

20

Environment

- The total number of registered vehicles has increased by 103% over the period 1990-2005. Related CO₂ emissions have increased by 166% in the same period.
- Greenhouse gas emissions (in equivalent tonnes of Carbon Dioxide) have increased by 24% during the years 1990 to 2005 while acid rain precursor emissions have decreased by 23% in the same period.
- The tonnage of household and commercial waste collected in 2005 increased by 3% relative to 2004.
- 34.6% of municipal waste collected in Ireland was re-used in 2005.
- Ireland's total primary energy requirement in 2005 was 15.61m TOE - an increase of 64% since 1990.

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Introduction

This chapter contains data on aspects of the physical environment. Greater coverage is available in the publications of the Environmental Protection Agency (EPA).

Table 20.1 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 1990-2005, which give an indication of the needs of the Irish economy for energy and how they are sourced, are given in tables 20.3-20.4. The Transport sector accounts for an increasing proportion of energy consumption and table 20.2 details the growth in vehicle numbers and CO₂ emissions. An example of a pressure indicator derived from economic prosperity and economic activity has been included in table 20.2, namely the number of cars per 1,000 population.

The next six tables (tables 20.5-20.10) deal with Greenhouse gases, Acid rain agents and river quality. Tables 20.11 – 20.12 contain statistics relating to the generation and recycling of household and commercial waste. Data is provided on various aspects of Ireland's climate in table 20.13 in respect of 2005. The graph with table 20.13 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.

Technical Notes

Table 20.1

Forest land is defined as all public and private plantation forests. Forest land is an area of land where tree crown cover is greater than 20% of the total area occupied or 50% of conventional stocking and includes recently clearfelled areas. It has a minimum width of 20m and a minimum area of 0.1ha and includes all trees with a potential to reach 5m in height. Trees grown for fruit or flowers are excluded, as are woody species such as furze and rhododendron.

According to the Revised 1966 IPCC Guidelines, for the purposes of reporting, the signs for carbon removals are always negative (-) and for emissions positive (+). Net changes in carbon stocks are converted to CO₂ by multiplying by 44/12 (the atomic weight of Carbon is assumed to be 12 and the atomic weight of Oxygen is assumed to be 16) and by changing the sign for net CO₂ removals to be negative.

Table 20.5

Table 20.5 does not contain the actual quantities of HFC's, PFC's and SF₆ gases because there is a large number of different types of gases, all of which have their own "CO₂ Equivalent" factor. This means that, unlike the stable relationship between say CH₄ and the CO₂ equivalent, there is not a common conversion factor for these gases and the CO₂ equivalent that is published (the conversion factor depends on the mix of gases each year).

