

# 19

## Environment

- The total number of registered vehicles increased by 136.9% over the period 1990-2008, before declining by 3.3% between 2008 and 2010. Road transport related CO<sub>2</sub> emissions followed a similar pattern, increasing by 193.3% from 1990-2007 before falling by 20.4% in the 2007-2010 period.
- Ireland's final energy consumption declined from 2007 to 2011 by 16.1%. The transport sector accounted for 39.9% of Ireland's final energy consumption, the highest for any economic sector, in 2011.
- Greenhouse gas emissions (as measured in Carbon Dioxide (CO<sub>2</sub>) equivalents) have decreased by 10% during the years 2002 to 2010 while acid rain precursor emissions (as measured in Sulphur Dioxide (SO<sub>2</sub>) equivalents) have declined by 36.9% during the period 2001 to 2010.
- The level of municipal waste generated increased by 16.4% between 2003 and 2007 before falling back by 16.2% in the 2007-2010 period.

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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.

Table 19.2 shows that the total number of vehicles increased up to 2008 before declining in 2009 and 2010. CO<sub>2</sub> emissions from transport followed a similar path, peaking in 2007 before declining in subsequent years. 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. Table 19.4 shows that the transport sector is the sector with the highest level of energy consumption, peaking in 2007 before declining in subsequent years.

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 2011.

## 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 CO<sub>2</sub> 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<sub>2</sub> removals to be negative.

The data for carbon sinks between 1990 and 2009 have changed significantly since last year due to a correction to this data by the EPA.

### Tables 19.3 and 19.4

The figures in respect of the year 2011 are provisional.

### Table 19.5

Table 19.5 does not contain the actual quantities of HFCs, PFCs and SF<sub>6</sub> gases because these comprise a large number of different types of gases, all of which have their own "CO<sub>2</sub> Equivalent" factor. This means that there is no stable relationship between say CH<sub>4</sub> and the CO<sub>2</sub> equivalent, there is no common conversion factor for these gases and the CO<sub>2</sub> equivalent that is published (the conversion factor depends on the mix of gases each year).

Greenhouse gas emissions (net) data in Tables 19.5 and 19.6 exclude net CO<sub>2</sub> from the LULUCF sector.

## Definitions

TOE = Tonnes of Oil Equivalent

HFCs = Hydrofluorocarbons

PFCs = Perfluorocarbons

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

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

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

WEEE = Waste Electronic and Electrical Equipment

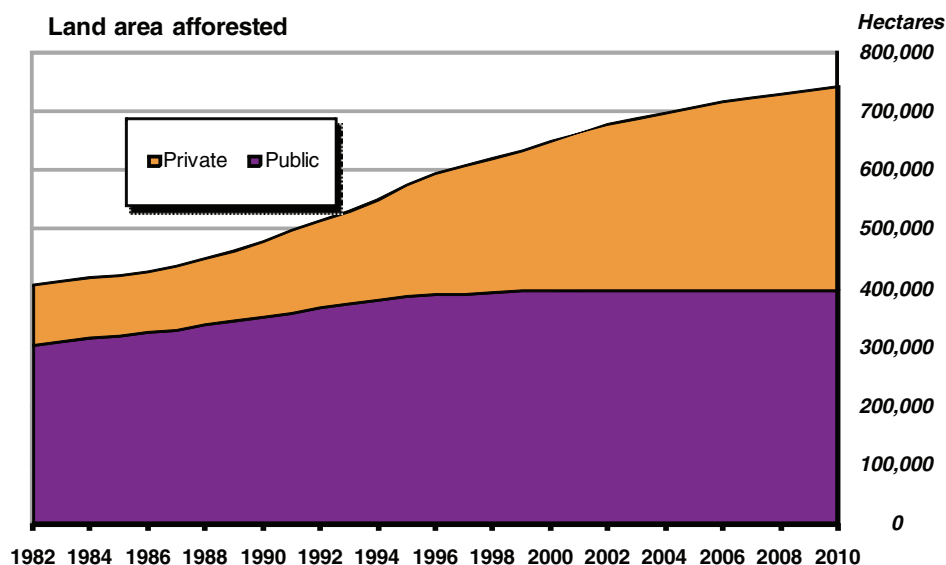
Forest Stocking Percent = Amount of live trees in a given area relative to what is considered the optimum for that area.

