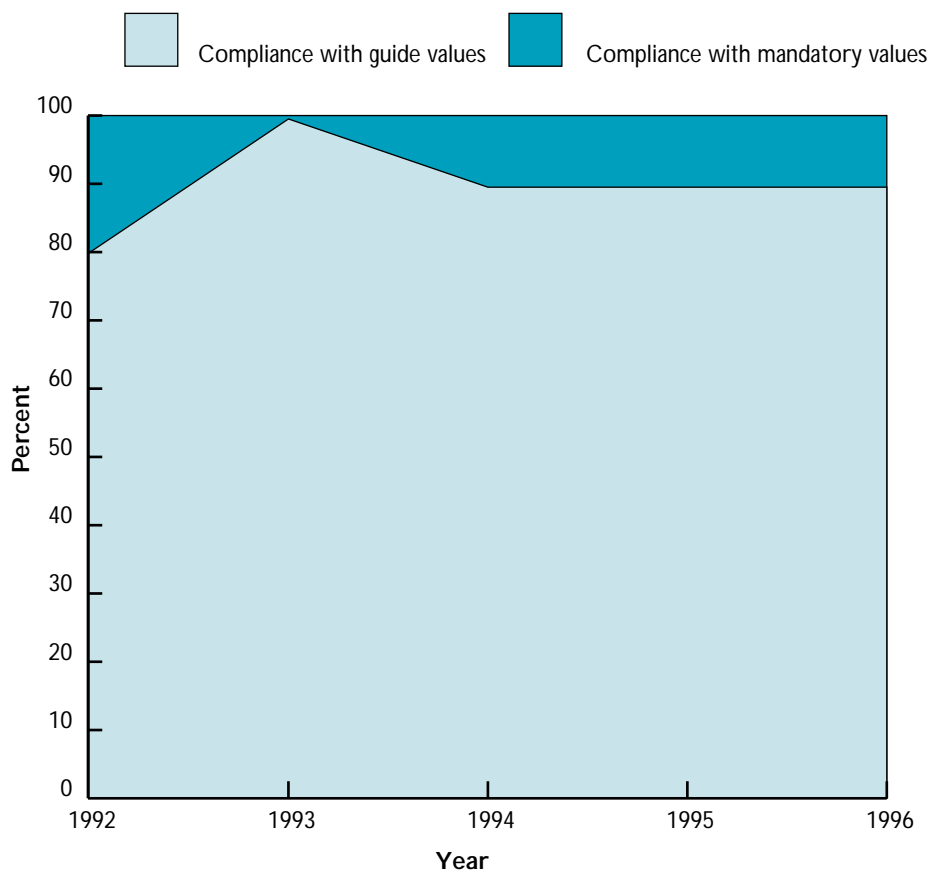


Source: Environmental Protection Agency, *Water Quality in Ireland, 1991-1994*.

Of 135 lakes examined in the EPA Water Quality Survey, 104 are classed oligotrophic or mesotrophic (i.e. unpolluted), 7 are moderately eutrophic, 11 are strongly eutrophic, 6 are highly eutrophic and 7 are hypertrophic (seriously polluted). The highest incidence of identified pollution was in the north-midlands where 16 of 47 lakes surveyed were polluted to some extent. In contrast, most lakes in the west and the majority elsewhere in the country (80%) were unpolluted. Non-point agricultural waste sources are

of major significance in the pollution of lakes in Ireland but in several cases point source discharges of sewage or industrial waste waters are implicated. Water quality in Loughs Ennel, Leane and Muckno has been improved through phosphorus removal at sewage plants discharging into the lakes. An integrated catchment management initiative will now be implemented to reverse deteriorating water quality trends in selected catchments.

Table 39 Bathing Water Quality Monitoring Results (Freshwater Bathing Areas)



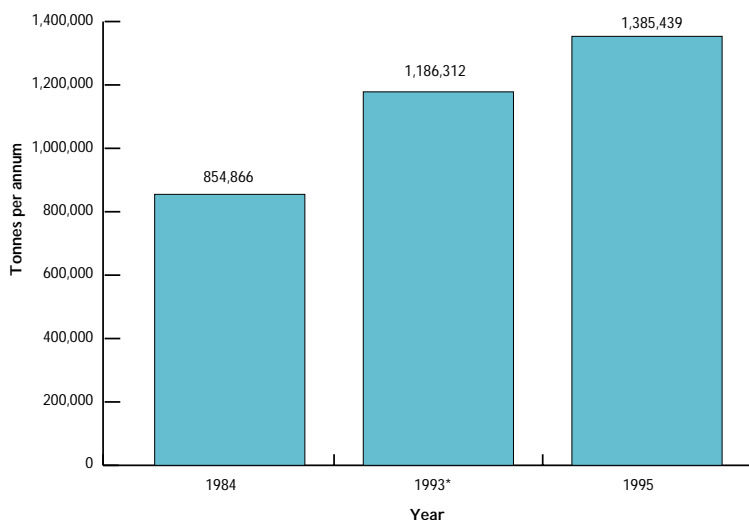
Note: For the 1991-1995 period, the parameters for which the compliance rate is calculated are total coliforms and faecal coliforms. For 1996, the parameters for which the compliance is calculated are total coliforms, faecal coliforms, mineral oils, surface active substances and phenols.

Source: Environmental Protection Agency, *Report to the European Commission on the Quality of Bathing Waters in Ireland for the 1996 Bathing Season*, p. 5.

The number of inland bathing areas designated and sampled in 1996 remained at nine. All inland water bathing areas complied with the mandatory values for total coliforms, faecal coliforms, mineral oils, surface active substances

and phenols in the 1996 bathing season. Eight of the nine areas (88.9%) also complied with the guide values of Council Directive 76/160/EEC for these parameters.

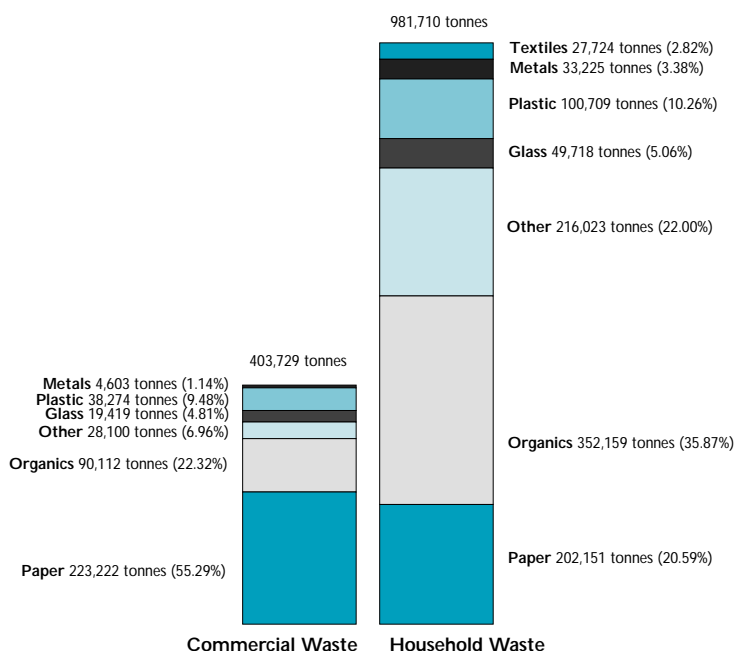
Table 40(1) Household and Commercial Waste collected by, or on behalf of Local Authorities (Landfilled)



* The figure for 1993 is that reported by local authorities for household and commercial waste collected.

The table across indicates trends in household and commercial waste arisings, and suggests an increase of over 62% in eleven years, equivalent to just under 4.5% *per annum*. Trends in municipal waste arisings have been difficult to establish due to the differing methodologies used to gather waste statistics. Total municipal waste collected in 1995, including household and commercial waste collected for recycling as well as street cleansing waste, has been estimated at 1,549,962 tonnes. Actual household waste arisings are greater, however, than the volume collected as a collection service is not provided to 100% of the population. When adjusted in this regard, actual municipal waste arisings for 1995 are estimated at 1,848,232 tonnes. Apparent increases in municipal waste volumes are, to some extent, a function of better reporting methods over time. The *National Waste Database Report* suggests that the figure for actual household waste arisings (estimated to be 1,324,521 tonnes in 1995) should be considered as a benchmark for future comparisons.

Table 40(2) Quantities and Composition of Waste in 1995

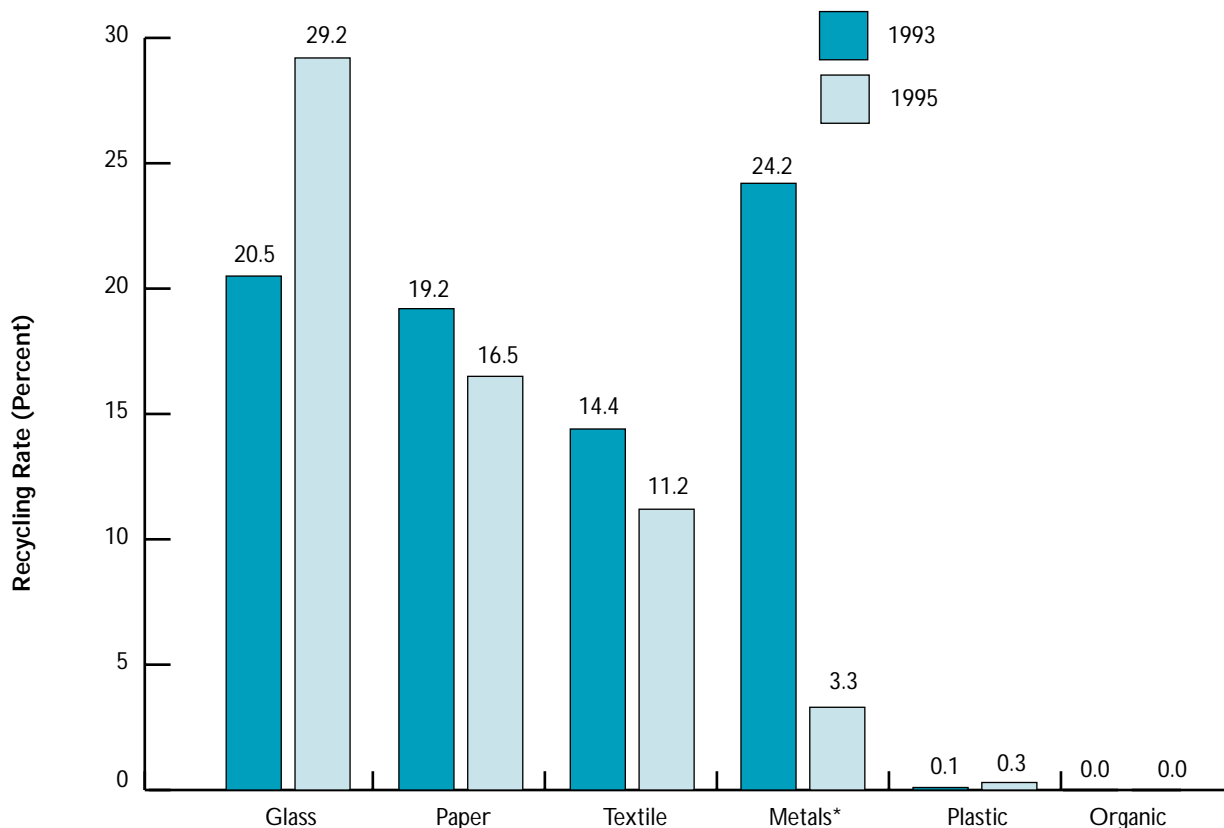


It is estimated that 403,729 tonnes of commercial waste were collected by, or on behalf of, local authorities in 1995. The table across illustrates the composition of this waste.

