

19

Environment

- The total number of registered vehicles has increased by 134% over the period 1990-2009. Related CO₂ emissions increased by 168% in the same period.
- Ireland's total primary energy requirement in 2010 was 14.57m TOE, an increase of 5.7% since 2000.
- Greenhouse gas emissions (as measured in Carbon Dioxide (CO₂) equivalents) have decreased by 12.5% during the years 2001 to 2009 while acid rain precursor emissions (as measured in Sulphur Dioxide (SO₂) equivalents) have decreased by 35.6% during the period 2000 to 2009.
- The proportion of rivers classified as being unpolluted has declined from 77.3% in 1987-1990 to 68.9% in 2007-2009.

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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 of 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, 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. Tables 19.7 and 19.8 refer to fuel sold rather than fuel used in the economy. Table 19.11 contains statistics related to the generation of municipal waste. Data is provided on various aspects of Ireland's climate in table 19.12 in respect of 2010.

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 5m 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 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.

The data for carbon sinks between 1990 and 2008 have changed significantly since last year due to a methodological revision in the treatment of carbon release attributable to afforestation on organic soils (drained peat).

Table 19.5

Table 19.5 does not contain the actual quantities of HFCs, PFCs and SF₆ gases because these comprise a large number of different types of gases, all of which have their own "CO₂ Equivalent" factor. This means that there is no stable relationship between say CH₄ and the CO₂ equivalent, there is no 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

SF₆ = Sulphur hexafluorides

PM₁₀ = Particulate matter measuring less than 10 microns in diameter

µg/m³ = Microgram per cubic metre

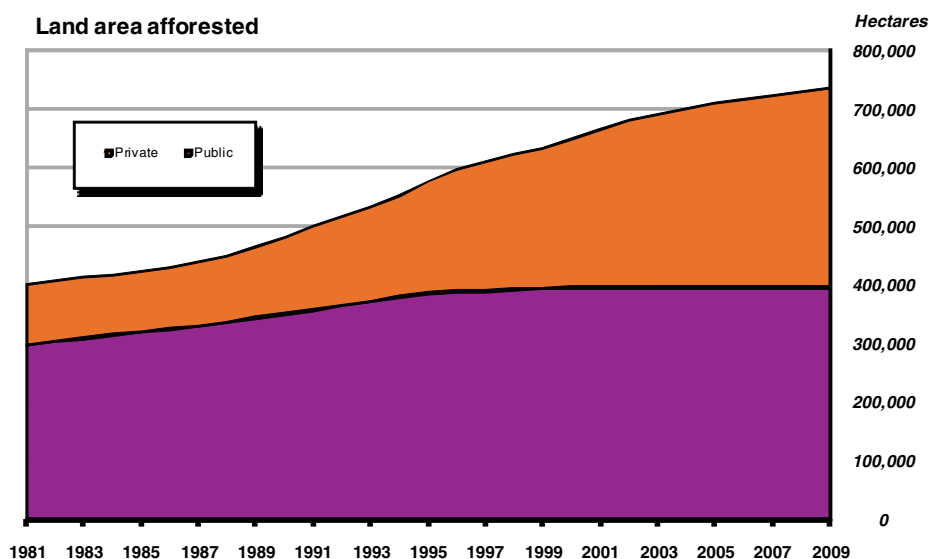
WEEE = Waste Electronic and Electrical Equipment

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 CO₂ 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	-1,137.80
1991	358,786	141,455	500,241	19,147	-1,206.43
1992	366,351	150,589	516,940	16,699	-1,078.00
1993	373,178	159,760	532,938	15,998	-1,174.08
1994	379,800	172,597	552,397	19,459	-1,155.73
1995	386,167	189,940	576,107	23,710	-1,220.77
1996	390,593	206,495	597,088	20,981	-1,259.54
1997	391,444	217,078	608,522	11,434	-1,399.50
1998	394,370	227,080	621,450	12,928	-1,534.03
1999	395,261	238,857	634,118	12,668	-1,568.11
2000	396,725	253,088	649,813	15,695	-1,432.28
2001	397,042	268,235	665,277	15,464	-1,592.87
2002	397,361	282,970	680,331	15,054	-1,776.61
2003	397,489	291,939	689,428	9,097	-2,014.09
2004	397,610	301,556	699,166	9,739	-1,687.09
2005	397,674	311,588	709,262	10,096	-1,840.75
2006	397,699	319,600	717,299	8,037	-1,882.91
2007	397,699	326,547	724,246	6,947	-2,407.67
2008	397,766	332,728	730,494	6,249	-3,051.70
2009	397,801	339,341	737,142	6,648	-2,684.78