Definitions

TOE = Tonnes of Oil Equivalent

HFCs = Hydrofluorocarbons

PFCs = Perfluorocarbons

PM₁₀ = Particulate matter measuring less than 10 microns in diameter

SF₆ = Sulphur hexafluorides

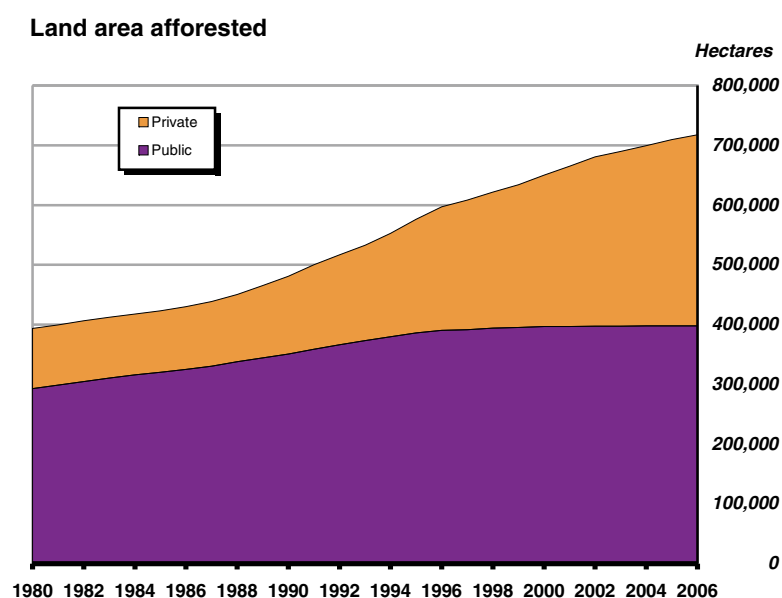
µg/m³ = Microgram per cubic metre

WEEE = Waste Electronic and Electrical Equipment

Table 20.1 Land areas afforested and CO₂ sinks

	Hectares public	Hectares private	Hectares total	Hectares annual change	CO ₂ sinks kilotonnes
1980	292,808	100,499	393,307	—	—
1981	298,907	100,774	399,681	6,374	—
1982	304,923	101,272	406,195	6,514	—
1983	310,621	101,599	412,220	6,025	—
1984	315,813	102,072	417,885	5,665	—
1985	320,438	102,689	423,127	5,242	—
1986	325,126	104,969	430,095	6,968	—
1987	330,521	107,923	438,444	8,349	—
1988	337,632	112,519	450,151	11,707	—
1989	344,261	121,016	465,277	15,126	—
1990	350,931	130,163	481,094	15,817	-478.02
1991	358,786	141,455	500,241	19,147	-391.91
1992	366,351	150,589	516,940	16,699	-201.01
1993	373,178	159,760	532,938	15,998	-275.98
1994	379,800	172,597	552,397	19,459	-207.58
1995	386,167	189,940	576,107	23,710	-245.02
1996	390,593	206,495	597,088	20,981	-216.91
1997	391,444	217,078	608,522	11,434	-349.44
1998	394,370	227,080	621,450	12,928	-505.17
1999	395,261	238,857	634,118	12,668	-591.85
2000	396,725	253,088	649,813	15,695	-474.15
2001	397,042	268,235	665,277	15,464	-624.88
2002	397,361	282,970	680,331	15,054	-738.42
2003	397,489	291,939	689,428	9,097	-1,060.00
2004	397,610	301,556	699,166	9,738	-665.77
2005	397,674	311,588	709,262	10,096	-811.38
2006	397,699	319,600	717,299	8,037	n/a

Source: Forest Service



Environment

Table 20.2 Road transport

	Number of private cars	Total number of vehicles	Population	Number of private cars per 1,000 of population	CO ₂ emissions from road transport kilotonnes	Road Freight Tonne-km (million)
1979	682,958	853,211	3,368,200	203	—	
1980	734,371	911,031	3,401,000	216	—	
1981	774,594	949,819	3,443,400	225	—	
1982	709,000	882,140	3,480,000	204	—	
1983	718,555	897,381	3,504,000	205	—	
1984	711,098	906,109	3,529,000	202	—	
1985	709,546	914,758	3,540,000	200	—	
1986	711,087	922,484	3,540,600	201	—	
1987	736,595	959,753	3,546,500	208	—	
1988	749,459	981,296	3,530,700	212	—	
1989	773,396	1,019,560	3,509,500	220	—	
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	5,493
1996	1,057,383	1,338,616	3,626,100	292	6,609	6,316
1997	1,134,429	1,432,330	3,664,300	310	7,205	6,998
1998	1,196,901	1,510,853	3,704,900	323	8,264	8,203
1999	1,269,245	1,608,156	3,744,700	339	9,121	10,275
2000	1,319,250	1,682,221	3,789,500	348	9,544	12,348
2001	1,384,704	1,769,684	3,847,200	360	10,300	12,405
2002	1,447,908	1,850,046	3,917,200	370	10,833	14,448
2003	1,507,106	1,937,429	3,978,900	379	10,993	15,898
2004	1,582,833	2,036,307	4,043,800	391	11,675	17,288
2005	1,662,200	2,138,700	4,130,700	402	12,454	18,152