It is estimated that 981,710 tonnes of household waste were collected by, or on behalf of, local authorities in 1995. The table illustrates the composition of this waste.

Source: Environmental Protection Agency, *National Waste Database Report, 1995*.

Table 41 Recycling Rates for Materials Recovered from the Household and Commercial Waste Stream



*Scrap metal was excluded from commercial waste stream in 1995.

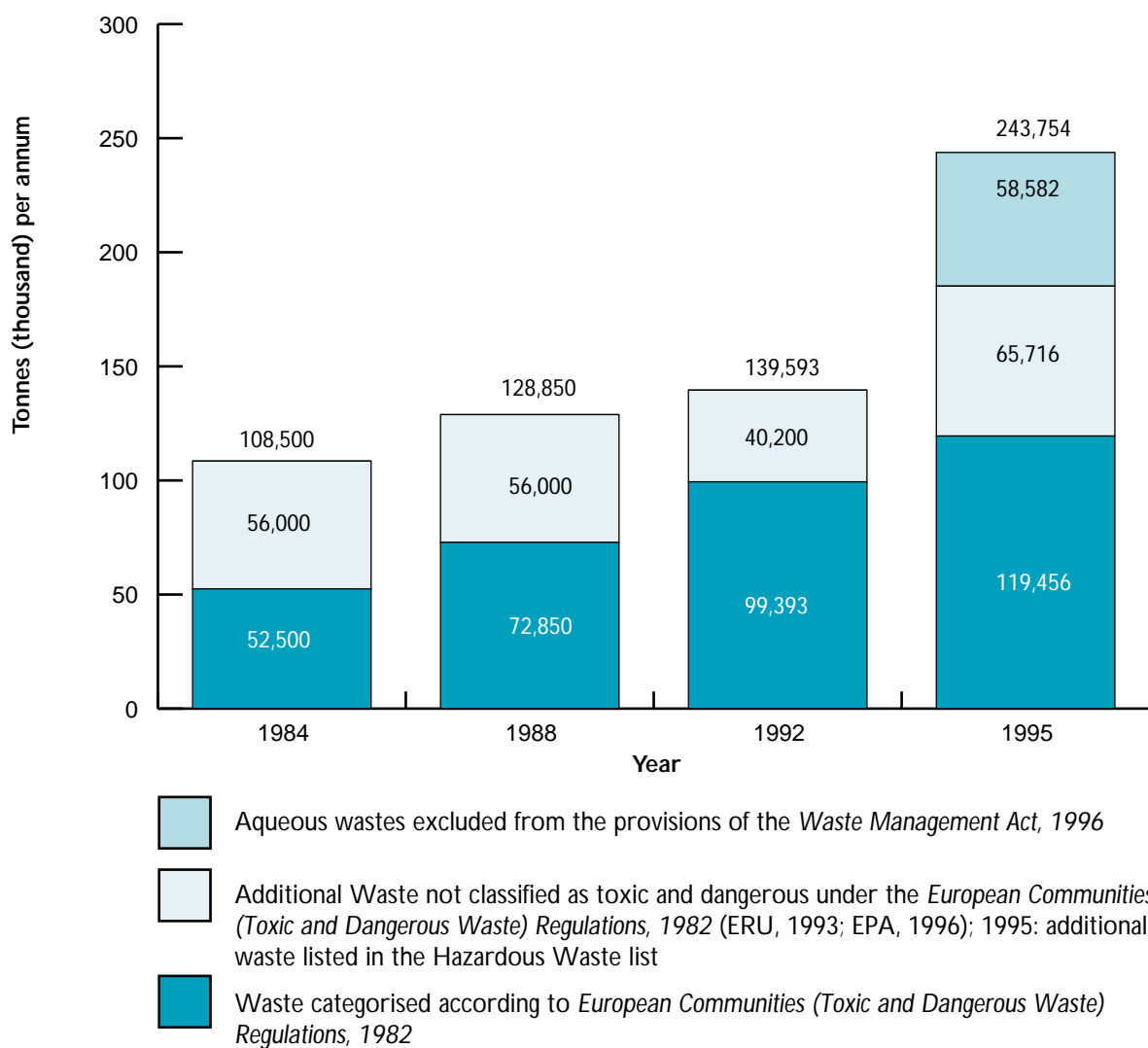
Source: Environmental Protection Agency, *National Waste Database Report, 1995*, p. 68.

In 1993, 92.6% of the household and commercial waste stream was landfilled and 7.4% was recycled. For household waste alone, 1.4% was recycled with the balance landfilled. The recycling rate for commercial waste was much higher at 14.5%. The figures for 1995 indicate that the overall recycling rate for household and commercial waste had risen to 10.4%, with 4.3% of household waste and 15.3% of commercial waste recycled. With regard to the 15.3% commercial recycling rate, it should be noted that tonnages for commercial waste recycled and landfilled in 1995 were lower than those reported for 1993 and that different methods were used to estimate commercial waste arisings and per cent recycled for the two years. Scrap metal was included as

part of the commercial waste stream in 1993 and it is now considered that this material is better classified as part of the industrial waste stream. With scrap metals excluded from the commercial waste stream, the national recycling rate for the household and commercial waste stream for 1995 is 7.8%.

This Strategy includes among its objectives a stabilisation and reversal of the growth in waste production, and intensification of reuse and recycling activity so that 20% of municipal waste is diverted from landfill by recycling by 1999. Higher targets will be established for subsequent years, including an increase from 27% to at least 50% in the recovery rate for packaging waste by 2005.

Table 42 Estimated Hazardous Industrial Waste Arisings

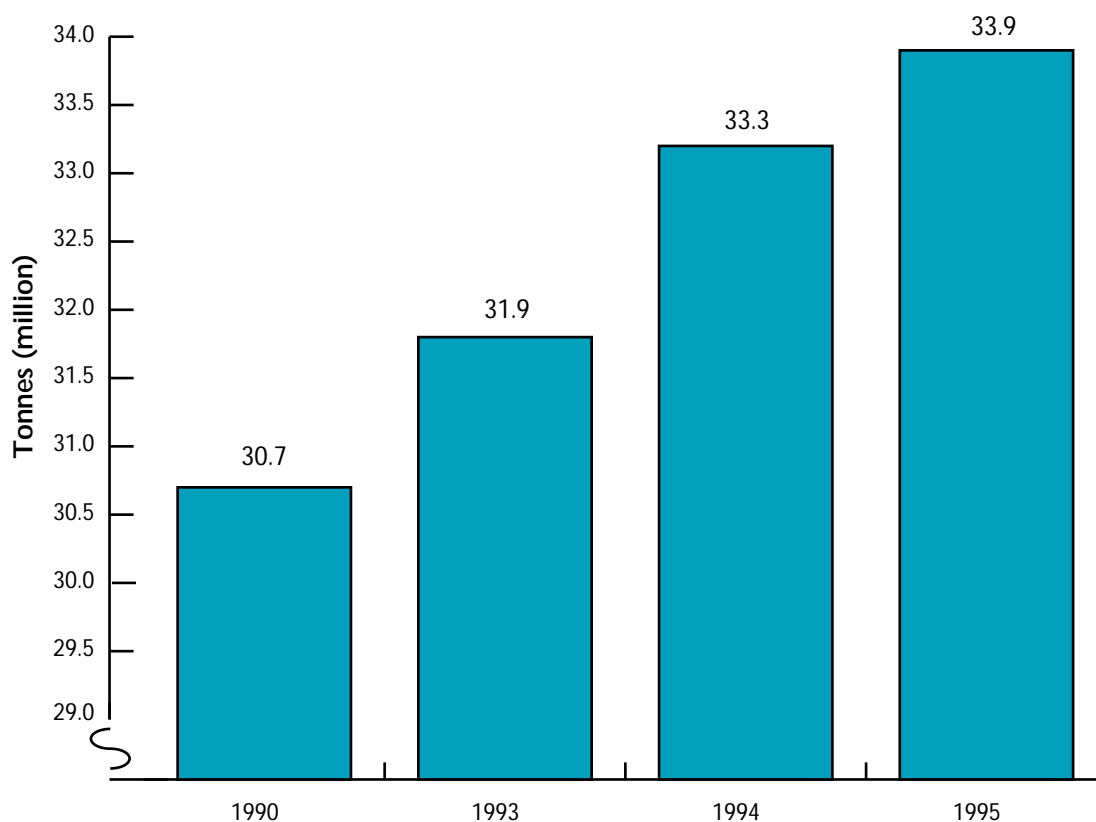


Source: Environmental Protection Agency, *National Waste Database, 1995*, pp. 70-71.

The above table illustrates estimated hazardous waste arisings. Surveys in 1984, 1988, and 1992 show a rising trend in waste regulated under the *European Communities (Toxic and Dangerous Waste) Regulations, 1982*. Figures for other wastes are not directly comparable due to changing definitions. The 1995 figures relate to wastes listed in the European Hazardous Waste List (94/904/EC). These figures cover wastes classifiable under the Toxic and Dangerous Waste Regulations, wastes not classifiable under the Regulations and aqueous wastes not included in the provisions of the *Waste Management Act, 1996*, as they are covered by other legislation.

Of reported hazardous waste arisings, 57.4% is disposed by various routes, with incineration and biological treatment being the main disposal routes. The recovery rate for reported hazardous waste arisings is 42.5%. Over 90% of hazardous waste is treated in Ireland with 78.2% treated on-site and 12% treated off-site. As a percentage of total reported industrial waste in 1995, hazardous industrial waste represents 3.79%. As a percentage of total waste in 1995, hazardous waste represents 3.18%. By far the greatest quantity of hazardous waste, as defined by the hazardous waste list, arose in the chemicals, chemical products and man-made fibre sector (88.4%).