Source: Forest Service



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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	4,701	–
1991	836,583	1,105,545	3,525,700	237	4,906	–
1992	858,498	1,126,473	3,554,500	242	5,357	–
1993	891,027	1,151,238	3,574,100	249	5,321	–
1994	939,022	1,202,273	3,585,900	262	5,560	–
1995	990,384	1,262,503	3,601,300	275	5,716	–
1996	1,057,383	1,338,616	3,626,100	292	6,719	–
1997	1,134,429	1,432,330	3,664,300	310	7,080	–
1998	1,196,901	1,510,853	3,703,100	323	8,439	8,184
1999	1,269,245	1,608,156	3,741,600	339	9,352	10,228
2000	1,319,250	1,682,221	3,789,500	348	10,103	12,263
2001	1,384,704	1,769,684	3,847,200	360	10,547	12,291
2002	1,447,908	1,850,046	3,917,200	370	10,829	14,282
2003	1,507,106	1,937,429	3,979,900	379	11,000	15,679
2004	1,582,833	2,036,307	4,045,200	391	11,608	17,011
2005	1,662,157	2,138,680	4,133,800	402	12,351	17,819
2006	1,778,861	2,296,393	4,232,900	420	13,093	17,322
2007	1,882,901	2,441,564	4,339,000	434	13,755	18,707
2008	1,924,281	2,497,568	4,422,100	435	13,646	17,289
2009	1,902,429	2,467,660	4,459,300	427	12,602	12,069

