

# *Environment*

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# 18

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# 18

## *Environment*

- The total number of registered vehicles has increased by 93% over the period 1990-2004. Related CO<sub>2</sub> emissions have increased by 149% in the same period.
- Greenhouse gas emissions have increased by 23% during the years 1990 to 2004 while acid rain precursor emissions have decreased by 24% in the same period.
- The tonnage of household and commercial waste collected in 2004 increased by 7% relative to 2003.
- 34% of municipal waste in Ireland was recovered in 2004, which compares favourably with a target of 35% recycling by 2013.
- Ireland's total primary energy requirement in 2004 was 15.01m TOE - an increase of 61% since 1990.
- The land area under forest was 709,262 hectares in 2005 - an increase of 47% over the period 1990-2005.

## Introduction

**A**t present, Ireland's rate of economic development is causing an acceleration of pressures on the environment. This follows a period of several decades during which population, urbanisation and agricultural intensification have given rise to gradually increasing environmental pressures.

Awareness of the necessity for environmental protection has grown substantially in the last number of years. There is increasing concern regarding environmental pollution in all of its aspects.

This chapter contains data on a number of these direct and indirect pressures on the environment, details of which are drawn primarily from the Environmental Protection Agency (EPA).

Table 18.1 contains information on the land areas afforested, together with the associated levels of carbon sinks (changes in forest and other woody biomass stocks). Forests absorb carbon dioxide from the atmosphere and store it in the biomass until the eventual release as a result of burning or timber decay.

Sources of energy by fuel type and energy consumption over the period 1990-2004, which give an indication of the needs of the Irish economy for energy and how they are sourced, are given in Tables 18.3-18.4. The Transport sector accounts for an increasing proportion of energy consumption and Table 18.2 details the growth in vehicle numbers and CO<sub>2</sub> emissions. An example of a pressure indicator derived from economic prosperity and economic activity has been included in Table 18.2, namely the number of cars per 1,000 population.

The next eight tables (Tables 18.5-18.12) deal with Greenhouse gases, Acid rain agents, environmental pressures over time, such as river quality and the generation of waste. Tables 18.5-18.8 give a picture as to where Ireland has progressed vis-à-vis emissions of greenhouse gases and acidifying agents. Finally, data is provided on various aspects of Ireland's weather in Tables 18.13-18.16 in respect of 2004. The final graph shows that over the past 100 years the mean temperature for Ireland has increased by 1°C and that the 1990s was the warmest decade in the last 120 years.

## Definitions

TOE = Tonnes of Oil Equivalent

HFCs = Hydrofluorocarbons

PFCs = Perfluorocarbons

PM<sub>10</sub> = Particulate matter measuring less than 10 microns in diameter

SF<sub>6</sub> = Sulphur hexafluorides

ug/m<sup>3</sup> = Microgram per cubic metre

Table 18.1 Land areas afforested and CO<sub>2</sub> sinks

	Hectares public	Hectares private	Hectares total	Hectares annual change	CO <sub>2</sub> sinks kilotonnes
1980	292,808	100,499	<b>393,307</b>	n/a	n/a
1981	298,907	100,774	<b>399,681</b>	6,374	n/a
1982	304,923	101,272	<b>406,195</b>	6,514	n/a
1983	310,621	101,599	<b>412,220</b>	6,025	n/a
1984	315,813	102,072	<b>417,885</b>	5,665	n/a
1985	320,438	102,689	<b>423,127</b>	5,242	n/a
1986	325,126	104,969	<b>430,095</b>	6,968	n/a
1987	330,521	107,923	<b>438,444</b>	8,349	n/a
1988	337,632	112,519	<b>450,151</b>	11,707	n/a
1989	344,261	121,016	<b>465,277</b>	15,126	n/a
1990	350,931	130,163	<b>481,094</b>	15,817	-478.98
1991	358,786	141,455	<b>500,241</b>	19,147	-393.12
1992	366,351	150,589	<b>516,940</b>	16,699	-202.34
1993	373,178	159,760	<b>532,938</b>	15,998	-277.34
1994	379,800	172,597	<b>552,397</b>	19,459	-209.03
1995	386,167	189,940	<b>576,107</b>	23,710	-246.60
1996	390,593	206,495	<b>597,088</b>	20,981	-218.63
1997	391,444	217,078	<b>608,522</b>	11,434	-351.12
1998	394,370	227,080	<b>621,450</b>	12,928	-506.73
1999	395,261	238,857	<b>634,118</b>	12,668	-593.20
2000	396,725	253,088	<b>649,813</b>	15,695	-475.40
2001	397,042	268,235	<b>665,277</b>	15,464	-626.24
2002	397,361	282,970	<b>680,331</b>	15,054	-739.87
2003	397,489	291,939	<b>689,428</b>	9,097	-1,061.36
2004	397,610	301,556	<b>699,166</b>	9,738	-671.30
2005	397,674	311,588	<b>709,262</b>	10,096	n/a