Table 43 CO₂ Emissions

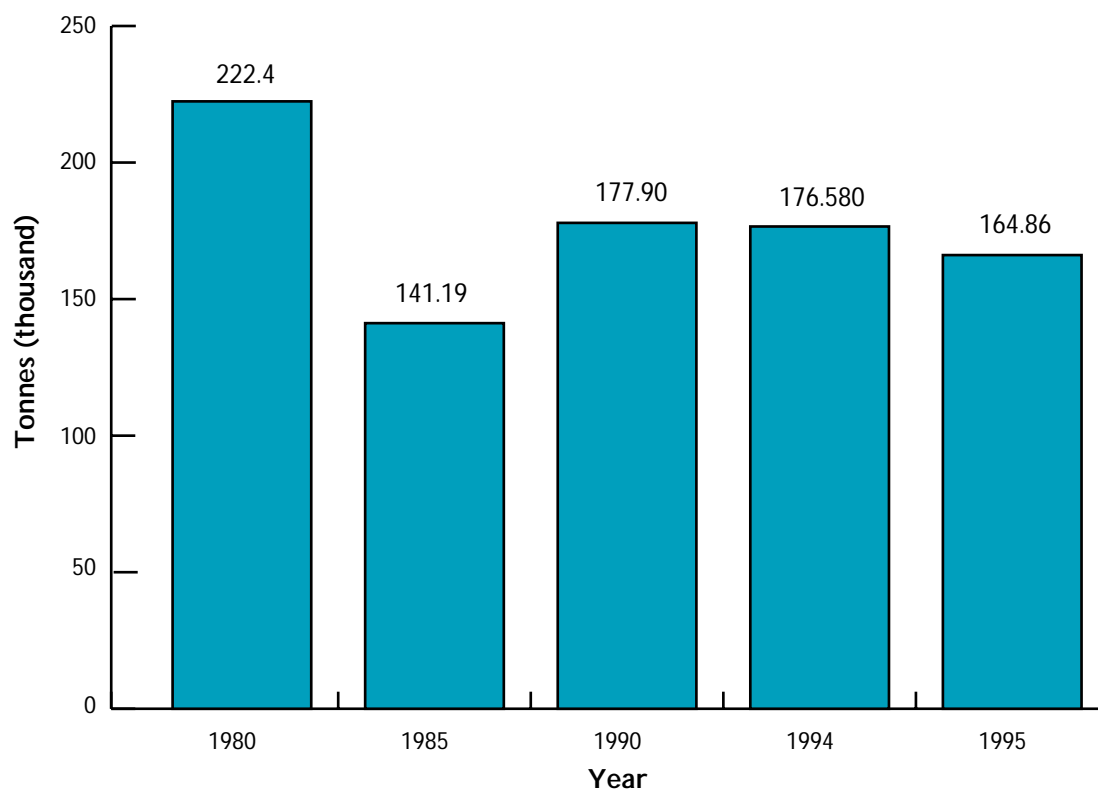


Source: Department of the Environment/Environmental Protection Agency

Carbon dioxide (CO₂) is the main gas generated by human activity which contributes to climate change. CO₂ arises principally as a result of the burning of fossil fuels in the energy and transport sectors. The above chart represents the increase in CO₂ emissions in the 1990s. A national climate change/CO₂ abatement strategy was published by the Department of the Environment in 1993. It sets the objective of limiting the growth in CO₂ emissions to 20% above their 1990 levels (a net increase of 11% when the

estimated growth in carbon fixation by expanded afforestation is taken into account). It is now projected that CO₂ emissions in the year 2000 will be less than this target.

Negotiations are currently taking place under the auspices of the Framework Convention on Climate Change to strengthen the Convention commitments in respect of greenhouse gases, including CO₂, in the post-2000 period.

Table 44 SO₂ Emissions

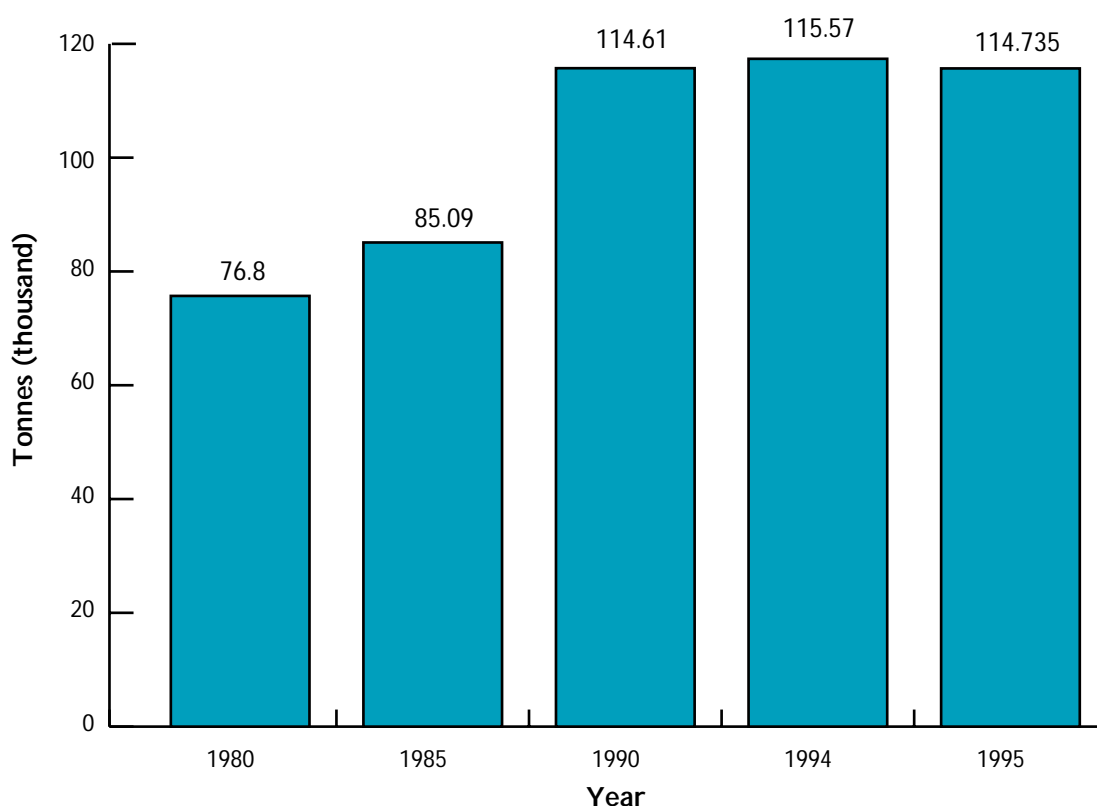
Source: Environmental Protection Agency

Sulphur dioxide (SO₂) can have adverse effects on human health, vegetation, materials and cultural heritage. Emissions of SO₂ are produced when fossil fuels containing sulphur are burnt. Electricity generation is the principal source of SO₂. Coal and oil produce varying amounts of SO₂ while gas produces little. Emissions of SO₂ decreased by approximately 25% over the period 1980 to 1995. This has mainly been achieved as a result of a switch to low sulphur fuels in the energy and industrial sectors, the reduction in fuel oil combustion in industry and the conver-

sion of solid fuel heating systems in private dwellings to gas or oil fired systems.

Under the *Second Sulphur Protocol to the Convention on Long Range Transboundary Air Pollution*, which Ireland has signed, national emissions of SO₂ should be reduced to 157,000 tonnes from the year 2000 onwards (i.e. a reduction of 30% on 1980 levels). Ireland will ratify the Second Sulphur Protocol in 1997.

Table 45 **NO_x Emissions**

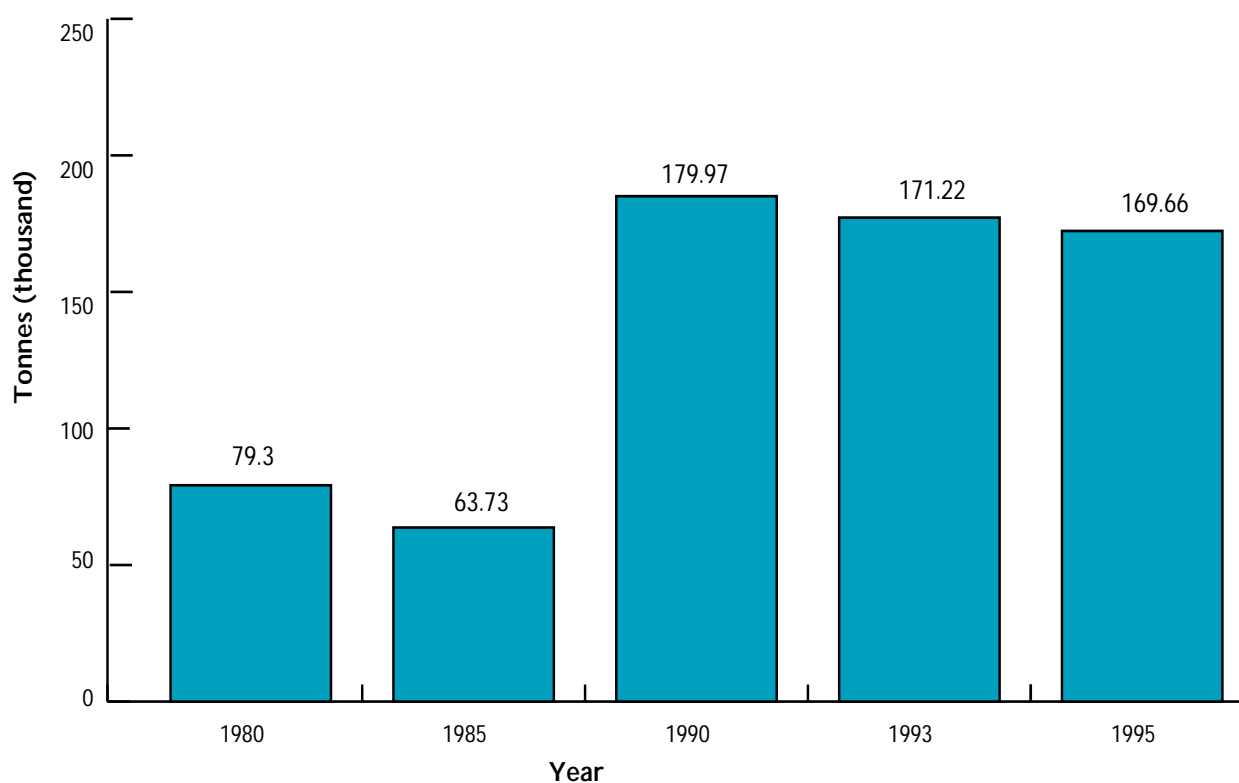


Source: Environmental Protection Agency

Nitrogen Oxides (NO_x) include two gases - nitric oxide (NO) and nitrogen dioxide (NO₂). Electricity generation and transport are the main sources of NO_x through high temperature combustion. Short term exposure to very high concentrations of NO₂ can result in adverse affects on the respiratory system while both NO and NO₂ contribute to acid rain and the formation of ground level ozone. NO_x emissions have increased by some 49% between 1980 and 1995,

but abatement strategies are now starting to show results. Under the Sofia Protocol, signed in 1988, Ireland was required to stabilise NO_x emissions at 105,400 tonnes from 1994 onwards. A revised protocol based on the critical loads approach is under negotiation and will require further NO_x reductions after 2000. Ireland will work towards the achievement of the emission standards now being developed at UN ECE and EU level.