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

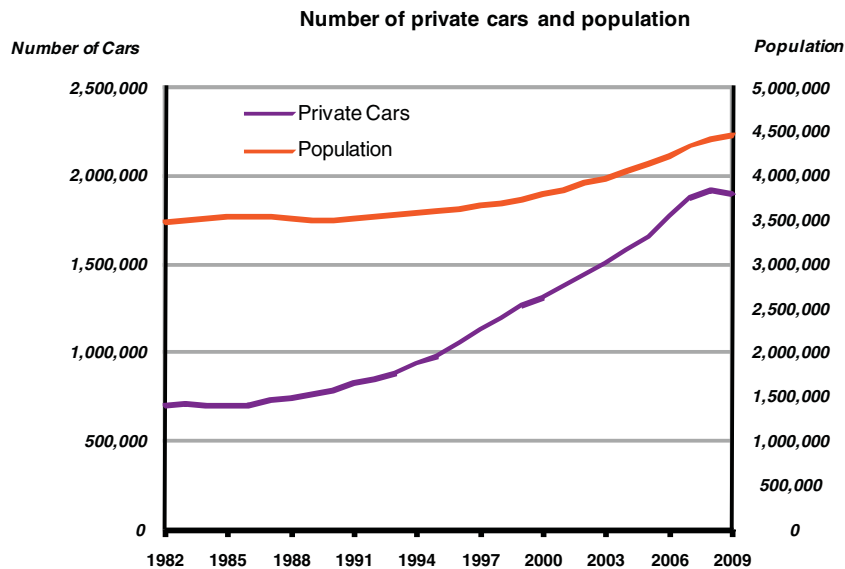


Table 19.3 Total primary energy requirement by fuel type

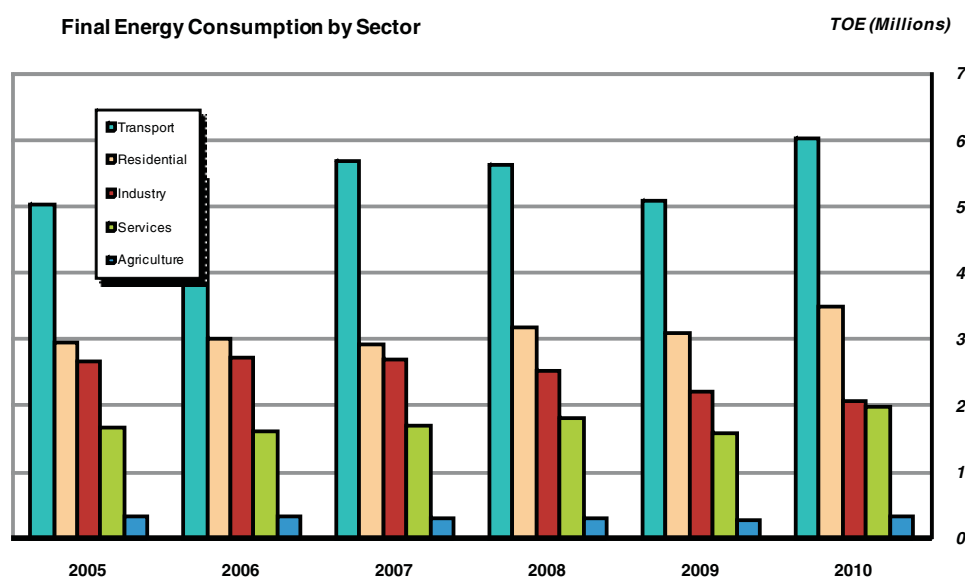
	Millions of tonnes of oil equivalent (TOE)							Percentages						
	2000	2005	2006	2007	2008	2009	2010	2000	2005	2006	2007	2008	2009	2010
Coal	1.82	1.88	1.68	1.55	1.48	1.21	1.21	13.2	11.9	10.5	9.6	9.0	8.2	8.3
Peat	0.80	0.78	0.71	0.70	0.85	0.86	0.81	5.8	4.9	4.4	4.3	5.2	5.8	5.5
Oil	7.86	9.13	8.96	9.02	8.96	7.75	7.05	57.0	57.7	56.2	55.8	54.7	52.1	48.4
Natural gas	3.06	3.48	4.02	4.29	4.49	4.31	4.71	22.2	22.0	25.2	26.6	27.4	29.0	32.3
Renewables	0.24	0.38	0.43	0.48	0.58	0.67	0.74	1.7	2.4	2.7	3.0	3.5	4.5	5.1
Non-renewable waste	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Electricity imports	0.01	0.18	0.15	0.11	0.04	0.07	0.04	0.1	1.1	1.0	0.7	0.2	0.4	0.3
Total	13.78	15.81	15.95	16.17	16.40	14.87	14.57	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Sustainable Energy Authority of Ireland

Table 19.4 Final energy consumption by sector

	Millions of tonnes of oil equivalent (TOE)						Percentages					
	2005	2006	2007	2008	2009	2010	2005	2006	2007	2008	2009	2010
Transport	5.03	5.39	5.69	5.61	5.08	6.04	39.7	41.3	42.8	41.8	41.4	43.4
Residential	2.96	3.00	2.93	3.19	3.10	3.49	23.3	23.0	22.0	23.7	25.3	25.1
Industry	2.67	2.72	2.69	2.54	2.22	2.07	21.1	20.8	20.2	18.9	18.1	14.9
Services	1.68	1.62	1.69	1.81	1.59	1.98	13.3	12.4	12.7	13.4	13.0	14.2
Agriculture	0.34	0.32	0.30	0.30	0.27	0.34	2.6	2.5	2.3	2.2	2.2	2.5
Total	12.69	13.05	13.29	13.44	12.25	13.92	100.0	100.0	100.0	100.0	100.0	100.0

Source: Sustainable Energy Authority of Ireland



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Table 19.5 Greenhouse gas emissions (net)

Kilotonnes

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Carbon dioxide (CO ₂)	46,142	44,537	43,884	44,777	46,312	45,865	45,578	45,136	40,198
Methane (CH ₄)	640	640	663	627	618	618	595	590	580
Nitrous oxide (N ₂ O)	28	27	26	26	25	25	24	23	23
Total	46,810	45,203	44,574	45,429	46,955	46,508	46,197	45,749	40,801