Source: Forest Service

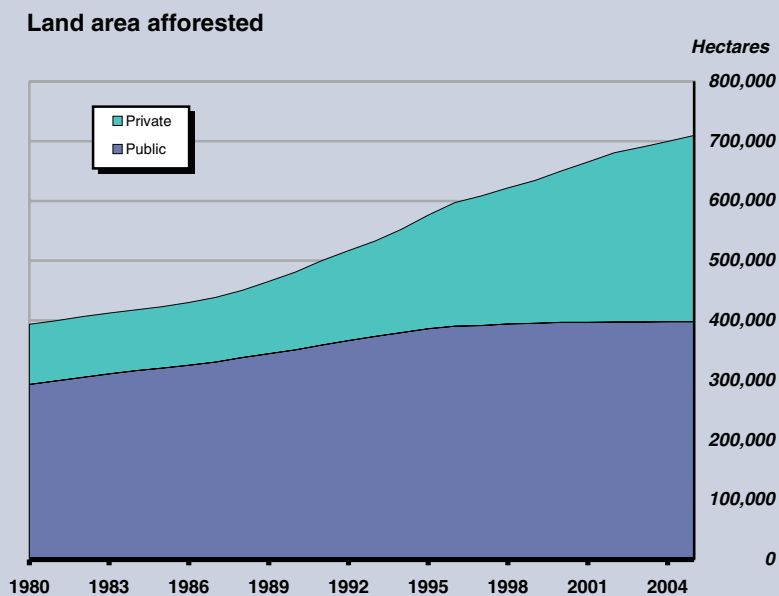
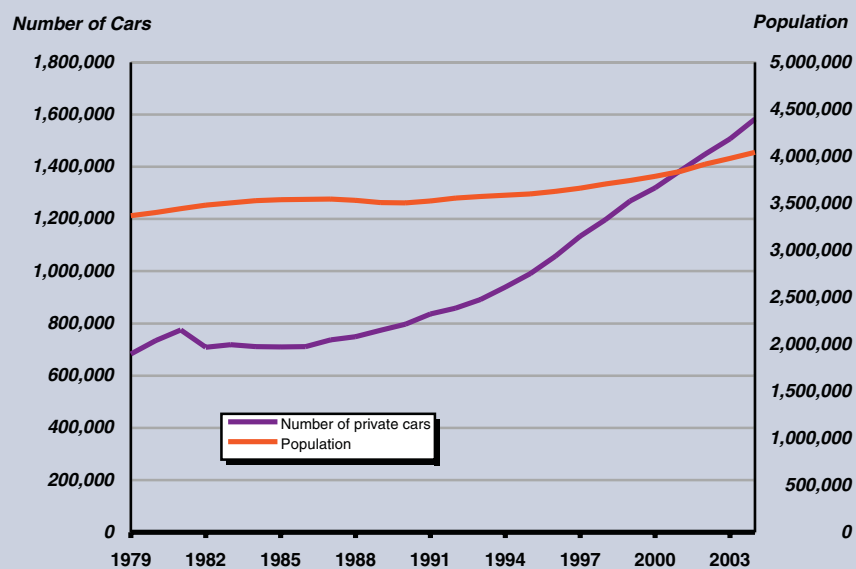