Table 46 VOC Emissions

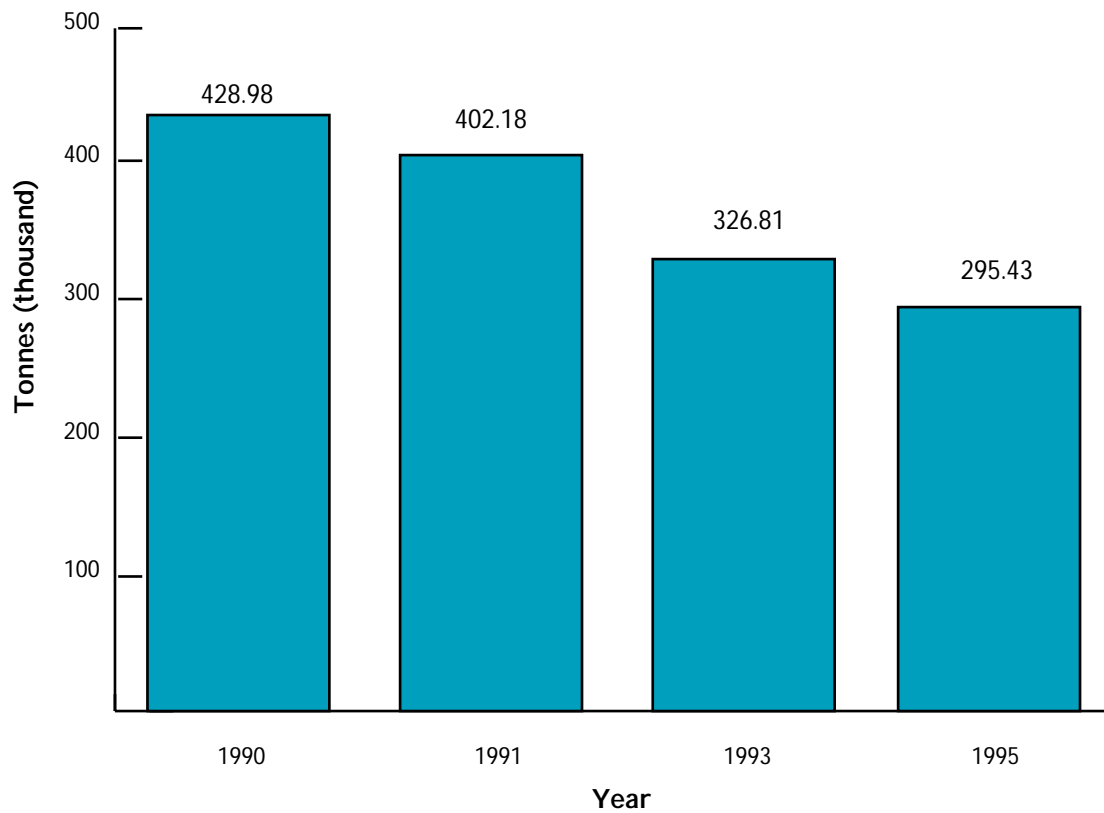


Source: Environmental Protection Agency

Volatile Organic Compounds (VOCs) are a primary air pollutant. The term VOC encompasses a wide range of reactive hydrocarbons and analogous compounds. VOCs include the aromatics, such as benzene, which is added to high octane unleaded petrol. The principal sources of VOCs have been identified as road traffic, petroleum distribution and the evaporation of solvents, emissions which principally have local or regional effects. Existing information indicates that industry emits limited quantities of VOCs

mainly from the use of solvents. However, the Environmental Protection Agency has noted that emissions of VOCs from a range of industrial processes have not yet been reliably quantified. Combined with NO_x , VOCs form low level ozone which is damaging to both human and crop health. An investigation of VOC and PM_{10} in Dublin is being funded under the R&D Sub-programme of the *Operational Programme for Environmental Services, 1994-1999*.

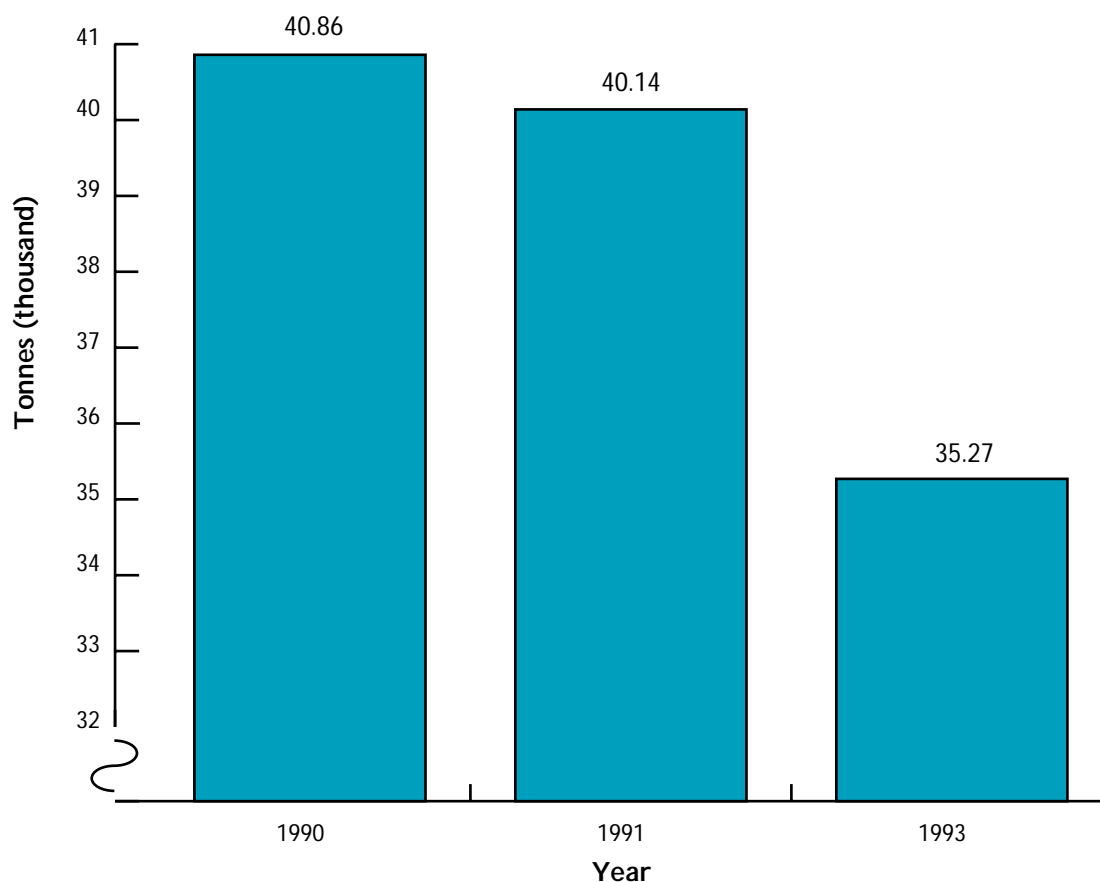
Table 47 CO Emissions



Source: Environmental Protection Agency

Carbon monoxide (CO), one of the major air pollutants, is a threat to human health. Emissions arise mainly as a result of the use of motor vehicles, with lesser amounts arising from residential and commercial combustion. Existing data indicate that industry emits limited quantities of this

pollutant. The effects of CO are principally local and regional. An EU Framework Directive on air quality has been adopted; it will be followed by subsidiary Directives which will specify air quality standards for a number of pollutants, including CO.

Table 48 **Smoke Emissions**

Source: Environmental Protection Agency, *Air Pollutants in Ireland - Emissions, Depositions and Concentrations, 1984-1994*.

Smoke emissions have been reduced in the course of the 1990s. Apart from transport, the major threat to urban air quality has been the burning of coal for domestic heating purposes. Serious smoke pollution in Dublin led to the ban of the sale, marketing and distribution of bituminous coal in the built up area of Dublin. A simi-

lar ban was extended to the Cork City area when it became clear that smoke emissions were approaching, though not exceeding, air quality standards. Concentrations of smoke have declined with the introductions of the bans in each city.



Appendix II

List of those who made submissions as part of the Public Consultation Process on the Strategy

Animal and Plant Health Association	Mr Rory Donegan, Dublin 7
An Taisce Economic Policy and International Group	Dublin Regional Authority
An Taisce West Cork	Earthwatch/Friends of the Earth Ireland
Association of Consulting Engineers of Ireland	Fehily Timoney Weston, Cork
Bahá'í Information Office, Dublin 4	Mr Tom Finn, Tralee, Co Kerry
Ballylickey Tourist and Development Association, Co Cork	Ms Kathleen Gibbons, Portumna, Co Galway
Mr Noel J Brady, Architect, Dublin 6	Global Action Plan Ireland
Mr Tony Carey, Enniskerry, Co Wicklow	Greenpeace Ireland
Ms Maeve Clarke, Douglas, Cork	IBEC - Irish Mining and Exploration Group
Clean Technology Centre, Regional Technical College, Cork	The Inland Waterways Association of Ireland
Conference of Religious of Ireland Justice Office	Irish Hydro Power Association
Cork Environmental Alliance Ltd	Irish Landscape Institute
Mr R V Cortlandt Herbst, Castlegregory, Co Kerry	Irish Wildbird Conservancy
K T Cullen and Co Ltd, Dublin 4	Irish Women's Environmental Network
Mr Thomas Cummins, Department of Environmental Resource Management, UCD	Irish Woodworkers for Africa
Cunnane Stratton Reynolds, Dublin 2	Keep Ireland Open
	Mr Donal Lamont, Dublin 18