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

Number of private cars and population

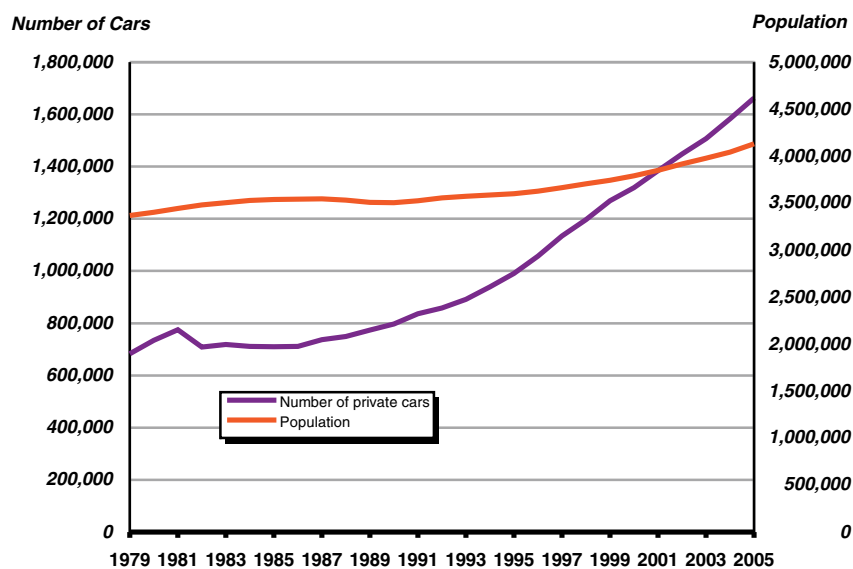


Table 20.3 Total primary energy requirement by fuel type

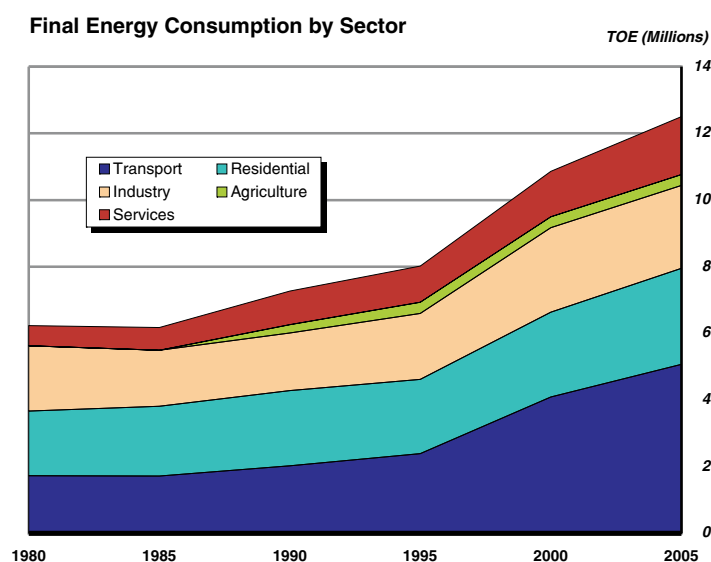
	Millions of tonnes of oil equivalent (TOE)							Percentages						
	1990	2000	2001	2002	2003	2004	2005	1990	2000	2001	2002	2003	2004	2005
Coal	2.08	1.81	1.88	1.75	1.70	1.78	1.83	21.9	13.1	12.8	11.8	11.6	11.7	11.7
Peat	1.38	0.80	0.86	0.89	0.80	0.57	0.78	14.5	5.8	5.9	6.0	5.5	3.8	5.0
Oil	4.43	7.88	8.51	8.50	8.10	8.71	8.96	46.6	57.0	58.2	57.4	55.4	57.5	57.4
Natural Gas	1.45	3.06	3.14	3.33	3.66	3.65	3.48	15.2	22.1	21.5	22.5	25.0	24.1	22.3
Renewables	0.17	0.26	0.26	0.29	0.26	0.31	0.39	1.8	1.9	1.8	1.9	1.8	2.0	2.5
Electricity imports	0.00	0.01	-0.02	0.04	0.10	0.14	0.18	0.0	0.1	-0.1	0.3	0.7	0.9	1.1
Total	9.50	13.82	14.63	14.80	14.63	15.16	15.61	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Sustainable Energy Ireland