Table 18.2 Environmental pressures – transport

	Number of private cars	Total number of vehicles	Population	Number of private cars per 1,000 of population	CO <sub>2</sub> emissions from road transport kilotonnes
1979	682,958	853,211	3,368,200	203	n/a
1980	734,371	911,031	3,401,000	216	n/a
1981	774,594	949,819	3,443,400	225	n/a
1982	709,000	882,140	3,480,000	204	n/a
1983	718,555	897,381	3,504,000	205	n/a
1984	711,098	906,109	3,529,000	202	n/a
1985	709,546	914,758	3,540,000	200	n/a
1986	711,087	922,484	3,540,600	201	n/a
1987	736,595	959,753	3,546,500	208	n/a
1988	749,459	981,296	3,530,700	212	n/a
1989	773,396	1,019,560	3,509,500	220	n/a
1990	796,408	1,054,259	3,505,800	227	4,680
1991	836,583	1,105,545	3,525,700	237	4,886
1992	858,498	1,126,473	3,554,500	242	5,297
1993	891,027	1,151,238	3,574,100	249	5,278
1994	939,022	1,202,273	3,585,900	262	5,496
1995	990,384	1,262,503	3,601,300	275	5,915
1996	1,057,383	1,338,616	3,626,100	292	6,609
1997	1,134,429	1,432,330	3,664,300	310	7,205
1998	1,196,901	1,510,853	3,704,900	323	8,264
1999	1,269,245	1,608,156	3,744,700	339	9,121
2000	1,319,250	1,682,221	3,789,500	348	9,544
2001	1,384,704	1,769,684	3,847,200	361	10,300
2002	1,447,908	1,850,046	3,917,200	370	10,833
2003	1,507,106	1,937,429	3,978,900	379	10,993
2004	1,582,833	2,036,307	4,043,800	391	11,675

Source: Department of the Environment, Heritage and Local Government; CSO and Environmental Protection Agency

Number of private cars and population



**Table 18.3 Total primary energy requirement by fuel type**

	Millions of tonnes of oil equivalent (TOE)							Percentages						
	1990	1995	2000	2001	2002	2003	2004	1990	1995	2000	2001	2002	2003	2004
Coal	2.16	1.92	1.99	2.04	1.98	1.91	1.94	23.2	17.9	14.2	13.8	13.4	12.9	12.9
Peat	1.36	1.21	0.80	0.89	0.85	0.84	0.58	14.6	11.4	5.8	6.0	5.8	5.7	3.8
Oil	4.29	5.45	7.87	8.44	8.26	7.99	8.38	46.0	51.0	56.3	57.2	56.0	54.0	55.8
Natural Gas	1.45	1.92	3.06	3.14	3.33	3.69	3.65	15.5	17.9	21.9	21.3	22.6	24.9	24.3
Renewables	0.06	0.19	0.26	0.26	0.29	0.28	0.32	0.6	1.8	1.9	1.8	1.9	1.9	2.2
Electricity imports	0.00	0.00	0.00	0.00	0.04	0.10	0.14	0.0	0.0	0.0	0.0	0.3	0.7	0.9
<b>Total</b>	<b>9.31</b>	<b>10.69</b>	<b>13.98</b>	<b>14.76</b>	<b>14.75</b>	<b>14.81</b>	<b>15.01</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

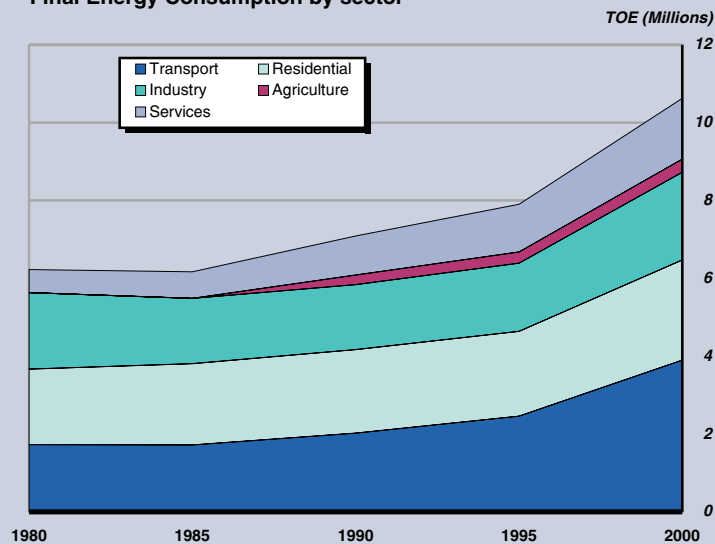
Source: Sustainable Energy Ireland

**Table 18.4 Final energy consumption by sector**

	Millions of tonnes of oil equivalent (TOE)							Percentages						
	1990	1995	2000	2001	2002	2003	2004	1990	1995	2000	2001	2002	2003	2004
Transport	2.03	2.46	3.90	4.31	4.46	4.51	4.70	28.6	31.1	36.7	38.6	39.5	39.0	40.0
Residential	2.15	2.18	2.57	2.68	2.68	2.77	2.88	30.3	27.5	24.2	24.0	23.7	24.0	24.5
Industry	1.66	1.75	2.25	2.25	2.20	2.19	2.16	23.5	22.1	21.2	20.2	19.5	18.9	18.3
Agriculture	0.25	0.29	0.33	0.33	0.33	0.33	0.31	3.6	3.6	3.1	3.0	2.9	2.8	2.7
Services	1.00	1.23	1.57	1.59	1.62	1.76	1.70	14.1	15.5	14.8	14.2	14.4	15.2	14.5
<b>Total</b>	<b>7.09</b>	<b>7.90</b>	<b>10.63</b>	<b>11.17</b>	<b>11.28</b>	<b>11.55</b>	<b>11.76</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Source: Sustainable Energy Ireland