Landscape Alliance Ireland

Mr Gerry O'Leary, Tralee, Co Kerry

Mr Paul Leech, Gaia Associates, Dublin 2

Dr Jim Parkes, Faraday Centre, Carlow

Leopardstown and Brewery Road Residents
Association Roads Committee, Co Dublin

Ms Anne Pender, Environmental Resource
Consultants, Dublin 9

Mr Brendan McGrath, Phibsborough, Dublin 7

Mr Nigel Pratt, Wicklow

Mr Ciarán Mannion, Minnesota Environmental
Initiative, USA

Mr John Sheils, John Barnett & Associates, Dublin 4

Mr John Markham, Greystones, Co Wicklow

Solid Fuel Industry Association

Mayo Regional Game Council

South-East Regional Authority

Mr Michael Newman, Kilbeggan, Co Westmeath

Mr Chris Southgate, Environment 2000 Ltd,
Dublin 4

Northern Regional Fisheries Board

Ms Hilary Tovey/Mr James Wickham, Department
of Sociology, TCD

Professor Dermot O'Connell, School of
Architecture, UCD

Ulster Wildlife Trust

Appendix III

References: PART II - Strategic Framework

Chapter 2 Overview

1. *A Government of Renewal: Policy Agreement between Fine Gael, Labour Party, Democratic Left*, (Dublin: Stationery Office, 1994), p. 25.
2. Larry Stapleton (ed.), *State of the Environment in Ireland*, (Wexford: Environmental Protection Agency, 1996); additional information from Department of the Environment.
3. The World Commission on Environment and Development, *Our Common Future*, (Oxford University Press, 1987), p. 8. ["by permission of Oxford University Press"]
4. *Agenda 21: Programme of Action for Sustainable Development - The final text of agreements negotiated by Governments at the United Nations Conference on Environment and Development (UNCED), 3-14 June, 1992, Rio de Janeiro, Brazil*, (New York: United Nations Publications, 1993).
5. The Treaty on European Union, as signed in Maastricht on 7 February, 1992, published as, Council of the European Communities & Commission of the European Communities, *Treaty on European Union*, (Luxembourg: Office for Official Publications of the European Communities, 1992).
6. Commission of the European Communities Directorate-General XI - Environment, Nuclear Safety and Civil Protection, *Towards Sustainability: A European Community Programme of Policy and Action in Relation to the Environment and Sustainable Development*, (Luxembourg: Office for Official Publications of the European Communities, 1993).
7. *Agenda 21*, p. 15.
8. European Environment Agency, *Environment in the European Union, 1995: Report for the Review of the Fifth Environmental Action Programme*, edited by Keimpe Wieringa, (Luxembourg: Office for Official Publications of the European Communities, 1995).
9. *ibid.*
10. *An Environment Action Programme*, (Dublin: Department of the Environment, 1990).
11. *An Environment Action Programme: 1st Progress Report*, (Dublin: Department of the Environment, 1991).
12. *Moving Towards Sustainability: A Review of Recent Environmental Policy and Developments*, (Dublin: Department of the Environment, 1995).
13. Report of the Industrial Policy Review Group, *A Time for Change: Industrial Policy for the 1990s*, (Dublin: Stationery Office, 1992).
14. *Green 2000 Advisory Group Report*, (Dublin: Stationery Office, 1993).
15. *EU Structural Funds: A Practical Guide*, (Brussels: Irish Business Bureau, 1995), p. 4.
16. Council of the European Communities, "Council Regulation No. 792/93 of 13 March, 1993" in *Official Journal of the European Communities*, No. L79/74, 1 April, 1993; and Council of the European Communities, "Council Regulation No. 1164/94 of 16 May, 1994" in *Official Journal of the European Communities*, No. L130/1, 25 May, 1994.
17. *Ireland: National Development Plan 1994-1999*, (Dublin: Stationery Office, 1993).
18. *Ireland Community Support Framework, 1994-99*, (Luxembourg: Office for Official Publications of the European Communities, 1994).
19. European Commission, *Growth, Competitiveness, Employment: The Challenges and Ways Forward into the 21st Century* (White Paper), (Luxembourg: Office for Official Publications of the European Communities, 1994), pp. 161-167.

Chapter 3 Overall Goals and Priorities

1. cf. *State of the Environment in Ireland*, p. 33.
2. David Stanners and Phillippe Bourdeau (eds.), *Europe's Environment: The Dobris Assessment*, (Copenhagen: European Environment Agency, 1995).
3. United Nations Environment Programme, *Global Environmental Outlook*, (New York: Oxford University Press, 1997).
4. William E. Rees, "Revisiting Carrying Capacity: Area-Based Indicators of Sustainability" in *Population and Environment: A Journal of Interdisciplinary Studies*, Vol. 17, Number 3, (Human Sciences Press, Inc., 1996), p. 205.
5. *ibid.*, p. 210.
6. Further work remains to be done to more accurately define Ireland's ecological footprint. This is particularly so in the light of a revised methodology incorporating additional factors and calculations, published in March 1997 [see Mathis Wackernagel *et al.*, *Ecological Footprints of Nations: How Much Nature Do They Use? -- How Much Nature Do They Have?*, (Mexico: Centro de Estudios para la Sustentabilidad, 1997), which suggests that all previous calculations significantly underestimated the size of ecological footprints.
7. As set out in *Moving Towards Sustainability*.
8. *Agenda 21*, p. 9.
9. cf. OECD, *Integrating Environment and Economy: Progress in the 1990s*, (Paris: OECD, 1996), pp. 21-23.

Chapter 4 Environment and Development

1. Central Statistics Office, *Census of Population of Ireland, 1996: Preliminary Report*, (Dublin: Stationery Office, 1996); Central Statistics Office, *1991 Census of Population - Detailed Report (Volume 2)*, (Dublin: Stationery Office, 1994); and Central Statistics Office, *Population & Labour Force Projections, 1996-2026*, (Dublin: Stationery Office, 1995).
2. Central Statistics Office, *1991 Census of Population - Detailed Report (Volume 1)*, (Dublin: Stationery Office, 1993).
3. *State of the Environment in Ireland*, pp. 146-159; Department of Agriculture, Food and Forestry, *Growing for the Future: A Strategic Plan for the Development of the Forestry Sector in Ireland*, (Dublin: Stationery Office, 1996), pp. 7-10.
4. *State of the Environment in Ireland*, p. 146.
5. *ibid.*, p. 147.
6. G. O'Sullivan, *A summary of uses of the CORINE land cover (Ireland) database* (Draft Report), (Dublin: Natural Resources Development Centre, Trinity College, 1995) cited in *State of the Environment in Ireland*, p. 146.
7. Figures supplied by CSO Data Service; see also *Shaping Our Future*, pp. 25-26, and *Economic Background to the Budget, 1997*, (Dublin: Department of Finance, 1997).
8. Forfás, *Shaping Our Future: A Strategy for Enterprise in Ireland in the 21st Century* (Summary Report), (Dublin: Forfás, 1996), p. 52.
9. Commission of the European Communities, *Economic Growth and the Environment: Some Implications for Economic Policy Making*, (Brussels: Communication from the Commission to the European Parliament and the Council, COM(94)465, 3 November, 1994); and European Commission, *Employment in Europe, 1995* [COM(95)361], (Brussels: Directorate-General for Employment, Industrial Relations and Social Affairs, 1995).
10. *Shaping Our Future*, p. 25.

11. *Economic Background to the Budget, 1997*, (Dublin: Department of Finance, 1997).
note: The seasonally adjusted standardised unemployment rate (live register) was 11.9% (281,700) at April 1996 [CSO, *Statistical Bulletin (December, 1996)*, (Dublin: Stationery Office, 1996)]. Pending a review of the methodology for estimating unemployment rates on a monthly basis, revised estimates have not been made for the period after April 1996. The seasonally adjusted live register figure was 259,500 for February 1997.
12. *Green 2000 Advisory Group Report*, pp. 45-52.
13. *Employment in Europe*, pp. 155-157.
14. *Prosperity through Competitiveness: IBEC's Strategic Policy Framework, 1996-2005*, (Dublin: Irish Business and Employers Confederation, 1996), pp. 8-9.
15. *Integrating Environment and Economy: Progress in the 1990s*, p. 10.
16. *Employment in Europe*, p. 146
17. See, for example, OECD, *Environmental Policies and Industrial Competitiveness*, (Paris: OECD, 1993).
18. Brian Hutchinson and David Dowe, *Cleaner Manufacturing Technologies in Ireland*, (Dublin: Department of the Environment, 1993).
19. *A Time for Change: Industrial Policy for the 1990s*, p. 94.
20. *Shaping Our Future*, p. 51.
21. *Science, Technology and Innovation: The White Paper*, (Dublin: Stationery Office, 1996), p. 92.
22. *Report of the Joint Committee on Sustainable Development*, (Dublin: Stationery Office, 1997), p. iii.
23. Report of the Science Technology and Innovation Advisory Council, *Making Knowledge Work for Us: A Strategic View of Science Technology and Innovation in Ireland*, (Dublin: Stationery Office, 1995), pp. 34-36.
24. *Partnership 2000 for Inclusion, Employment and Competitiveness*, (Dublin: Stationery Office, 1996).
25. *Growth, Competitiveness, Employment: The Challenges and Ways Forward into the 21st Century*, pp. 164-167.

References: PART III - Strategic Sectors

Chapter 5 Agriculture

1. *Compendium of Irish Economic and Agricultural Statistics, 1996* [currently available on the website homepage of the Department of Agriculture, Food and Forestry - <http://www.irlgov.ie/daff/index/htm>].
2. Tony Leavy, "Use of Underutilised Resources in Irish Agriculture" in *Farm & Food*, (Dublin: Teagasc, 1996), p. 3.
3. Measure 1.1(d) on Farm Investment of *Operational Programme for Agriculture, Rural Development and Forestry, 1994-1999*, (Dublin: Stationery Office, 1994).
4. Measure 1.1(a) on Farm Investment of *OP for Agriculture, Rural Development and Forestry, 1994-1999*.
5. Information provided by the Department of Agriculture, Food and Forestry.
6. Council of the European Communities, "Regulation (EEC) No. 2078/92 of 30 June 1992 on agricultural production methods compatible with the protection of the environment and the maintenance of the countryside" in *Official Journal of the European Communities*, No. L 215/85, 30 July, 1992.
7. Information provided by the Department of Agriculture, Food and Forestry.
8. *State of the Environment in Ireland*, p. 84.
9. *1995 Annual Review & Outlook for Agriculture, the Food Industry and Forestry*, p. 40.
10. Central Statistics Office, *Statistical Abstract, 1996*, (Dublin: Stationery Office, 1996), p. 76.
11. Central Statistics Office, *June Survey*, (Dublin: Stationery Office, 1996).
12. Information provided under EU monitoring mechanism of Community CO₂ and other greenhouse gas emissions (as provided for in Council Decision 93/389/EEC, O.J. No. L 167, 9.3.1993).
13. *ibid.*
14. *Farm Wastes and Water Pollution: The Present Position*, (Dublin: Environmental Research Unit, 1989).
15. *ibid.*, p. 3.
16. *State of the Environment in Ireland*, p. 68; and John Lee, "Some Aspects of Sustainability in Relation to Agriculture in Ireland" in *Assessing Sustainability in Ireland*, p. 73.
17. John Lee, "Some Aspects of Sustainability in Relation to Agriculture in Ireland", p. 79.
18. *State of the Environment in Ireland*, p. 121.
19. B. Coulter and H. Tunney, "The Background to the P Debate"; papers for a Teagasc workshop, 1 November, 1996.
20. H. Tunney, "A Note on a Balance Sheet Approach to Estimating the Phosphorus Fertiliser Needs of Agriculture" in *Irish Journal of Agricultural Research* 29(2), pp. 149-154; also referred to in John Lee, "Some Aspects of Sustainability in Relation to Agriculture in Ireland", pp. 71-85.
21. H. Tunney, N. Culleton and O. Carton, "Phosphorus for Farming and the Environment" in *Farm & Food, July/December 1994*, (Dublin: Teagasc, 1994), p. 12.
22. *STRIDE Operational Programme for Ireland, 1991-93. Special Research Fund. Project 8: Eutrophication in the Inniscarra Reservoir, River Lee, Cork*, (Dublin: Department of the Environment, 1995).
23. H. Tunney, "Phosphorus for Farming and the Environment" in *Irish Journal of Agricultural Research*, (Dublin: Teagasc, 1990).
24. *OECD Environmental Data Compendium 1995*, (Paris: OECD, 1995), p. 265.
25. *State of the Environment in Ireland*, p. 157.
26. *ibid.*, pp. 118-121.
27. *The Quality of Drinking Water in Ireland - A Report for the Year 1995 with a Review of the Period 1993-1995*, (Wexford: Environmental Protection Agency, 1996), p. 15.