LULUCF = Land Use, Land Use Change and Forestry.

Table 19.1 Land areas afforested and CO<sub>2</sub> sinks

	Hectares public	Hectares private	Hectares total	Hectares annual change	CO <sub>2</sub> sinks kilotonnes
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	-371.02
1991	358,786	141,455	500,241	19,147	-398.42
1992	366,351	150,589	516,940	16,699	-226.93
1993	373,178	159,760	532,938	15,998	-281.32
1994	379,800	172,597	552,397	19,459	-224.46
1995	386,167	189,940	576,107	23,710	-260.04
1996	390,593	206,495	597,088	20,981	-234.04
1997	391,444	217,078	608,522	11,434	-355.87
1998	394,370	227,080	621,450	12,928	-471.10
1999	395,261	238,857	634,118	12,668	-505.71
2000	396,725	253,088	649,813	15,695	-355.14
2001	397,042	268,235	665,277	15,464	-481.87
2002	397,361	282,970	680,331	15,054	-623.31
2003	397,489	291,939	689,428	9,097	-856.85
2004	397,610	301,556	699,166	9,739	-477.93
2005	397,674	311,588	709,262	10,096	-635.28
2006	397,699	319,600	717,299	8,037	-709.10
2007	397,699	326,547	724,246	6,947	-1,194.68
2008	397,766	332,728	730,494	6,249	-1,826.71
2009	397,801	339,341	737,142	6,648	-1,475.29
2010	397,805	347,651	745,456	8,314	-1,371.23

Source: Forest Service

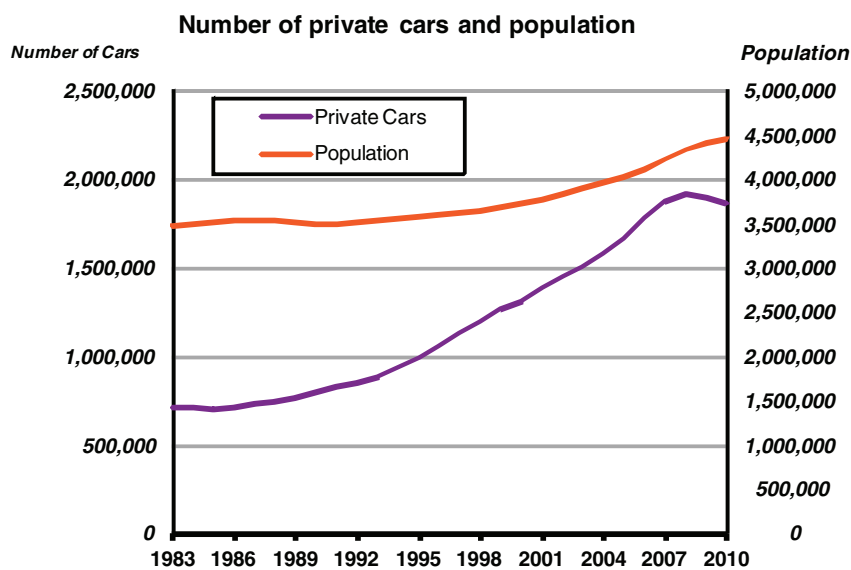


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**Table 19.2 Road transport**

	Number of private cars	Total number of vehicles	Population	Number of private cars per 1,000 of population	CO <sub>2</sub> 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	4,691	–
1991	836,583	1,105,545	3,525,700	237	4,880	–
1992	858,498	1,126,473	3,554,500	242	5,296	–
1993	891,027	1,151,238	3,574,100	249	5,278	–
1994	939,022	1,202,273	3,585,900	262	5,498	–
1995	990,384	1,262,503	3,601,300	275	5,685	–
1996	1,057,383	1,338,616	3,626,100	292	6,609	–
1997	1,134,429	1,432,330	3,664,300	310	6,957	–
1998	1,196,901	1,510,853	3,703,100	323	8,247	8,184
1999	1,269,245	1,608,156	3,741,600	339	9,119	10,228
2000	1,319,250	1,682,221	3,789,500	348	10,156	12,263
2001	1,384,704	1,769,684	3,847,200	360	10,621	12,291
2002	1,447,908	1,850,046	3,917,200	370	10,826	14,282
2003	1,507,106	1,937,429	3,979,900	379	11,008	15,679
2004	1,582,833	2,036,307	4,045,200	391	11,662	17,011
2005	1,662,157	2,138,680	4,133,800	402	12,359	17,819
2006	1,778,861	2,296,393	4,232,900	420	13,092	17,322
2007	1,882,901	2,441,564	4,339,000	434	13,759	18,707
2008	1,924,281	2,497,568	4,422,100	435	13,041	17,289
2009	1,902,429	2,467,660	4,459,300	427	11,860	12,071
2010	1,872,715	2,416,387	4,470,700	419	10,951	10,924