**Final Energy Consumption by sector**



**Table 18.5 Greenhouse gas emissions**

	<i>Kilotonnes</i>							
	1990	1998	1999	2000	2001	2002	2003	2004
Carbon Dioxide (CO <sub>2</sub> )	32,667.65	40,090.59	41,890.74	44,238.96	46,530.37	45,509.39	44,136.60	45,194.89
Methane (CH <sub>4</sub> )	629.33	679.02	653.91	636.96	627.28	626.04	654.09	632.63
Nitrous Oxide (N <sub>2</sub> O)	31.62	35.18	35.59	33.94	32.43	30.86	30.32	29.82
<b>Total</b>	<b>33,328.60</b>	<b>40,804.78</b>	<b>42,580.24</b>	<b>44,909.86</b>	<b>47,190.08</b>	<b>46,166.29</b>	<b>44,821.02</b>	<b>45,857.34</b>

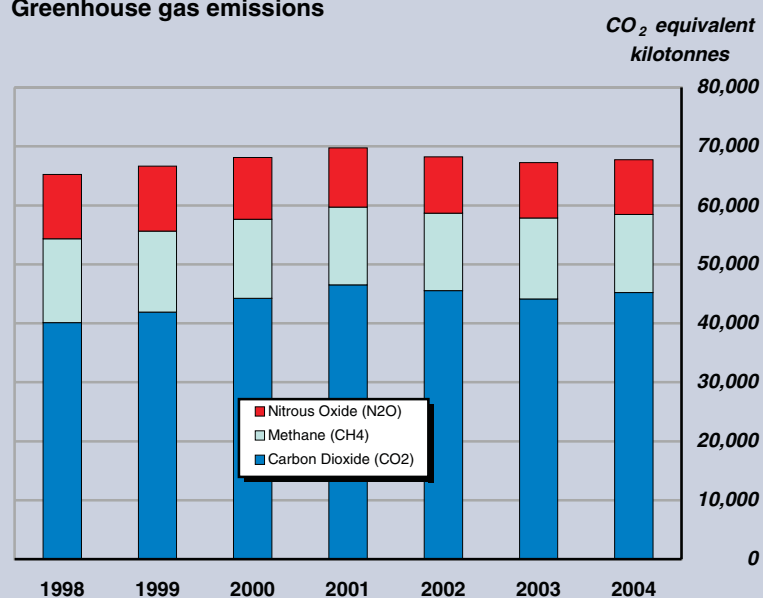
Source: Environmental Protection Agency

**Table 18.6 Greenhouse gas emissions, CO<sub>2</sub> equivalent**

	<i>CO<sub>2</sub> equivalent kilotonnes</i>							
	1990	1998	1999	2000	2001	2002	2003	2004
Carbon Dioxide (CO <sub>2</sub> )	32,667.65	40,090.59	41,890.74	44,238.96	46,530.37	45,509.39	44,136.60	45,194.89
Methane (CH <sub>4</sub> )	13,215.96	14,259.35	13,732.07	13,376.07	13,172.85	13,146.94	13,735.97	13,285.28
Nitrous Oxide (N <sub>2</sub> O)	9,801.99	10,905.14	11,034.23	10,521.43	10,054.20	9,565.64	9,399.85	9,243.07
HFCs, PFCs and SF <sub>6</sub>	36.19	345.13	459.72	590.24	618.48	571.47	705.30	665.63
<b>Total</b>	<b>55,721.79</b>	<b>65,600.21</b>	<b>67,116.76</b>	<b>68,726.69</b>	<b>70,375.90</b>	<b>68,793.43</b>	<b>67,977.72</b>	<b>68,388.87</b>
Base year 1990=100	100.00	117.73	120.45	123.34	126.30	123.46	121.99	122.73