28. Donal Daly, "Chemical Pollutants in Groundwater: A review of the situation in Ireland", paper presented at Conference "Chemicals - A Cause for Concern?" in Cork, 3-4 November, 1994; and Michael O'Brien, "The Development of Groundwater Resources in North Cork", paper read at Spring Show Conference, 10 May, 1991.
29. O. T. Carton, M. Ryan and W. L. Magette, *Phosphorus Recommendations for Grassland - Good Agronomic Practice*, (Wexford: Teagasc, 1996).
30. *Code of Good Agricultural Practice to Protect Waters from Pollution by Nitrates*, (Dublin: Department of the Environment and Department of Agriculture, Food and Forestry, 1996).
31. *Operational Programme for Environmental Services, 1994-1999*, (Dublin: Stationery Office, 1994).
32. *Europe's Environment: The Dobris Assessment*, p. 146.
33. Central Statistics Office, *Land Utilisation and Number of Livestock - County Analysis Studies*, (Dublin: Stationery Office, 1996).
34. Information provided by the Department of Arts, Culture and the Gaeltacht.
35. C. O'Donnell, *Pesticides in Drinking Water: Results of a Preliminary Survey December 1994 - December 1995*, (Wexford: Environmental Protection Agency, 1996).
36. Council of the European Communities, "Council Directive 91/414/EEC of 15 July 1991 concerning the placing of plant protection products on the market" in *Official Journal of the European Communities*, No. L 230/1, 19 August, 1991.
37. *OECD Environmental Data Compendium 1995*, p. 271.
38. Information provided by the Department of Agriculture, Food and Forestry.
39. *ibid.*
40. *STRIDE Operational Programme for Ireland, 1991-1993. Special Research Fund. Project 6: Reuse and Recycling of Large Plastic Sheetting from the Agriculture, Horticulture, Building and Commercial Sectors*, (Dublin: Department of the Environment, 1995), p. 7.
41. *State of the Environment in Ireland*, p. 22.
42. *International Conference and Programme for Plant Genetic Resources: Country Report - Ireland*, (Dublin: Department of Agriculture, Food and Forestry, 1995).
43. Council of the European Communities, "Council Regulation (EC) No. 1467/94 of 20 June 1994 on the conservation, characterization, collection and utilization of genetic resources in agriculture" in *Official Journal of the European Communities*, No. L 159/1, 28 June, 1994.
44. *Shaping our Future*, p. 139.
45. *ibid.*
46. Council of the European Communities, "Council Directive (90/219/EEC) on the contained use of genetically modified micro-organisms" in *Official Journal of the European Communities*, No. L 117/1, 8 May, 1990.
47. Council of the European Communities, "Council Directive (90/220/EEC) of 23 April 1990 on the deliberate release into the environment of genetically modified organisms" in *Official Journal of the European Communities*, No. L 117/17, 8 May, 1990.
48. Council of the European Communities, "Council Regulation (EC) No. 258/97 of the European Parliament and of the Council of 27 January 1997 concerning novel foods and novel food ingredients" in *Official Journal of the European Communities*, No. L 43/1-7, 14 February, 1997.

Chapter 6 Forestry

1. *Growing for the Future*, p. 19.
2. *ibid.*, p. 15.
3. *ibid.*, p. 7.
4. Department of the Environment, *Ireland: Climate Change/CO₂ Abatement Strategy*, (Dublin: Stationery Office, 1993).
5. *State of the Environment in Ireland*, p. 242.
6. *Forestry and the Landscape Guidelines and Forestry and Archaeology Guidelines*, (Dublin: Department of Agriculture, Food and Forestry, 1993); *Forestry and Fisheries Guidelines*, (Dublin: Department of Agriculture, Food and Forestry, 1992).
7. *Forestry Development: Consultation draft of Guidelines for Planning Authorities*, (Dublin: Department of the Environment, 1997).
8. *Growing for the Future*, p. 10; data relate to 1985-91 except for Germany and Italy (data from Eurostat, 1976-86) and Ireland (1995 figures).
9. E.P. Farrell, "Sustainability of the Forest Resource" in *Assessing Sustainability in Ireland*, p. 135.
10. J. J. Bowman, *Acid Sensitive Surface Waters in Ireland*, (Dublin: Environmental Research Unit, 1991), cited in *State of the Environment in Ireland*, pp. 124-125.
11. Council of the European Communities, "Council Directive (79/409/EEC) of 2 April 1979 on the conservation of wild birds" ("the Birds Directive") in *Official Journal of the European Communities*, No. L 103/1, 25 April, 1979.
12. Council of the European Communities, "Council Directive (92/43/EEC) of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora" ("the Habitats Directive") in *Official Journal of the European Communities*, No. L 206/35, 22 July, 1992.
13. Summary of criteria resulting from the Helsinki Conference follow-up process, provided by the Department of Agriculture, Food and Forestry.
14. "Resolution No. 1 of the 1993 Ministerial Conference on the Protection of Forests in Europe", *General Guidelines for the Sustainable Management of Forests in Europe*, (Helsinki: Ministry for Agriculture and Forestry, 1993).
15. "Statement of Forest Principles" in *Agenda 21*, pp. 291-294.

Chapter 7 Marine Resources

1. *Towards a Marine Policy for Ireland: Proceedings of the Consultative Process*, (Dublin: Marine Institute, 1996).
2. *New Directions for Agriculture, Forestry and Fisheries*, (Rome: United Nations Food and Agriculture Organisation, 1994), p. 16.
3. see *Operational Programme for Fisheries, 1994-1999*, (Dublin: Stationery Office, 1995), pp. 13, 29, data also provided by An Bord Iascaigh Mhara.
4. *Operational Programme for Fisheries, 1994-1999*, pp. 13, 29.
5. *International Convention for the Prevention of Pollution from Ships, 1973 done at London on the 2nd day of November, 1973, as amended by the protocol done at London on the 17th day of February, 1978 (MARPOL 73/78)*, (London: International Maritime Organisation).
6. *Code on the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on Board Ships (the INF Code)*, [IMO Assembly Resolution A18/Res.748], (London: International Maritime Organisation, 1993).
7. Papers from *Washington Global Programme of Action for the Protection of the Marine Environment from Land-based Activities*.
8. *ibid.*
9. *The International Convention for the Regulation of Whaling*, opened for signature in Washington DC on 2 December, 1946, and ratified by Ireland on 2 January, 1985, [International Whaling Commission, Cambridge, UK].

Chapter 8 Energy

1. International Energy Agency, *Energy Policies of IEA Countries: 1994 Review*, (Paris: OECD/IEA, 1995), p. 274.
2. Alison Myers, *Energy in Ireland 1980-1993: A Statistical Bulletin*, (Dublin: Department of Transport, Energy and Communications, 1994), p. 5.
3. *Energy Policies of IEA Countries: 1994 Review*, p. 278.
4. International Energy Agency, *Energy Policies of IEA Countries: Ireland 1994 Review*, (Paris: OECD/IEA, 1995), p. 31.
5. *Energy in Ireland 1980-1993*, p. 15.
6. *Energy Policies of IEA Countries: 1994 Review*, p. 275.
7. *ibid.*, p. 276.
8. Department of the Environment/ Environmental Protection Agency data (1994 figures).
9. Environmental Protection Agency information provided under the UN Framework Convention on Climate Change.
10. Intergovernmental Panel on Climate Change, *Climate Change 1995 - The Science of Climate Change: Contribution of Working Group 1 to the Second Assessment Report of the Intergovernmental Panel on Climate Change*, (Cambridge: University Press, 1996), p. 4.
11. Information provided by the Environmental Protection Agency.
12. *ibid.*
13. *State of the Environment in Ireland*, p. 57.
14. *Our Common Future*, p. 54.
15. *The European Auto Oil Programme: A Report by the European Commission Directorate-Generals for: Industry; Environment, Civil Protection and Nuclear Safety; and Energy*, (Brussels: European Commission, 1996).

Chapter 9 Industry

16. *Renewable Energy: A Strategy for the Future*, (Dublin: Department of Transport, Energy and Communications, 1996), p. 13.
17. see *Environment Bulletin No. 26*, (Dublin: Department of the Environment, 1995), p. 7.
18. *Renewable Energy: A Strategy for the Future*, pp. 8-9.
19. Council of the European Communities, "Council Directive (96/16/EC) of 24 September 1991 concerning integrated pollution prevention and control" in *Official Journal of the European Communities*, No. L 257/26 of 10 October, 1996.
20. Department of Foreign Affairs, *Challenges and Opportunities Abroad: White Paper on Foreign Policy*, (Dublin: Stationery Office, 1996), p. 307.
1. *Operational Programme for Industrial Development, 1994-1999*, (Dublin: Stationery Office, 1994).
2. *Task Force on Small Business*, (Dublin: Stationery Office, 1994), p. ii.
3. Central Statistics Office, *Statistical Abstract, 1996*, (Dublin: Stationery Office, 1997), p. 101.
4. *Ireland: National Development Plan, 1994-1999*, pp. 23, 53-61.
5. *Our Common Future*, p. 220.
6. M. F. McGettigan and C. O'Donnell, *Air Pollutants in Ireland: Emissions, Depositions and Concentrations 1984-1994*, (Wexford: Environmental Protection Agency, 1995), p. 9., as revised by EPA (see Fig 8.4).
7. Calculated from figures for 1994 provided by EPA (see Fig 8.4).
8. Calculated from figures for 1990 cited in *OECD Environmental Data Compendium 1995*, p. 21.
9. Calculated from figures for 1994 provided by EPA (see Fig 8.4).
10. *Air Pollutants in Ireland*, p. 19.
11. *State of the Environment in Ireland*, p. 116.
12. *ibid.*, p. 118.
13. *ibid.*, p. 156.
14. Colman Concannon, *Dioxins in the Irish Environment: An Assessment Based on Levels in Cow's Milk*, (Wexford: Environmental Protection Agency, 1996).
15. S. Scott and J. Lawlor, *Waste Water Services: Charging Industry the Capital Cost*, (Dublin: ESRI, 1994).
16. *Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction*, adopted on 3 September, 1992, at the Conference on Disarmament at Geneva.

