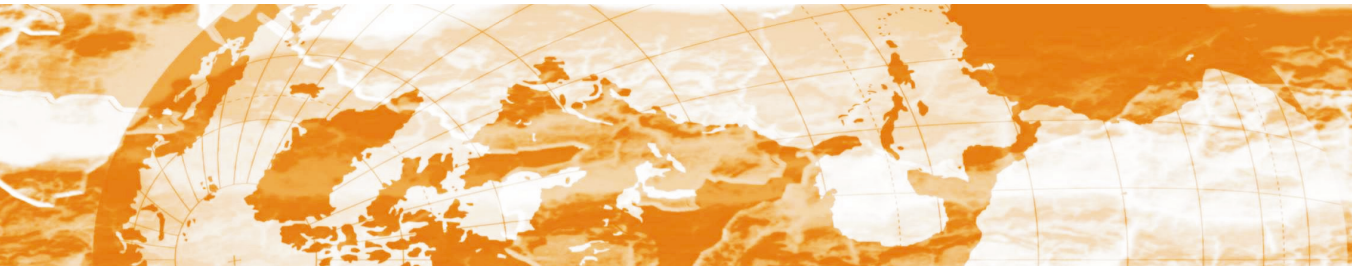
19

Environment

- The total number of registered vehicles increased by 137% over the period 1990-2008. Related CO_2 emissions increased by 179% in the same period.
- Ireland's total primary energy requirement in 2009 was 14.37m TOE, an increase of 51% since 1990.
- Greenhouse gas emissions (as measured in Carbon Dioxide (CO_2) equivalents) have increased by 20% during the years 1990 to 2008 while acid rain precursor emissions (as measured in Sulphur Dioxide (SO_2) equivalents) have decreased by 34% in the same period.
- The proportion of rivers classified as being unpolluted has declined from 77.3% in 1987-1990 to 70% in 2006-2008.



Contents

Introduction

This chapter contains data on aspects of the physical environment. Greater coverage is available in the publications of the Environment Protection Agency (EPA) and Sustainable Energy Authority Ireland (SEAI).

Table 19.1 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 its eventual release as a result of burning or timber decay.

The transport sector accounts for an increasing proportion of energy consumption and table 19.2 details the growth in vehicle numbers and CO2 emissions. One example of a pressure indicator derived from economic prosperity and activity is identified in table 19.2, namely the number of cars per 1,000 population. Sources of energy by fuel type and energy consumption over the period 1990-2009, which give an indication of the needs of the Irish economy for energy and how they are sourced, are given in tables 19.3 and 19.4.

The next six tables (tables 19.5 – 19.10) deal with greenhouse gases, acid rain agents, air quality and river quality. Table 19.11 contains statistics related to the collection of household and commercial waste. Data is provided on various aspects of Ireland's climate in table 19.12 in respect of 2009.

Technical Notes

Table 19.1

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 optimum forest stocking and includes recently clear-felled areas. It has a minimum width of 20m and a minimum area of 0.1 hectares and includes all trees with a potential to reach 5 m in height. Trees grown for fruit or flowers are excluded, as are woody species such as furze and rhododendron.

According to the Revised 1996 IPPC Guidelines, for the purposes of reporting, the signs for carbon removals are always shown as negative with carbon emissions shown as positive. Net changes in carbon stocks are converted to CO_2 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 CO_2 removals to be negative.

Table 19.5

Table 19.5 does not contain the actual quantities of HFCs, PFCs and SF_6 gases because these comprise a large number of different types of gases, all of which have their own "CO_2 Equivalent" factor. This means that there is no stable relationship between say CH_4 and the CO_2 equivalent, there is no common conversion factor for these gases and the CO_2 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

SF_6 = Sulphur hexafluorides

PM_{10} = Particulate matter measuring less than 10 microns in diameter

$\mu g/m^3$ = Microgram per cubic metre

WEEE = Waste Electronic and Electrical Equipment

Forest Stocking Percent = Amount of live trees in a given area relative to what is considered the optimum for that area.