Source: Environmental Protection Agency

**Greenhouse gas emissions**





**Table 18.7 Acid rain and ozone precursors**

	Tonnes							
	1990	1998	1999	2000	2001	2002	2003	2004
Sulphur Dioxide (SO <sub>2</sub> )	185,138	176,124	157,463	130,911	126,858	96,422	76,686	70,922
Nitrogen Oxides (NOX)	121,537	128,641	126,366	132,713	134,926	125,317	119,855	118,954
Ammonia (NH <sub>3</sub> )	112,317	126,551	126,987	122,440	122,599	118,973	113,842	114,272
Volatile Organic Compounds (VOC)	108,485	111,408	90,828	80,101	77,699	71,208	66,729	63,436
Carbon Monoxide (CO)	415,445	317,061	285,101	278,892	274,076	255,146	241,908	239,458
<b>Total</b>	<b>942,922</b>	<b>859,785</b>	<b>786,745</b>	<b>745,057</b>	<b>736,158</b>	<b>667,066</b>	<b>619,020</b>	<b>607,042</b>

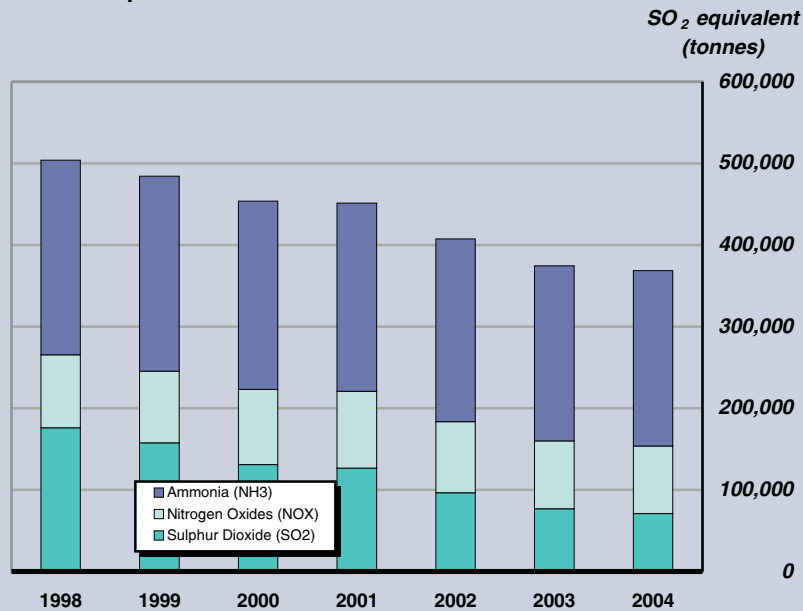
Source: Environmental Protection Agency

**Table 18.8 Acid rain precursors**

	SO <sub>2</sub> equivalent per tonne of gas emitted							
	1990	1998	1999	2000	2001	2002	2003	2004
Sulphur Dioxide (SO <sub>2</sub> )	185,138	176,124	157,463	130,911	126,858	96,422	76,686	70,922
Nitrogen Oxides (NOX)	84,553	89,496	87,913	92,328	93,868	87,183	83,383	82,756
Ammonia (NH <sub>3</sub> )	211,426	238,220	239,040	230,481	230,780	223,955	214,296	215,106
<b>Total</b>	<b>481,117</b>	<b>503,840</b>	<b>484,416</b>	<b>453,720</b>	<b>451,506</b>	<b>407,560</b>	<b>374,365</b>	<b>368,784</b>
Base year 1990=100	100	104	100	94	94	84	78	76

Source: Environmental Protection Agency

**Acid rain precursors**



**Table 18.9** Number of days with PM<sub>10</sub> greater than 50 µg/m<sup>3</sup> in Dublin

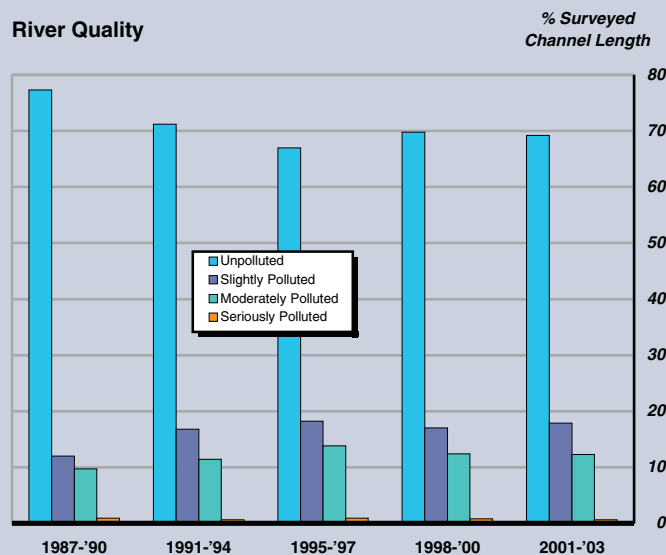
Location	1997	1998	1999	2000	2001	2002	2003	2004
Wood Quay	74	66	45	-	28	14	28	14
Rathmines	9	12	3	6	18	12	27	16
Phoenix Park	5	5	6	4	12	8	9	2