Source: Environmental Protection Agency

Table 19.6 Greenhouse gas emissions (net), in CO₂ equivalents

CO₂ equivalent kilotonnes

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Carbon dioxide (CO ₂)	46,142	44,537	43,884	44,777	46,312	45,865	45,578	45,136	40,198
Methane (CH ₄)	13,446	13,443	13,930	13,162	12,977	12,983	12,499	12,380	12,178
Nitrous oxide (N ₂ O)	8,604	8,245	8,168	7,974	7,867	7,704	7,387	7,255	7,213
HFCs, PFCs and SF ₆	618	560	698	636	700	725	700	688	632
Total	68,810	66,785	66,681	66,549	67,857	67,277	66,164	65,459	60,222
Base year 1990=100	127	123	123	123	125	124	122	121	111

Source: Environmental Protection Agency

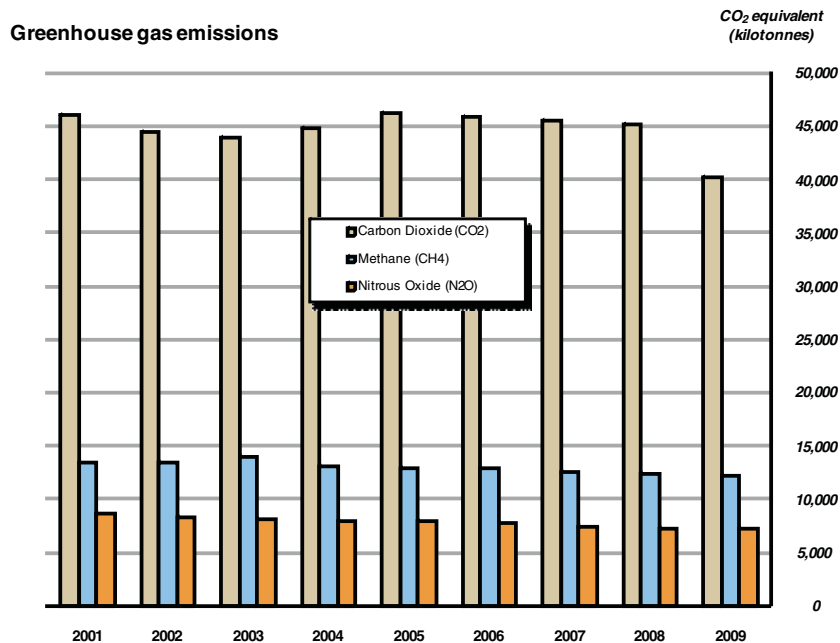


Table 19.7 Acid rain and ozone precursors

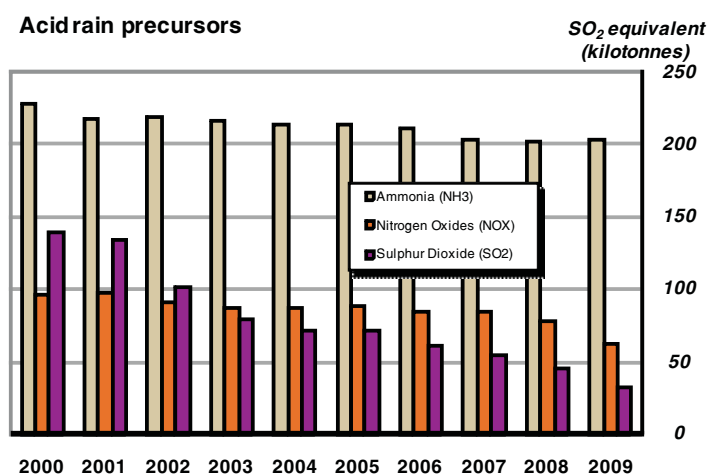
	Kilotonnes									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Sulphur dioxide (SO ₂)	139.75	134.41	101.45	79.29	71.90	71.19	60.75	55.12	45.26	32.70
Nitrogen oxides (NO _x)	137.96	139.85	130.33	126.19	125.75	127.05	122.43	121.17	112.33	90.28
Ammonia (NH ₃)	120.86	115.56	116.18	114.90	113.72	113.26	112.38	107.61	107.39	107.77
Volatile organic compounds (VOC)	73.43	71.40	66.84	64.28	61.34	59.70	58.41	56.95	55.18	52.22
Carbon monoxide (CO)	255.72	244.95	225.69	214.00	203.91	193.76	184.56	173.75	165.42	158.31
Total	727.72	706.17	640.51	598.66	576.62	564.96	538.52	514.59	485.57	441.28