Table 19.1 Land areas afforested and CO_2 sinks

	Hectares public	Hectares private	Hectares total	Hectares annual change	CO_2 sinks kilotonnes
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	-339.82
1991	358,786	141,455	500,241	19,147	-308.27
1992	366,351	150,589	516,940	16,699	-108.46
1993	373,178	159,760	532,938	15,998	-193.96
1994	379,800	172,597	552,397	19,459	-134.41
1995	386,167	189,940	576,107	23,710	-133.97
1996	390,593	206,495	597,088	20,981	-126.65
1997	391,444	217,078	608,522	11,434	-271.05
1998	394,370	227,080	621,450	12,928	-449.12
1999	395,261	238,857	634,118	12,668	-557.91
2000	396,725	253,088	649,813	15,695	-440.80
2001	397,042	268,235	665,277	15,464	-584.27
2002	397,361	282,970	680,331	15,054	-778.70
2003	397,489	291,939	689,428	9,097	-1,044.47
2004	397,610	301,556	699,166	9,739	-717.49
2005	397,674	311,588	709,262	10,096	-906.73
2006	397,699	319,600	717,299	8,037	-975.14
2007	397,699	326,547	724,246	6,947	-1,516.89
2008	397,766	332,728	730,494	6,249	-2,167.41

Source: Forest Service

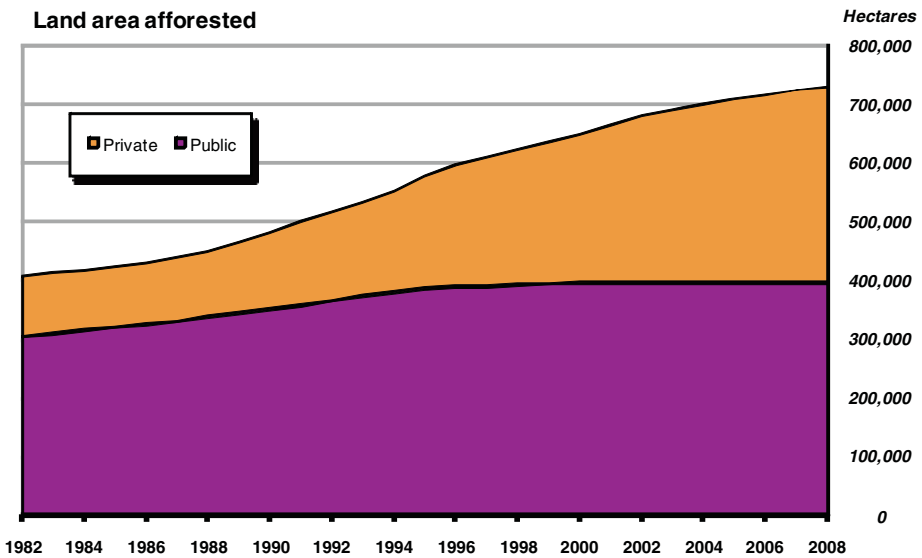


Table 19.2 Road transport

	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)
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	5,039	–
1991	836,583	1,105,545	3,525,700	237	5,242	–
1992	858,498	1,126,473	3,554,500	242	5,686	–
1993	891,027	1,151,238	3,574,100	249	5,647	–
1994	939,022	1,202,273	3,585,900	262	5,881	–
1995	990,384	1,262,503	3,601,300	275	6,107	–
1996	1,057,383	1,338,616	3,626,100	292	7,145	–
1997	1,134,429	1,432,330	3,664,300	310	7,482	–
1998	1,196,901	1,510,853	3,703,100	323	8,829	8,184
1999	1,269,245	1,608,156	3,741,600	339	9,784	10,228
2000	1,319,250	1,682,221	3,789,500	348	10,513	12,263
2001	1,384,704	1,769,684	3,847,200	360	11,017	12,291
2002	1,447,908	1,850,046	3,917,200	370	11,216	14,282
2003	1,507,106	1,937,429	3,978,900	379	11,397	15,679
2004	1,582,833	2,036,307	4,043,800	391	12,028	17,011
2005	1,662,157	2,138,680	4,130,700	402	12,792	17,819
2006	1,778,861	2,296,393	4,234,900	420	13,483	17,322
2007	1,882,901	2,441,564	4,339,000	434	14,144	18,707
2008	1,924,281	2,497,568	4,422,100	435	14,062	17,289