17. Council of the European Communities, "Council Directive (82/501/EEC) of 24 June 1982 on the major-accident hazards of certain industrial activities" in *Official Journal of the European Communities*, No. L 230/1, 5 August, 1982.
18. P. Carey, G. Carty, J. Clarke, M. F. Crowe and P. J. Rudden, *National Waste Database Report 1995*, (Wexford: Environmental Protection Agency, 1996).
19. Council of the European Communities, "Council Directive (91/689/EEC) of 12 December 1991 on hazardous waste" in *Official Journal of the European Communities*, No. L 377/20, 31 December, 1991.
20. "Declaration and Resolution on Risk Reduction for Lead", adopted at Meeting of OECD Environment Policy Committee at Ministerial Level, Paris, 19-20 February, 1996.
21. *A Government of Renewal: Policy Agreement between Fine Gael, Labour Party, Democratic Left*, p. 25.
22. *Summary of Issues Raised at the Symposium on Sustainable Consumption*, 19-20 January, 1994, Oslo, Norway, cited in *OECD Workshop on Sustainable Consumption and Production: Clarifying the Concepts*, Rosendal, Norway, 2-4 July, 1995, (Paris: OECD, 1995), p. A7.
23. Commission of the European Communities, *Progress Report on Implementation of the European Community Programme of Policy and Action in Relation to the Environment and Sustainable Development "Towards Sustainability"*, (Brussels: Communication from the Commission, 10 January, 1996 - COM(95)624).
24. *Towards Sustainable Europe: The Study*, (Brussels: Friends of the Earth, 1995).
25. Repak, *Working Together on Waste: Report by IBEC's Industry Task Force on Recycling*, (Dublin: Irish Business and Employers Confederation, 1996).
26. Business Council for Sustainable Development, in association with UNEP, IEO, and CEC, *Getting Eco-Efficient: Report of the First Antwerp Eco-Efficiency Workshop*, November 1993, cited in *OECD Workshop on Sustainable Consumption and Production: Clarifying the Concepts*, p. A29.
27. *Industry and Environment*, Vol. 17 No. 4, (Geneva: UNEP IE, 1994), p. 4.
28. The first phase of LIFE (1992-95) has been completed; the legal basis for the second phase (1996-99) is Regulation (EC) No. 1404/96 adopted by the Council of Ministers on 15 July, 1996, (see *Official Journal of the European Communities*, No. L 181, 20 July, 1996).
29. Council of the European Communities, "Council Regulation (EEC) No. 1836/93 of 29 June 1993 allowing voluntary participation by companies in the industrial sector in a Community eco-management and audit scheme" in *Official Journal of the European Communities*, No. L 168/1, 10 July, 1993.
30. Adapted from *Guide to Environmental Self-Auditing*, (Dublin: The Chambers of Commerce of Ireland, 1993), p. 5.
31. "Launch of Environmental Training Programme for Irish Industry", IBEC Press Release, 15 January, 1997.
32. Council of the European Communities, "Council Regulation (EEC) No. 880/92, of 23 March 1992, on a Community eco-label award scheme" in *Official Journal of the European Communities*, No. L 99, 11 April, 1992.
33. Council of the European Communities, "European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste" in *Official Journal of the European Communities*, No. L 365/10, 31 December, 1994.
34. cf. *Shaping Our Future*, p. 247.
35. *Environmental Technologies from Ireland*, (Dublin: An Bord Tráchtála, 1995).
36. *Report of the Joint Committee on Sustainable Development*, p. 10.

Chapter 10 Transport

37. *Making Knowledge Work for Us: A Strategic View of Science Technology and Innovation in Ireland (Vol. 1)*, (Dublin: Stationery Office, 1995), p. 107.
38. *Task Force on the Implementation of the Report of the Science, Technology and Innovation Advisory Council*, (Dublin: Department of Enterprise and Employment, 1996), pp. 103-108.
39. Loraine Fegan, *Environmental Research: Discussion Document on a National Programme and Priorities*, (Wexford: Environmental Protection Agency, 1995).
40. *Europe's Environment: The Dobbris Assessment*, p. 421.
41. *Guidelines for Good Environmental Practice in Mineral Exploration*, (Dublin: Department of Transport, Energy and Communications, 1995).
42. *A New Minerals Policy: Report of the National Minerals Policy Review Group*, (Dublin: Stationery Office, 1995).
1. *Operational Programme for Transport, 1994-1999*, (Dublin: Stationery Office, 1994), p. 5.
2. *ibid.*
3. European Commission, *The Future Development of the Common Transport Policy: A Global Approach to the Construction of a Community Framework for Sustainable Mobility*, (Brussels: Directorate-General for Transport, 1992).
4. *Common Transport Policy Action Programme, 1995-2000*, (Luxembourg: Office for Official Publications of the European Communities, 1996).
5. European Commission, *Towards Fair and Efficient Pricing in Transport: Policy Options for Internalising the External Costs of Transport in the European Union*, (Brussels: Directorate-General for Transport, 1995).
6. European Commission, *The Citizens' Network: Fulfilling the potential of public passenger transport in Europe, Green Paper*, (Luxembourg: Office for Official Publications of the European Communities, 1996).
7. Based on an analysis of road travel in million vehicle-kilometres *per annum* in *Traffic Station Counts and Road Travel for 1995*, (Dublin: National Roads Authority, 1996), p. 11-12.
8. Information provided by the Dublin Transportation Office.
9. *Irish Bulletin of Vehicle and Driver Statistics, 1995*, (Dublin: Department of the Environment, 1996), p. 3.
10. Calculated from *World Road Statistics, 1997 Edition*, (Geneva: International Road Federation, 1997).
11. *Irish Bulletin of Vehicle and Driver Statistics, 1995*, p. 3.
12. *ibid.*, p. 26.
13. *Energy in Ireland 1980-1993: A Statistical Bulletin*, p. 19.
14. Figures extracted from *Irish Bulletin of Vehicle and Driver Statistics* [various years].

15. *Transport OP, 1994-1999*, p. 21.
16. *State of the Environment in Ireland*, p. 109.
17. Council of the European Communities, "Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management" in *Official Journal of the European Communities*, No. L 296/55, 21 November, 1996.
18. Calculated from figures supplied by the Environmental Protection Agency (see Fig 8.4).
19. Environmental Protection Agency information provided under the UN Framework Convention on Climate Change.
20. Information from European Commission Directorate-General XVII.
21. Calculated from figures supplied by the Environmental Protection Agency (see Fig 8.4).
22. *State of the Environment in Ireland*, p. 110.
23. *Irish Bulletin of Vehicle and Driver Statistics, 1995*, p. 3.
24. Information from European Commission Directorate-General for Environment, Nuclear Safety and Civil Protection. (DG-XI)
25. *Budget 1996*, (Dublin: Stationery Office, 1996), p. 27.
26. Information from European Commission DG XI.
27. *Irish Bulletin of Vehicle and Driver Statistics, 1995*, p. 3.
28. *Environment Bulletin No. 26*, p. 12; more recent data from Department of the Environment.
29. *Irish Bulletin of Vehicle and Driver Statistics, 1995*, p. 3.
30. *Ireland: Climate Change/CO₂ Abatement Strategy*, p. 13.
31. see *Environment Bulletin No. 31*, p. 40.
32. *White Paper: An Energy Policy for the European Union*, (Brussels: European Commission, 1995 - COM(95)682).
33. *Dublin Transportation Initiative: Final Report*, (Dublin: Stationery Office, 1995), pp. 150-151.
34. Michael Keating, *The Earth Summit's Agenda for Change: A plain language version of Agenda 21 and the other Rio Agreements*, (Geneva: Centre for Our Common Future, 1993), p. 12.
35. *Europe's Environment: The Dobbris Assessment*, p. 362.
36. *State of the Environment in Ireland*, p. 193.

Chapter 11 Tourism

1. *Operational Programme for Tourism, 1994-1999*, (Dublin: Stationery Office, 1994).
2. See *Developing Sustainable Tourism; OP for Tourism, 1994-1999*; 1996 figures provided by the Department of Tourism and Trade.
3. *Developing Sustainable Tourism*, p. 12.
4. *Bord Fáilte Report and Accounts, 1995*, (Dublin: Bord Fáilte, 1996), p. 14.
5. See *Environment Bulletin No. 29*, pp. 31-32.
6. See *Environment Bulletin No. 30*, p. 4.
7. See supplement to *Environment Bulletin No. 29*.
8. Sinéad Ní Mhainnín, "Tourism Eco-Labeling" in Dave Hogan and Adrian Phillips (eds.), *Seeking a Partnership Towards Managing Ireland's Uplands*, (Dublin: Irish Uplands Forum, 1996), pp. 124-128; see also *Environment Bulletin No. 27*, pp. 29-30.
9. Information provided by Bord Fáilte.
10. *Developing Sustainable Tourism*, p. 13.
11. *State of the Environment in Ireland*, p. 223.
12. Information provided by the Department of Tourism and Trade.
13. *State of the Environment in Ireland*, p. 178.
14. *Developing Sustainable Tourism*, p. 30.
15. *ibid.*, p. 15.
16. *ibid.*, pp. 55-58.
17. Jeanne Meldon and Conor Skehan, *Tourism and the Landscape: Landscape Management by Consensus*, (Dublin: Bord Fáilte/An Taisce, 1996), p. iii.
18. Adapted from *Tourism and the Landscape: Landscape Management by Consensus*, p. 20.
19. *Developing Sustainable Tourism*, p. 54.
20. See *Environment Bulletin No. 26*, p. 21.
21. See *Environment Bulletin No. 31*, p. 11.
22. Extract from "Principles of Sustainable Development", the Irish Hotel and Catering Institute policy on Sustainable Development in the Hospitality Industry.

Chapter 12 Trade

1. *Statistical Bulletin* (December 1996), (Dublin: Central Statistics Office, 1996), p. 723.
2. *Shaping Our Future*, p. 90.
3. "Rio Declaration on Environment and Development" in *Agenda 21*, p. 10.
4. Commission of the European Communities, *Communication from the Commission to the Council and the European Parliament on Trade and Environment*, [Brussels: COM(96)54 final, Brussels, 28 February, 1996].
5. *Agenda 21*, p. 19.
6. *Challenges and Opportunities Abroad: White Paper on Foreign Policy*.
7. *Growing for the Future*, p. 35.
8. *Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973*, [CITES]; also being implemented in the European Community in "Council Regulation (EEC) No. 3626/82 of 3 December 1982 on the implementation in the Community of the Convention on International Trade in Endangered Species of Wild Fauna and Flora" in *Official Journal of the European Communities*, No. L 384, 31 December, 1982.