Table 20.4 Final energy consumption by sector

	Millions of tonnes of oil equivalent (TOE)						Percentages					
	1980	1985	1990	1995	2000	2005	1980	1985	1990	1995	2000	2005
Transport	1.73	1.72	2.02	2.39	4.09	5.07	27.8	27.9	27.8	29.8	37.6	40.6
Residential	1.94	2.09	2.26	2.23	2.55	2.87	31.1	33.9	31.1	27.8	23.5	23.0
Industry	1.96	1.68	1.72	1.98	2.54	2.49	31.5	27.2	23.7	24.6	23.4	19.9
Agriculture	n/a	n/a	0.25	0.34	0.32	0.33	n/a	n/a	3.5	4.2	2.9	2.6
Services	0.60	0.68	1.01	1.09	1.37	1.73	9.6	11.0	13.9	13.6	12.6	13.9
Total	6.23	6.17	7.27	8.02	10.86	12.50	100.0	100.0	100.0	100.0	100.0	100.0

Source: Sustainable Energy Ireland



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Table 20.5 Greenhouse gas emissions

Kilotonnes

	1990	1998	1999	2000	2001	2002	2003	2004	2005
Carbon Dioxide (CO ₂)	32,667.65	40,551.85	42,137.49	44,992.58	47,361.94	45,776.81	44,847.49	45,552.30	46,635.04
Methane (CH ₄)	629.33	682.47	662.84	639.91	631.46	631.83	661.01	635.16	623.92
Nitrous Oxide (N ₂ O)	31.62	34.06	34.35	32.95	31.30	29.81	29.30	28.83	28.55
Total	33,328.60	41,268.39	42,834.68	45,665.43	48,024.70	46,438.45	45,537.80	46,216.29	47,287.50

Source: Environmental Protection Agency

Table 20.6 Greenhouse gas emissions, in CO₂ equivalent

CO₂ equivalent kilotonnes

	1990	1999	2000	2001	2002	2003	2004	2005
Carbon Dioxide (CO ₂)	32,667.65	42,137.49	44,992.58	47,361.94	45,776.81	44,847.49	45,552.30	46,635.04
Methane (CH ₄)	13,215.96	13,919.70	13,438.10	13,260.61	13,268.48	13,881.23	13,338.46	13,102.32
Nitrous Oxide (N ₂ O)	9,801.99	10,648.13	10,214.20	9,702.05	9,240.36	9,083.32	8,935.99	8,849.96
HFCs, PFCs and SF ₆	36.19	459.71	590.26	616.97	559.26	696.99	637.97	700.94
Total	55,721.79	67,165.03	69,235.13	70,941.58	68,844.92	68,509.04	68,464.72	69,288.26
Base year 1990=100	100.00	121.03	124.76	127.83	124.06	123.45	123.37	124.85