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

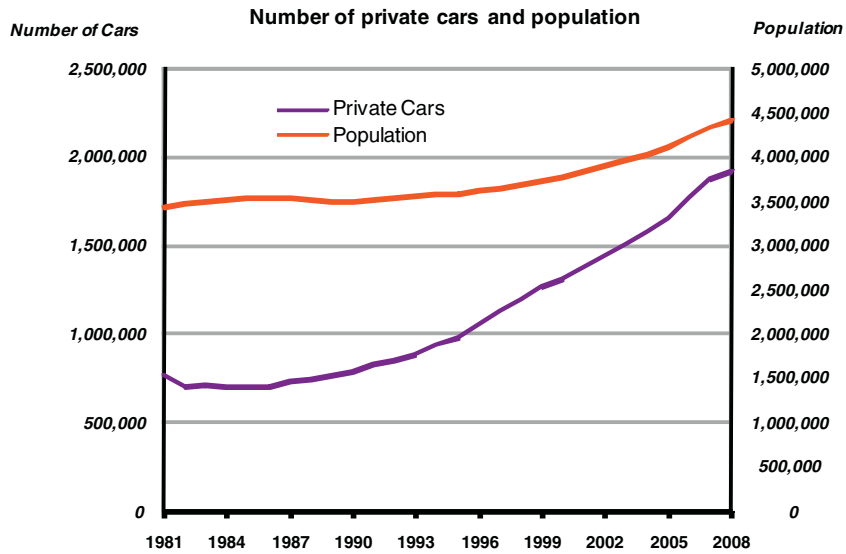


Table 19.3 Total primary energy requirement by fuel type

	Millions of tonnes of oil equivalent (TOE)							Percentages						
	1990	2000	2005	2006	2007	2008	2009	1990	2000	2005	2006	2007	2008	2009
Coal	2.09	1.82	1.88	1.68	1.55	1.48	1.21	22.0	13.2	11.9	10.5	9.6	9.0	8.5
Peat	1.38	0.80	0.78	0.71	0.70	0.85	0.86	14.5	5.8	4.9	4.4	4.3	5.2	6.0
Oil	4.42	7.86	9.13	8.96	9.02	8.96	7.28	46.6	57.0	57.7	56.2	55.8	54.7	50.7
Natural gas	1.45	3.06	3.48	4.02	4.29	4.49	4.31	15.2	22.2	22.0	25.2	26.6	27.4	30.0
Renewables	0.17	0.24	0.38	0.43	0.48	0.58	0.65	1.8	1.7	2.4	2.7	3.0	3.5	4.5
Electricity imports	0.00	0.02	0.18	0.15	0.12	0.07	0.08	0.0	0.1	1.1	1.0	0.7	0.4	0.6
Total	**9.50**	**13.78**	**15.81**	**15.95**	**16.17**	**16.40**	**14.37**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.1**

Source: Sustainable Energy Authority of Ireland

Table 19.4 Final energy consumption by sector

	Millions of tonnes of oil equivalent (TOE)						Percentages					
	1990	1995	2000	2005	2008	2009	1990	1995	2000	2005	2008	2009
Transport	2.02	2.38	4.08	5.03	5.61	5.08	27.9	29.8	37.7	39.7	41.8	41.5
Residential	2.26	2.21	2.52	2.96	3.19	3.10	31.1	27.7	23.3	23.3	23.7	25.3
Industry	1.72	1.97	2.53	2.67	2.54	2.15	23.7	24.6	23.4	21.1	18.9	17.5
Services	1.01	1.09	1.37	1.68	1.81	1.64	13.9	13.6	12.7	13.3	13.4	13.4
Agriculture	0.25	0.34	0.32	0.34	0.30	0.28	3.5	4.3	2.9	2.6	2.2	2.3
Total	**7.26**	**8.00**	**10.81**	**12.69**	**13.44**	**12.25**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Sustainable Energy Authority of Ireland

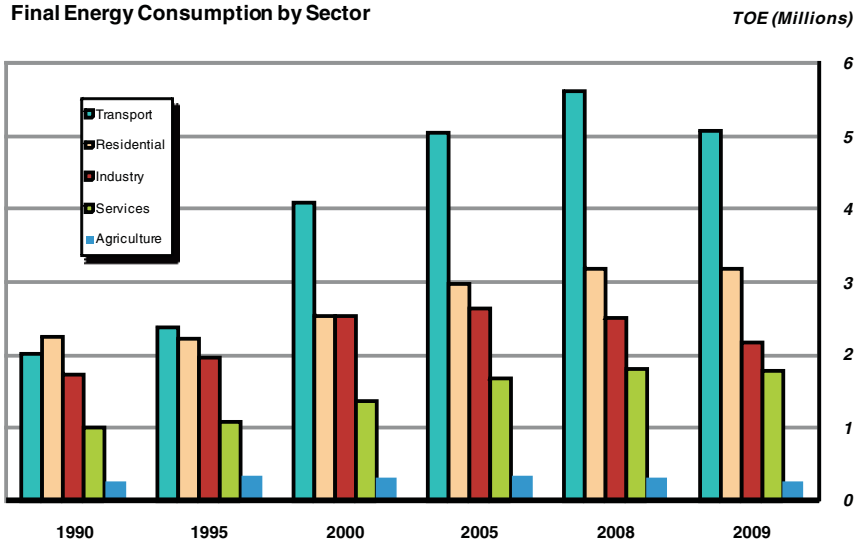


Table 19.5 Greenhouse gas emissions (net)