Source: Environmental Protection Agency

Table 19.8 Acid rain precursors, in SO₂ equivalents

	SO ₂ equivalent kilotonnes									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Sulphur dioxide (SO ₂)	139.75	134.41	101.45	79.29	71.90	71.19	60.75	55.12	45.26	32.70
Nitrogen oxides (NO _x)	95.98	97.29	90.67	87.79	87.48	88.39	85.17	84.30	78.15	62.80
Ammonia (NH ₃)	227.50	217.52	218.70	216.29	214.07	213.21	211.55	202.56	202.14	202.86
Total	463.22	449.22	410.83	383.37	373.45	372.79	357.47	341.98	325.54	298.37
Base year 1990=100	98.85	95.86	87.67	81.81	79.69	79.55	76.28	72.98	69.47	63.67

Source: Environmental Protection Agency



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Table 19.9 Air quality – number of days with PM₁₀ greater than 50 µg/m³ in Dublin

Location	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Wood Quay	74	66	45	-	28	14	28	14	8	10	7	7	1
Rathmines	9	12	3	6	18	12	27	6	7	13	7	11	1
Phoenix Park	5	5	6	4	12	8	9	2	2	2	2	1	0

Source: Environmental Protection Agency

Table 19.10 River quality (based on the national scheme of biological classification)

% of channel length

	1987-1990	1991-1994	1995-2007	1998-2000	2001-2003	2004-2006	2007-2009
Unpolluted	77.3	71.2	66.9	69.7	69.3	71.4	68.9
Slightly polluted	12.0	16.8	18.2	17.1	17.9	18.1	20.7
Moderately polluted	9.7	11.4	14.0	12.4	12.3	10.0	10.0
Seriously polluted	0.9	0.6	0.9	0.8	0.6	0.5	0.4
Total	100.0	100.0	100.1	100.0	100.1	100.0	100.0

Source: Environmental Protection Agency

Table 19.11 Total municipal waste generated

Tonnes

	2002	2003	2004	2005	2006	2007	2008	2009
Household waste	1,679,068	1,704,844	1,728,154	1,746,408	1,978,716	1,761,167	1,677,338	1,626,469
Commercial waste	975,744	1,141,264	1,202,824	1,235,629	1,327,068	1,549,075	1,477,397	1,299,807
Cleansing waste	65,573	71,779	69,661	58,677	78,822	87,441	69,546	26,701
Total municipal waste	2,720,385	2,917,886	3,000,638	3,040,714	3,384,606	3,397,683	3,224,281	2,952,977
Base year 1995 = 100	147.2	157.9	162.4	164.5	183.1	183.8	174.5	159.8