Source: Environmental Protection Agency

Greenhouse gas emissions

*CO₂ equivalent
kilotonnes*

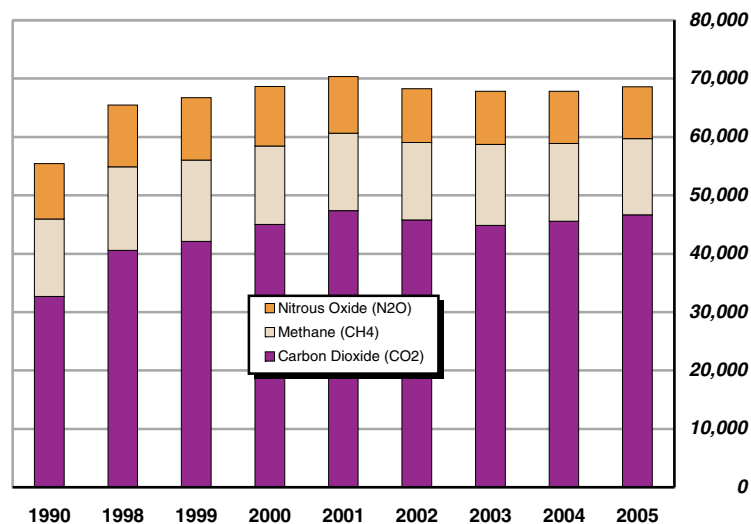


Table 20.7 Acid rain and ozone precursors

Kilotonnes

	1990	1998	1999	2000	2001	2002	2003	2004	2005
Sulphur Dioxide (SO ₂)	182.84	176.70	157.41	137.16	129.64	99.65	77.95	72.18	70.40
Nitrogen Oxides (NO _x)	124.23	134.31	132.11	133.46	134.79	125.67	119.96	118.72	119.09
Ammonia (NH ₃)	110.06	126.39	127.29	123.12	117.18	115.00	113.57	113.13	112.70
Volatile Organic Compounds (VOC)	106.78	109.82	90.27	81.08	77.68	71.17	67.54	63.94	62.11
Carbon Monoxide (CO)	410.80	330.77	301.11	281.87	275.84	254.60	244.95	237.35	225.96
Total	934.71	878.00	808.19	756.70	735.14	666.10	623.98	605.32	590.25

Source: Environmental Protection Agency

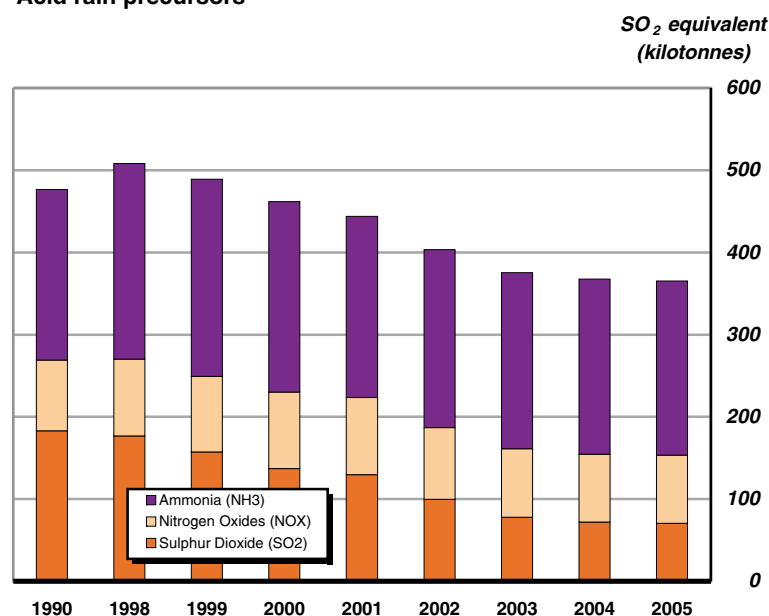
Table 20.8 Acid rain precursors, in SO₂ equivalents

SO₂ equivalent kilotonnes

	1990	1998	1999	2000	2001	2002	2003	2004	2005
Sulphur Dioxide (SO ₂)	182.84	176.70	157.41	137.16	129.64	99.65	77.95	72.18	70.40
Nitrogen Oxides (NO _x)	86.39	93.40	91.87	92.81	93.73	87.39	83.42	82.56	82.81
Ammonia (NH ₃)	207.18	237.92	239.61	231.76	220.58	216.48	213.79	212.96	212.14
Total	476.40	508.03	488.89	461.73	443.96	403.53	375.16	367.70	365.36
Base year 1990=100	100	107	103	97	93	85	79	77	77

Source: Environmental Protection Agency

Acid rain precursors



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Table 20.9 Air quality - number of days with PM₁₀ greater than 50 µg/m³ in Dublin

Location	1997	1998	1999	2000	2001	2002	2003	2004	2005
Wood Quay	74	66	45	-	28	14	28	14	8
Rathmines	9	12	3	6	18	12	27	16	7
Phoenix Park	5	5	6	4	12	8	9	2	2

Source: Environmental Protection Agency

Table 20.10 River quality (based on the national scheme of biological classification)

% of channel length

	1987-1990	1991-1994	1995-1997	1998-2000	2001-2003	2003-2005
Unpolluted	77.3	71.2	67.0	69.8	69.2	70.2
Slightly polluted	12.0	16.8	18.2	17.0	17.9	18.1
Moderately polluted	9.7	11.4	13.8	12.4	12.3	11.1
Seriously polluted	0.9	0.6	0.9	0.8	0.6	0.6
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Environmental Protection Agency