Source: Environmental Protection Agency

**Table 18.10** River quality

	% of channel length				
	1987-1990	1991-1994	1995-1997	1998-2000	2001-2003
Unpolluted	77.3	71.2	67.0	69.8	69.2
Slightly polluted	12.0	16.8	18.2	17.0	17.9
Moderately polluted	9.7	11.4	13.8	12.4	12.3
Seriously polluted	0.9	0.6	0.9	0.8	0.6
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Source: Environmental Protection Agency



**Table 18.11 Total household and commercial waste collected**

	Tonnes						
	1984	1995	1998	2001	2002	2003	2004
Household and commercial waste collected	854,866	1,385,439	1,852,450	2,297,603	2,398,769	2,559,387	2,737,531
Base year 1984=100	100	162.1	216.7	268.8	280.6	299.4	320.2

Source: Environmental Protection Agency

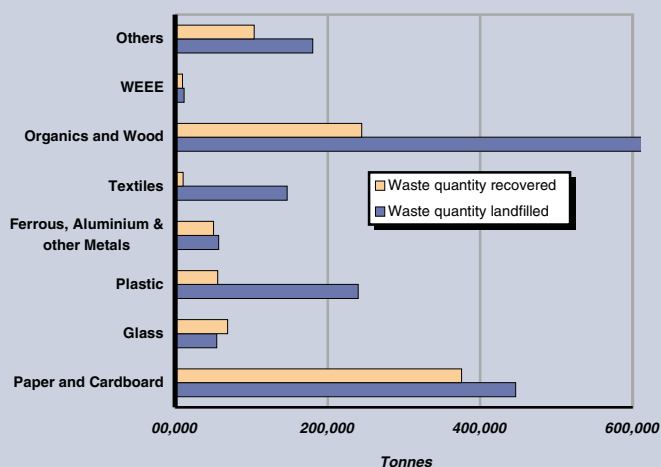
**Table 18.12 Disposal and recovery of household and commercial waste and packaging in 2004**

	Paper and cardboard	Glass	Plastic	Ferrous, aluminium and other metals	Textiles	Organics	WEEE	Others	Total
<b>Waste quantity landfilled</b>	<b>446,306</b>	<b>54,643</b>	<b>239,986</b>	<b>57,058</b>	<b>146,986</b>	<b>681,254</b>	<b>11,856</b>	<b>180,432</b>	<b>1,818,536</b>
Household waste landfilled	233,446	45,313	167,261	40,201	133,310	451,283	9,179	134,916	1,214,908
Commercial waste landfilled	212,860	9,330	72,725	16,857	13,676	229,971	2,677	45,516	603,628
<b>Waste quantity recovered</b>	<b>375,597</b>	<b>68,804</b>	<b>55,904</b>	<b>50,336</b>	<b>10,536</b>	<b>244,655</b>	<b>9,537</b>	<b>103,627</b>	<b>918,996</b>
Household waste recovered	120,300	66,381	19,871	5,873	4,520	35,513	5,510	37,167	295,134
Commercial waste recovered	255,297	2,423	36,034	44,463	6,016	209,142	4,027	66,460	623,862
<b>Total Waste Recovered (%)</b>	<b>45.7</b>	<b>55.7</b>	<b>18.9</b>	<b>46.9</b>	<b>6.7</b>	<b>26.4</b>	<b>44.6</b>	<b>36.5</b>	<b>33.6</b>
Packaging quantity disposed	93,258	52,532	164,337	30,407	555	2,699*	–	27,584	371,371
Packaging quantity recovered	217,383	64,379	47,292	41,139	0	108,355*	–	992	479,540
<b>Total Packaging Recovered (%)</b>	<b>70.0</b>	<b>55.1</b>	<b>22.3</b>	<b>57.5</b>	<b>0.0</b>	<b>97.6</b>	<b>–</b>	<b>3.5</b>	<b>56.4</b>