Kilotonnes

	1990	2001	2002	2003	2004	2005	2006	2007	2008
Carbon dioxide (CO_2)	32,609	47,095	45,477	44,622	45,568	47,011	46,579	46,292	46,035
Methane (CH_4)	646	635	635	658	619	609	611	586	580
Nitrous oxide (N_2O)	29	28	27	26	26	25	25	24	23
Total	**33,284**	**47,758**	**46,139**	**45,306**	**46,213**	**47,645**	**47,215**	**46,902**	**46,638**

Source: Environmental Protection Agency

Table 19.6 Greenhouse gas emissions (net), in CO_2 equivalents

CO_2 equivalent kilotonnes

	1990	2001	2002	2003	2004	2005	2006	2007	2008
Carbon dioxide (CO_2)	32,609	47,095	45,500	44,606	45,568	47,011	46,579	46,292	45,878
Methane (CH_4)	13,576	13,336	13,328	13,813	12,994	12,786	12,821	12,303	12,166
Nitrous oxide (N_2O)	8,837	8,617	8,231	8,138	7,941	7,848	7,682	7,373	7,237
HFCs, PFCs and SF_6	36	618	560	698	636	701	725	700	688
Total	**55,059**	**69,666**	**67,620**	**67,255**	**67,140**	**68,346**	**67,808**	**66,668**	**65,969**
Base year 1990=100	100	127	123	122	122	124	123	121	120

Source: Environmental Protection Agency

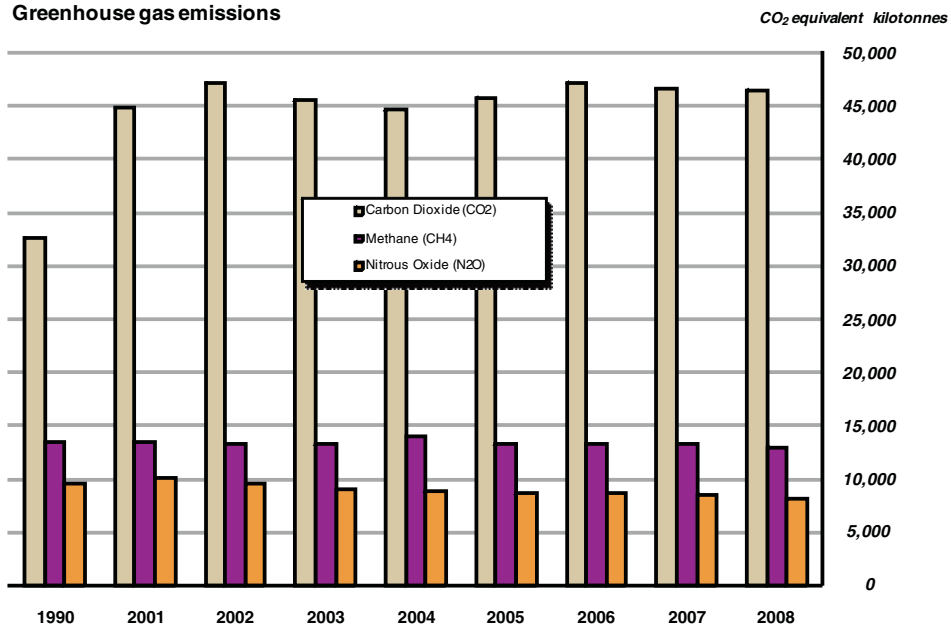


Table 19.7 Acid rain and ozone precursors

Kilotonnes

	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sulphur dioxide (SO_2)	182.30	139.49	134.17	102.24	78.45	71.06	70.43	60.00	54.07	44.54
Nitrogen oxides (NO_X)	123.15	135.23	137.14	127.75	122.82	122.13	123.08	118.11	116.71	108.38
Ammonia (NH_3)	109.54	121.43	115.50	113.07	111.79	111.30	110.28	109.81	105.51	103.84
Volatile organic compounds (VOC)	81.73	69.44	68.50	64.12	62.26	59.52	58.58	58.14	57.59	57.07
Carbon monoxide (CO)	418.02	255.28	244.49	225.43	213.54	200.53	190.49	181.00	170.86	162.28
Total	**914.74**	**720.85**	**699.79**	**632.61**	**588.87**	**564.55**	**552.85**	**527.07**	**504.74**	**476.11**