Table 20.11 Total household and commercial waste collected

Tonnes

	1984	1995	1998	2001	2002	2003	2004	2005
Total household and commercial waste collected	854,866	1,385,439	1,852,450	2,297,603	2,398,769	2,559,387	2,703,604	2,788,433
Base year 1984=100	100.0	162.1	216.7	268.8	280.6	299.4	316.3	326.2

Source: Environmental Protection Agency

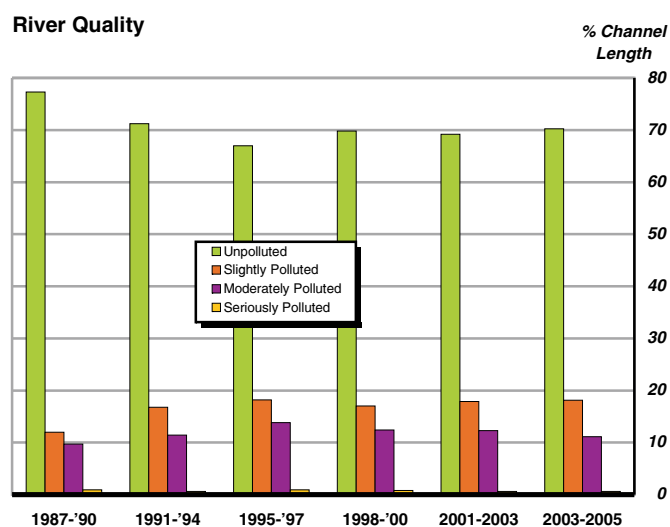
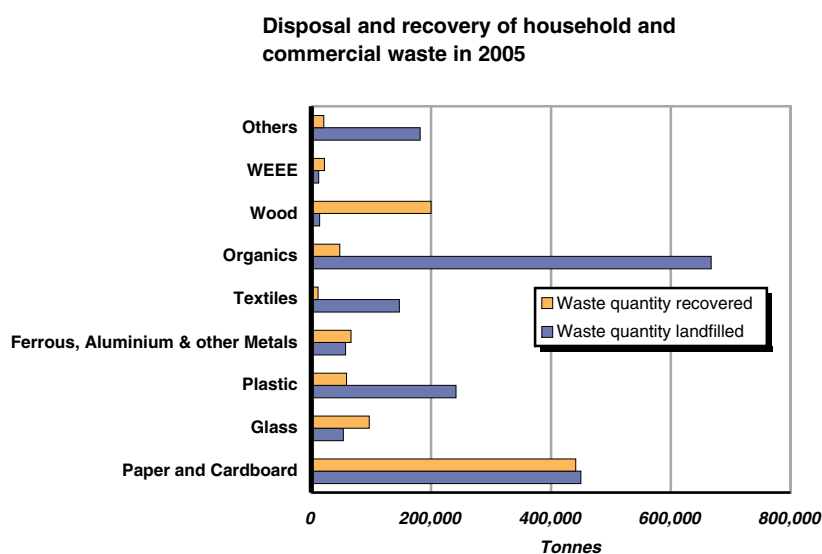


Table 20.12 Disposal and recovery of household and commercial waste and packaging in 2005

Tonnes

	Paper and cardboard	Glass	Plastic	Ferrous, aluminium and other metals	Textiles	Organics	Wood	WEEE	Others	Total
Total household and commercial wastes collected by type	891,264	150,158	300,111	123,271	157,984	715,314	213,926	34,052	202,353	2,788,433
Waste quantity landfilled	449,957	53,461	241,424	57,006	146,790	667,512	13,939	12,312	181,664	1,824,066
Household waste landfilled	229,223	44,173	164,754	39,397	131,326	432,182	10,745	9,551	132,520	1,193,872
Commercial waste landfilled	220,734	9,288	76,669	17,608	15,464	235,331	3,194	2,761	49,145	630,194
Waste quantity recovered	441,307	96,697	58,687	66,265	11,194	47,802	199,987	21,740	20,689	964,367
Household waste recovered	165,803	77,501	29,570	8,325	7,533	33,820	8,266	11,121	7,658	349,596
Commercial waste recovered	275,504	19,197	29,116	57,941	3,661	13,982	191,722	10,619	13,031	614,772
Total Waste Recovered (%)	49.5	64.4	19.6	53.8	7.1	6.7	93.5	63.8	10.2	34.6
Packaging quantity disposed	92,668	51,568	165,431	30,730	215	-	2,535	-	27,441	370,589
Packaging quantity recovered	233,219	92,239	52,586	43,020	0	-	118,345	-	15,222	554,632
Total Packaging Recovered (%)	71.6	64.1	24.1	58.3	0.0	-	97.9	-	35.7	59.9