References: PART 1V - Supporting the Strategy

Chapter 13 Environmental Quality

1. *State of the Environment in Ireland*, p. xxvi.
2. *Europe's Environment: The Dobris Assessment*, p. 13.
3. cited in *State of the Environment in Ireland*, pp. 113-117.
4. Council of the European Communities, "Council Directive (91/271/EEC) of 21 May, 1991 concerning urban waste water treatment" in *Official Journal of the European Communities*, No. L 135/40, 30 May, 1991.
5. Generale Des Eaux/M. C. O'Sullivan & Co. Ltd., *Greater Dublin Water Supply Strategy: Strategic Development Plan*, (Dublin: Department of the Environment, 1996).
6. *State of the Environment in Ireland*, pp. 10, 49.
7. *Irish Wildbird Conservancy Annual Report, 1995*, (Dublin: IWC/BirdWatch Ireland, 1996), p. 3.
8. *OP for Environmental Services, 1994-1999*, pp. 46-49, 78-81.
9. K. Dubsy, "Pressures on the Coastal Zone", in *Assessing Sustainability in Ireland*, pp. 113-117.
10. See *Environment Bulletin No. 28*, p. 16.
11. *State of the Environment in Ireland*, p. 179.
12. See *Dáil Debates* 6 March, 1996, pp. 1481-1507.
13. *State of the Environment in Ireland*, p. 72.
14. *Recycling for Ireland: A Strategy for Recycling Domestic and Commercial Waste*, (Dublin: Department of the Environment, 1994).
15. *Working Together on Waste: Report by IBEC's Industry Task Force on Recycling*.
16. *OP for Environmental Services, 1994-1999*, pp. 42-45, 72-77.
17. Alan Barrett and John Lawlor, *The Economics of Solid Waste Management*, (Dublin: The Economic and Social Research Institute, 1995).
18. John Dunne, Director-General, IBEC, in the foreword to *Working Together on Waste*.
19. *State of the Environment in Ireland*, p. 59.
20. *ibid.*, p. 98; see also *Environment Bulletin No. 26*, p. 11.

Chapter 14 Spatial Planning and Land Use

1. *Europe's Environment: The Dobris Assessment*, p. 24.
2. *Windfarms Development: Guidelines for Planning Authorities*, (Dublin: Department of the Environment, 1996).
3. *Telecommunications Antennae and Support Structures: Guidelines for Planning Authorities*, (Dublin: Department of the Environment, 1996).
4. *Forestry Development: Consultation draft of Guidelines for Planning Authorities*, (Dublin: Department of the Environment, 1997).
5. Department of the Environment, *Better Local Government - A Programme for Change*, (Dublin: Stationery Office, 1996).
6. Council of the European Communities, "Council Directive (85/337/EEC) of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment" in *Official Journal of the European Communities*, No. L 175/40, 5 July, 1985.
7. *Draft Guidelines on the Information to be Contained in Environmental Impact Statements and Advice Notes on Current Practice*, (Wexford: Environmental Protection Agency, 1995).
8. United Nations Economic Commission for Europe, *Convention on Environmental Impact Assessment in a Transboundary Context done at Espoo (Finland), on 25 February, 1991*, (New York & Geneva: United Nations, 1994).

Chapter 15 The Built Environment

1. *Agenda 21*, pp. 52-54.
2. *Europe and Architecture Tomorrow*, (Brussels: Architects' Council of Europe, 1995), p. 6.
3. *Report of the United Nations Conference on Human Settlements (HABITAT II) (Istanbul, 3-14 June, 1996) ["HABITAT Agenda"]*, (New York: United Nations, 1996), p. 57 [note: preliminary version of Report, reference A/CONF.165/14].
4. *Dublin Transportation Initiative: Final Report*, p. 129.
5. European Commission, *European Sustainable Cities: Report by the Expert Group on the Urban Environment*, (Brussels: European Commission - DG XI - Environment, Nuclear Safety and Civil Protection, 1996), p. 242.
6. *Operational Programme for Local Urban and Rural Development, 1994-1999*, (Dublin: Stationery Office, 1994).
7. *Guidelines on Residential Development in Designated Tax Incentive Areas*, (Dublin: Department of the Environment, 1996).
8. *A Study on the Urban Renewal Schemes: A Study Prepared by KPMG in association with Murray O'Loire Associates, Architects and Urban Designers and the Northern Ireland Economic Research Centre*, (Dublin: Stationery Office, 1994).
9. *Strengthening the Protection of the Architectural Heritage*, (Dublin: Stationery Office, 1996).
10. Ann McNicholl and J. Owen Lewis (eds.), *Green Design: Sustainable Building for Ireland*, (Dublin: Stationery Office, 1996), p. 3.
11. Information provided by the Department of the Environment.
12. Information provided by the Irish Energy Centre.
13. *Green Design: Sustainable Building for Ireland*, p. 17.
14. *HABITAT Agenda*, p. 69.
15. *Annual Housing Statistics Bulletin, 1996*, (Dublin: Stationery Office, 1997).
16. *A Plan for Social Housing*, (Dublin: Department of the Environment, 1991).
17. *Social Housing - The Way Ahead*, (Dublin: Department of the Environment, 1995).
18. *Housing Management Group: First Report*, (Dublin: Department of the Environment, 1996).

Chapter 16 Public Action and Awareness

1. *Shaping Our Future*, p. 245.
2. INRA (Europe) - E.C.O., *Europeans and the Environment in 1995*, (Brussels: European Commission Directorate-General XI - Environment, Nuclear Safety and Civil Protection, 1995).
3. From submission made by An Taisce West Cork under the public consultation process for the preparation of this Strategy.
4. Erna Witoelar, "Sustainable consumption, our common challenge" in *Industry and Environment*, (UNEP IE, Oct-Dec 1995), p. 25.
5. *Europeans and the Environment in 1995*.
6. *Energy in Ireland 1980-1993: A Statistical Bulletin*, p. 15.
7. See *Environment Bulletin No. 28*.
8. S. Scott, "Energy Conservation in the Home - Are We Contrary?" in John FitzGerald and Daniel McCoy (eds.), *Issues in Irish Energy Policy*, (Dublin: Economic and Social Research Institute, 1993).
9. An Foras Forbartha, *Domestic Energy Use 1985-86: Results of a Survey*, (Dublin: An Foras Forbartha, 1988) as referred to in S. Scott, "Energy Conservation in the Home - Are We Contrary?".
10. *State of the Environment in Ireland*, p. 65.
11. *Greater Dublin Water Supply Strategy: Strategic Development Plan*, p. 14.
12. *Global Action Plan's Ecoteam Workbook*, (Dublin: GAP Ireland, 1996), p. 55.
13. *State of the Environment in Ireland*, p. 92.
14. *ibid.*, p. 90.
15. See *Environment Bulletin No. 29*, for Action Against Litter policy statement.
16. *Agenda 21*, p. 267.
17. See *Environment Bulletin No. 27*, pp. 18-19.
18. From submission made by An Taisce West Cork under the public consultation process for the preparation of this Strategy.

Chapter 17 Ireland in the International Community

19. From submission made by Earthwatch/Friends of the Earth Ireland under the public consultation process for the preparation of this Strategy.
 20. Up to and including December 1996; see also *Environment Bulletin No. 30*, p. 12 and *Environment Bulletin No. 29*, p. 4.
 21. *Our Common Future*, p. 113.
 22. *The Report of the Inter-Departmental Working Group on Environmental Awareness*, (Dublin: An Roinn Oideachais, 1994), p. 9.
1. *Challenges and Opportunities Abroad: White Paper on Foreign Policy*, pp. 297-307.
 2. *The Environmental Imperative*, Declaration by the European Council, Dublin, 25-26 June, 1990.
 3. *Challenges and Opportunities Abroad: White Paper on Foreign Policy*, pp. 232-233.
 4. *ibid.*, p. 230.
 5. Information from the Department of Foreign Affairs.
 6. Patrick D. McGuckian (ed.), *Irish Aid and Agriculture: A Report to the Minister for Foreign Affairs*, (Dublin: Irish Aid Advisory Council, 1996), p. 12.
 7. See *Environment Bulletin No. 33*.

References: PART V - Implementing and Monitoring the Strategy

Chapter 18

Monitoring and Indicators

1. F. J. Convery, "Assessing Sustainability in Ireland - a Synthesis" in *Assessing Sustainability in Ireland*, p. 8.
2. *Agenda 21*, p. 284.
3. *ibid.*, p. 286.
4. *IRELAND Community Support Framework, 1994-99*, p. 62.
5. *ibid.*
6. *ibid.*, p. 63.
7. *ibid.*, p. 65.
8. *ibid.*
9. *ibid.*, p. 66.
10. S. Scott, B. Nolan and T. Fahey, *Formulating Environmental and Social Indicators for Sustainable Development*, (Dublin: ESRI, 1996).
11. *Environment Indicators: OECD Core Set*, (Paris: OECD, 1994).
12. *The OECD List of Social Indicators*, (Paris: OECD, 1982).
13. Published in *Assessing Sustainability in Ireland*.
14. *State of the Environment in Ireland*, p. xxv.

Chapter 19

Implementation and Review

1. *Strategic Management Initiative - Delivering Better Government, Second Report to Government of the Co-ordinating Group of Secretaries: A Programme of Change for the Irish Civil Service*, (Dublin: Government of Ireland, 1996), p. 14.
2. See *Environment Bulletin No. 24*.
3. *A Government of Renewal: Policy Agreement between Fine Gael, Labour Party, Democratic Left*, p. 25.
4. *ibid.*
5. *The Green Government Guide: Promoting Environmental Management & Practice in Government*, (Dublin: Department of the Environment, 1996).
6. *Energy Conservation Programme for State Buildings*, (Dublin: Office of Public Works, Department of Transport, Energy and Communications and Irish Energy Centre, 1995); see also Kevin O'Rourke (ed.), *Energy Officers Guidebook*, (Dublin: Irish Energy Centre, 1995).
7. *Better Local Government: A Programme for Change*, p. 11.
8. Submissions in this regard were made by the South-East Regional Authority and the Dublin Regional Authority as part of the public consultation process in the preparation of this Strategy.
9. *Local Authorities and Sustainable Development: Guidelines on Local Agenda 21*, (Dublin: Department of the Environment, 1996), Minister's Foreword.
10. *Agenda 21*, p. 230.
11. *Integrating Environment and Economy: Progress in the 1990s*, p. 23.