Source: Environmental Protection Agency

Table 19.8 Acid rain precursors, in SO_2 equivalents

SO_2 equivalent kilotonnes

	1990	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sulphur dioxide (SO_2)	182.30	139.49	134.17	101.24	78.45	71.06	70.43	60.00	54.07	44.54
Nitrogen oxides (NO_X)	85.64	94.04	95.36	88.83	85.41	84.93	85.60	82.14	81.16	75.365
Ammonia (NH_3)	206.20	228.58	217.42	212.84	210.43	209.52	207.59	206.71	198.61	195.47
Total	**474.14**	**462.10**	**446.96**	**402.91**	**374.29**	**365.51**	**363.61**	**348.85**	**333.84**	**315.37**
Base year 1990=100	100.00	97.46	94.27	84.98	78.94	77.09	76.69	73.58	70.41	66.51

Source: Environmental Protection Agency

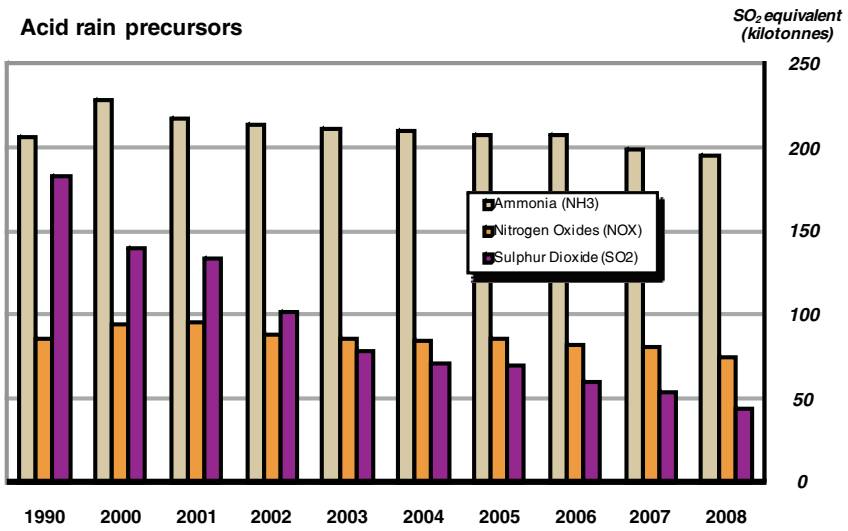


Table 19.9 Air quality – number of days with PM_{10} greater than 50 µg/m^3 in Dublin

Location	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Wood Quay	74	66	45	-	28	14	28	14	8	10	7	7
Rathmines	9	12	3	6	18	12	27	6	7	13	7	11
Phoenix Park	5	5	6	4	12	8	9	2	2	2	2	1

Source: Environmental Protection Agency

Table 19.10 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	2004-2006	2005-2007	2006-2008
Unpolluted	77.3	71.2	67.0	69.8	69.2	70.2	71.4	68.3	70.0
Slightly polluted	12.0	16.8	18.2	17.0	17.9	18.1	18.1	21.4	19.0
Moderately polluted	9.7	11.4	13.8	12.4	12.3	11.1	10.0	9.9	10.6
Seriously polluted	0.9	0.6	0.9	0.8	0.6	0.6	0.5	0.4	0.5
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.1**

Source: Environmental Protection Agency

Table 19.11 Total household and commercial waste collected

Tonnes

	1995	2001	2002	2003	2005	2006	2007	2008
Total household and commercial waste collected	**1,385,439**	**2,297,603**	**2,398,769**	**2,559,387**	**2,703,603**	**3,100,310**	**3,174,565**	**3,103,820**
Base year 1995=100	100.0	165.8	173.1	184.7	195.1	223.8	229.1	224.0