Source: Environmental Protection Agency

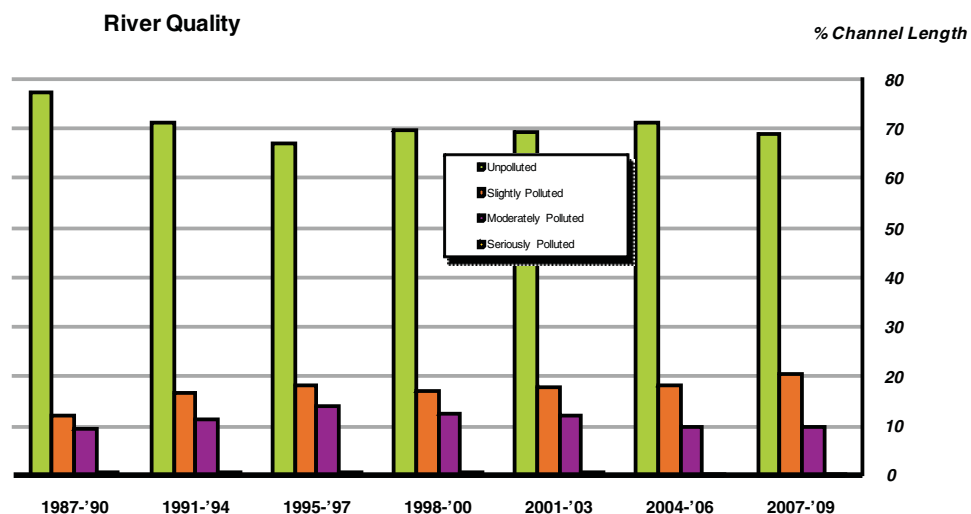


Table 19.12 Climate, 2010

	Carlow (Oak Park)	Ballyhaise	Shannon Airport	Cork Airport	Roches Point	Malin Head	Dublin Airport
Rainfall (mm)							
Total	774.9	835.8	845.1	904.7	805.1	962.4	668.8
% of average	99	80	92	76	86	91	n/a
Most in a day (mm)	47.1	56.2	42.4	36.4	31.4	37.7	20.5
Date(s)	06-Sep	06-Sep	07-Sep	27-Dec	29-Oct	06-Sep	06-Sep
Temperature (°C)							
Mean	8.9	8.2	9.4	9	9.8	9.4	8.5
Diff. from average	-0.5	n/a	-0.7	-0.5	-0.5	0.1	n/a
Highest	25.6	24.9	25.2	23.1	22.7	22.5	24
Lowest	-12.9	-15.2	-11.4	-7.2	-4.4	-3.5	-12.2
Sunshine (hours)							
Total	n/a	n/a	4.46	4.85	n/a	4.01	4.70
% of average	n/a	n/a	123	124	n/a	118	117
Most in a day amount (hours)	n/a	n/a	15.8	15.8	n/a	13.7	15.8
Date(s)	n/a	n/a	20-Jun	20-Jun	n/a	10-Jun	21-Jun
No. of days with:							
Rain (>0.1 mm)	182	196	199	200	178	224	179
Snow	n/a	n/a	19	19	n/a	23	32
Air frost	87	91	78	60	40	29	98
Hail	n/a	n/a	4	1	n/a	33	17
Thunder	n/a	n/a	1	1	n/a	2	8
Fog	n/a	n/a	49	96	n/a	9	43
Gale gusts	12	18	28	36	47	124	32

Source: Met Éireann

Table 19.12 Climate, 2010 - continued

	Casement Aerodrome	Valentia Observatory	Belmullet	Knock Airport	Gurteen	Mullingar	Johnstown Castle
Rainfall (mm)							
Total	713.5	1331.7	1106.9	1093.3	735.2	896.1	966.6
% of average	98	95	101	n/a	n/a	96	96
Most in a day (mm)	29.8	58.5	42.1	86.5	23.4	59.4	60.5
Date(s)	22-Sep	12-Jan	07-Sep	06-Sep	29-Mar	06-Sep	06-Sep
Temperature (°C)							
Mean	8.6	10.3	9.7	8.1	8.5	8.3	9.1
Diff. from average	-0.7	-0.3	-0.3	n/a	n/a	-0.5	-0.5
Highest	24.9	23.6	22.4	23.6	25.1	24.9	23.9
Lowest	-15.7	-7.7	-7.6	-7.4	-13.4	-14.1	-4.6
Sunshine (hours)							
Total	4.24	4.64	4.45	4.18	n/a	n/a	n/a
% of average	110	130	120	n/a	n/a	n/a	n/a
Most in a day amount (hours)	16.0	15.9	14.0	15.3	n/a	n/a	n/a
Date(s)	20-Jun	20-Jun	08-May	23-May	n/a	n/a	n/a
No. of days with:							
Rain (>0.1 mm)	176	230	256	234	195	194	184
Snow	33	10	33	33	n/a	n/a	n/a
Air frost	92	49	49	76	92	91	43
Hail	20	14	38	10	n/a	n/a	n/a
Thunder	8	5	4	1	n/a	n/a	n/a
Fog	39	9	17	115	n/a	n/a	n/a
Gale gusts	37	54	94	42	16	7	12

Source: Met Éireann