\* Wood

Source: Environmental Protection Agency

**Disposal and recovery of household and commercial waste in 2004**

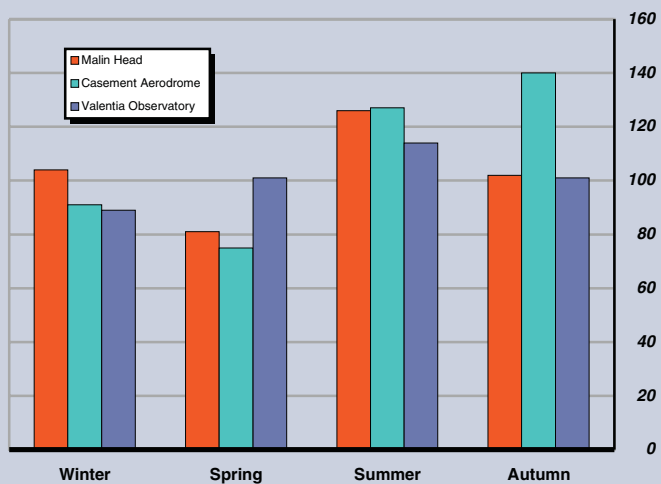


**Table 18.13 Rainfall, 2004**

Station	Annual amount	% of average <sup>1</sup>	Most in a day	
			Amount	Date
	<i>mm</i>		<i>mm</i>	
Shannon Airport	903.7	98	21.7	18 Dec
Cork Airport	1,115.4	91	44.3	22 Jun
Malin Head	1,141.3	110	28.6	23 Jun
Dublin Airport	702.6	n/a	32.8	18 Aug
Casement Aerodrome	772.5	106	44.2	20 Oct
Valentia Observatory	1,398.9	100	42.3	11 Mar
Kilkenny	803.3	97	34.4	28 Oct
Belmullet	1,130.1	103	27.8	31 Jan
Connacht Airport	1,374.5	n/a	29.4	31 Jan
Clones	852.0	93	23.4	31 Jan
Birr	751.3	92	23.3	28 Oct
Mullingar	953.1	103	26.6	20 Nov
Rosslare	878.8	99	44.7	22 Oct

<sup>1</sup> 30 year average 1961-1990  
Source: Met Éireann

**Percentage of normal rainfall, 2004**



**Table 18.14 Temperature, 2004**

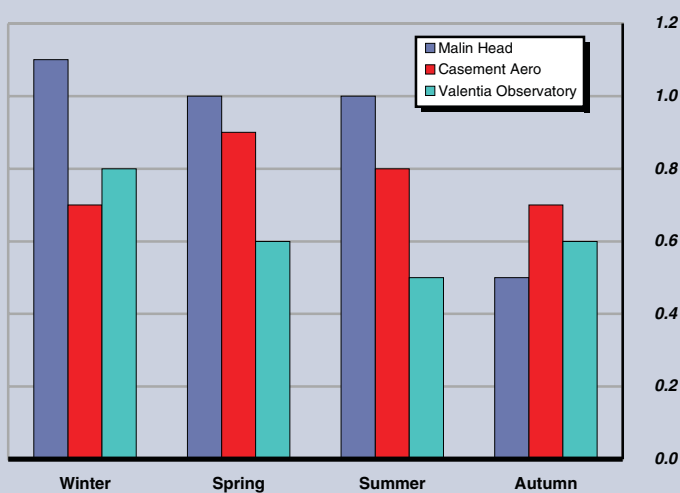
°C

Station	Daily Mean	Difference from average <sup>1</sup>	Extremes	
			Highest	Lowest
Shannon Airport	10.8	0.6	24.9	-3.1
Cork Airport	10.2	0.7	25.2	-4.0
Malin Head	10.3	0.9	23.6	-0.5
Dublin Airport	10.0	n/a	24.3	-6.4
Casement Aerodrome	10.2	0.9	25.7	-6.8
Valentia Observatory	11.2	0.7	24.9	-2.1
Kilkenny	10.3	0.9	25.5	-7.7
Belmullet	10.9	1.0	24.2	-0.8
Connacht Airport	9.0	n/a	24.3	-3.7
Clones	9.7	0.8	23.9	-4.6
Birr	10.2	0.9	27.3	-6.4
Mullingar	9.7	1.0	25.9	-6.3
Rosslare	11.2	1.0	25.5	-3.3