Source: Environmental Protection Agency

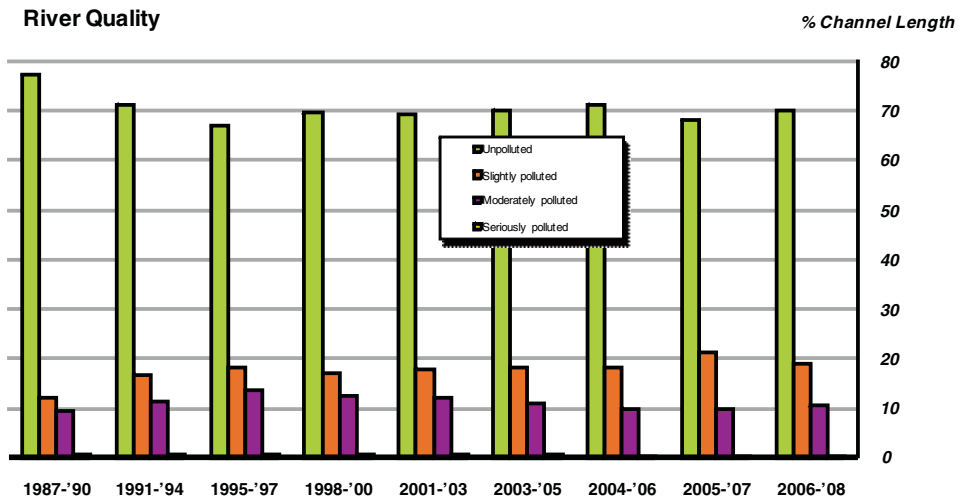


Table 19.12 Climate, 2009

	Carlow (Oak Park)	Ballyhaise	Shannon Airport	Cork Airport	Roches Point	Malin Head	Dublin Airport
Rainfall (mm)							
Total	1124.1	1167.9	1165.7	1578.5	1166.4	1171.7	917.7
% of average	143	126	127	128	125	112	–
Most in a day (mm)	32.1	43.3	26.7	51.2	39.0	38.1	42.4
Date(s)	19-Nov	19-Nov	19-Nov	19-Nov	30-Jan	16-Nov	02-Jul
Temperature (°C)							
Mean	9.8	9.4	10.7	9.6	10.6	10.2	9.7
Diff. from average	0.4	–	0.6	0.1	0.3	0.8	–
Highest	26.8	26.5	26.9	23.8	23.2	24.4	24.5
Lowest	-7.0	-9.7	-5.6	-3.3	-1.6	-3.0	-6.6
Sunshine (hours)							
Total	–	–	4.02	4.24	–	4.13	4.28
% of average	–	–	110	108	–	117	107
Most in a day amount (hours)	–	–	15.3	15.5	–	15.2	15.7
Date(s)	–	–	04-Jun	01-Jun	–	24-Jun	24-Jun
No. of days with:							
Rain (>0.1 mm)	217	243	236	237	215	246	209
Snow	–	–	9	14	–	25	16
Air frost	47	46	27	26	12	8	45
Hail	–	–	9	5	–	38	5
Thunder	–	–	2	1	–	11	4
Fog	–	–	28	100	–	8	29
Gale gusts	30	20	51	66	95	151	72

Source: Met Éireann

Table 19.12 Climate, 2009 - continued

	Casement Aerodrome	Valentia Observatory	Belmullet	Knock Airport	Gurteen	Mullingar	Johnstown Castle
Rainfall (mm)							
Total	925.5	2174.9	1326.3	1436.5	1076.8	1177.5	1452.6
% of average	127	155	120	–	–	126	144
Most in a day (mm)	44.7	50.4	25.7	30.6	30.0	32.4	44.3
Date(s)	06-Jun	19-Nov	07-Apr	16-Nov	30-Jan	23-Jul	06-Oct
Temperature (°C)							
Mean	9.8	11.1	10.6	8.8	9.6	9.4	10.2
Diff. from average	0.5	0.5	0.6	–	–	0.6	0.6
Highest	24.9	26.1	23.9	25.2	26.6	26.6	24.2
Lowest	-8.3	-3.6	-2.7	-6.1	-6.6	-10.0	-4.1
Sunshine (hours)							
Total	4.09	3.63	4.15	3.64	–	–	–
% of average	107	102	112	102	–	–	–
Most in a day amount (hours)	16.0	15.4	15.0	15.7	–	–	–
Date(s)	24-Jun	01-Jun	04-Jun	03-Jun	–	–	–
No. of days with:							
Rain (>0.1 mm)	202	272	274	277	235	243	224
Snow	21	4	25	34	–	–	–
Air frost	38	13	15	42	41	53	26
Hail	15	30	54	12	–	–	–
Thunder	4	5	10	4	–	–	–
Fog	18	7	8	146	–	–	–
Gale gusts	74	86	149	71	25	7	25

Source: Met Éireann