Source: Environmental Protection Agency



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Table 20.13 Climate, 2005

	Belmullet	Birr	Casement aerodrome	Clones	Connacht Airport	Cork Airport
Rainfall (mm)						
Total	1,220.1	789	624.2	852.7	1,205.6	1,191.7
Rainfall % of average	107	98	88	92	n/a	100
Amount	31.7	44.9	31.4	27.2	39.2	66.3
Date(s)	2-Dec	7-Jan	28-Jul	24-Oct	25-May	24-Jul
Temperature						
Mean	11.1	10.5	10.4	10	9.1	10.3
Diff. from average	+1.5	+1.2	+1.1	+1.2	n/a	+0.9
Extremes						
Highest	24.5	28.4	27.3	28.6	25.9	26.2
Lowest	-1.1	-4.7	-5.6	-4.6	-3.4	-2.2
Sunshine						
Daily mean	3.48	3.14	3.55	3.24	3.1	3.81
Sunshine % of average	99	94	98	102	n/a	100
Most in a day amount (hours)	14.8	14.8	15.5	14.1	14.5	15.5
Date(s)	06-Jun	11-Jun	11-Jul	14-May	14-May	27-Jun
No. of days with:						
Rain (>0.1 mm)	255	214	181	211	278	208
Snow	12	n/a	16	n/a	18	9
Air frost	7	37	42	21	25	9
Hail	40	n/a	18	n/a	13	4
Thunder	5	n/a	8	n/a	2	2
Fog	15	n/a	19	n/a	155	113
Gale gusts	113	28	75	39	79	69

Source: Met Éireann

Table 20.13 Climate, 2005 - continued

	Dublin Airport	Kilkenny	Malin Head	Mullingar	Rosslare	Shannon Airport	Valentia Observatory
Rainfall (mm)							
Total	683.1	757.9	1,086.1	866.7	853.5	914.2	100.1
Rainfall % of average	n/a	92	102	93	97	99	105
Amount	32.6	35.8	30.2	36.6	51.6	40	52
Date(s)	28-Jul	21-Mar	11-Feb	7-Jan	24-Jul	7-Jan	2-Dec
Temperature							
Mean	10.2	10.5	10.4	9.9	11.2	11	11.5
Diff. from average	n/a	+1.2	+1.1	+1.1	+1.1	+0.9	+1.1
Extremes							
Highest	24.8	29.2	23.4	27.2	22.5	28	26.2
Lowest	-3.4	-5.1	-0.8	-4.4	0	-2.8	-1.2
Sunshine							
Daily mean	3.77	3.75	3.3	3.68	4.43	3.6	3.53
Sunshine % of average	97	107	97	105	102	103	104
Most in a day amount (hours)	15.6	15.4	14.5	15	15.6	15.3	15.2
Date(s)	11-Jul	27-Jun	13-May	11-Jul	11-Jul	27-Jun	11-Jun
No. of days with:							
Rain (>0.1 mm)	192	193	229	216	183	219	235
Snow	14	n/a	10	n/a	8	5	4
Air frost	32	41	3	41	0	20	5
Hail	19	n/a	40	n/a	12	12	19
Thunder	7	n/a	1	n/a	4	5	3
Fog	32	n/a	8	n/a	27	25	15
Gale gusts	68	33	140	23	107	51	91

Source: Met Éireann

**Ireland's Annual Temperature deviation from the 1961-90 average (9.65 C)
with 15 year smoothed average superimposed.
(Average based on data from Valentia, Birr, Malin, Dublin)**