<sup>1</sup> 30 year average 1961-1990  
Source: Met Eireann

TABLE 18.14

**Difference from normal mean temperature, 2004**



**Table 18.15 Sunshine, 2004**

Station	Daily Mean	% of average <sup>1</sup>	Most in a day	
			Amount	Date
	<i>hours</i>		<i>hours</i>	
Shannon Airport	3.82	105	14.2	24 Jun
Cork Airport	4.31	110	16.0	15 Jun
Malin Head	3.59	101	15.6	07 Jul
Dublin Airport	4.26	106	15.0	22 May
Casement Aerodrome	3.75	97	14.8	18 May
Valentia Observatory	3.88	109	15.4	14 Jun
Kilkenny	4.04	111	15.5	14 Jun
Belmullet	3.87	104	15.1	25 May
Connacht Airport	3.61	n/a	15.5	07 Jul
Clones	3.58	110	14.6	07 Jul
Birr	3.38	95	14.0	18 May
Mullingar	4.15	115	14.5	18 May
Rosslare	4.87	109	15.6	14 Jun

<sup>1</sup> 30 year average 1961-1990  
Source: Met Éireann

**Percentage of normal sunshine, 2004**

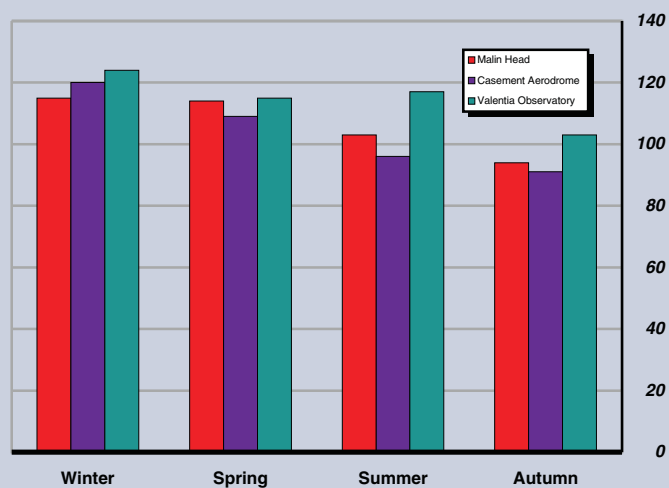


TABLE 18.15

**Table 18.16** Number of days in 2004 with various weather conditions

Station	Number of days						
	Rain	Snow	Air frost	Hail	Thunder	Fog	Gale gusts
Shannon Airport	219	4	21	13	5	34	65
Cork Airport	217	4	15	7	2	84	67
Malin Head	251	10	4	45	6	11	170
Dublin Airport	202	7	29	14	8	26	90
Casement Aerodrome	192	8	35	12	5	20	65
Valentia Observatory	257	1	8	15	4	13	76
Kilkenny	185	n/a	42	n/a	n/a	n/a	35
Belmullet	280	13	5	42	8	14	144
Connacht Airport	281	23	23	14	5	135	75
Clones	231	n/a	29	n/a	n/a	n/a	35
Birr	207	n/a	36	n/a	n/a	n/a	33
Mullingar	229	n/a	39	n/a	n/a	n/a	24
Rosslare	165	3	6	8	4	29	108

**Averages<sup>1</sup>**

Station	Number of days						
	Rain	Snow	Air frost	Hail	Thunder	Fog	Gale gusts
Shannon Airport	214	2.0	25.4	21.7	6.3	31.8	90
Cork Airport	204	5.6	24.0	8.8	3.7	99.5	101
Malin Head	237	3.3	11.0	48.4	5.9	11.8	187
Dublin Airport	185	4.5	24.3	9.5	4.1	50.5	89
Casement Aerodrome	185	5.3	41.3	10.7	4.8	25.9	92
Valentia Observatory	239	0.8	13.9	25.5	7.1	8.9	135
Kilkenny	192	4.1	53.0	10.4	5.0	44.4	61
Belmullet	249	2.3	16.7	45.1	5.5	16.6	132
Connacht Airport	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Clones	218	10.8	46.1	15.5	5.7	46.8	88
Birr	204	6.6	45.7	8.7	5.2	29.9	71
Mullingar	214	8.4	50.0	12.1	5.3	52.6	76
Rosslare	176	1.8	8.0	11.8	6.7	38.5	122

<sup>1</sup> 30 year average 1961-1990  
Source: Met Éireann

TABLE 18.16

**Ireland's annual Temperature deviation from the 1961-90 average (9.65 °C) with 15 year smoothed average superimposed**