Source: Department of Transport, Tourism and Sport; CSO and Environmental Protection Agency



**Table 19.3 Total primary energy requirement by fuel type**

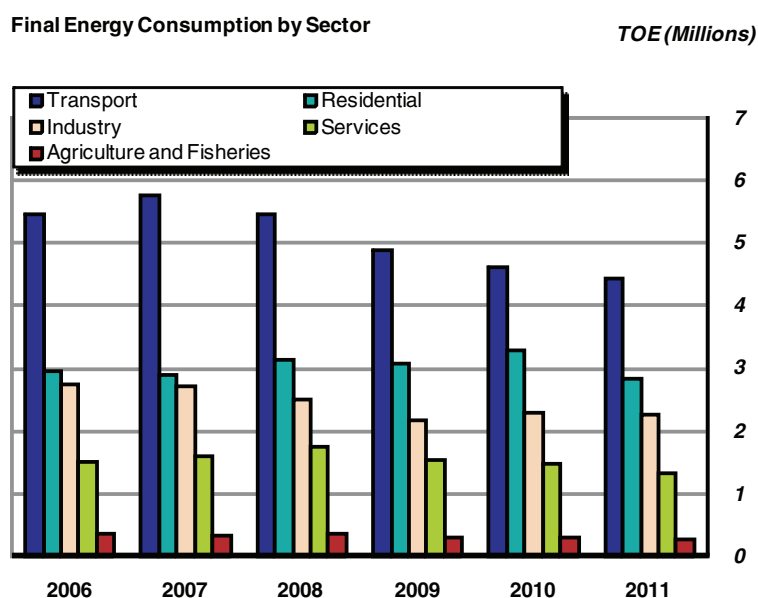
	Millions of tonnes of oil equivalent (TOE)							Percentages						
	2005	2006	2007	2008	2009	2010	2011	2005	2006	2007	2008	2009	2010	2011
Coal	1.89	1.63	1.60	1.42	1.15	1.24	1.26	11.9	10.2	9.8	8.7	7.8	8.4	9.1
Peat	0.79	0.75	0.75	0.85	0.82	0.79	0.76	5.0	4.7	4.6	5.2	5.5	5.3	5.5
Oil	9.13	8.96	9.02	8.96	7.74	7.36	6.78	57.7	56.2	55.5	54.8	52.4	49.7	48.8
Natural gas	3.48	4.02	4.29	4.49	4.31	4.70	4.21	22.0	25.2	26.4	27.4	29.1	31.7	30.3
Renewables	0.38	0.44	0.49	0.60	0.69	0.68	0.82	2.4	2.7	3.0	3.6	4.6	4.6	5.9
Non-renewable waste	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Electricity imports	0.18	0.15	0.11	0.04	0.07	0.04	0.04	1.1	1.0	0.7	0.2	0.4	0.3	0.3
<b>Total</b>	<b>15.83</b>	<b>15.95</b>	<b>16.27</b>	<b>16.36</b>	<b>14.79</b>	<b>14.83</b>	<b>13.89</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 Authority of Ireland

**Table 19.4 Final energy consumption by sector**

	Millions of tonnes of oil equivalent (TOE)						Percentages					
	2006	2007	2008	2009	2010	2011	2006	2007	2008	2009	2010	2011
Transport	5.47	5.75	5.48	4.89	4.62	4.45	41.9	43.2	41.4	40.7	38.6	39.9
Residential	2.97	2.90	3.15	3.09	3.28	2.84	22.7	21.8	23.8	25.7	27.4	25.5
Industry	2.75	2.72	2.50	2.18	2.29	2.27	21.1	20.4	18.9	18.2	19.1	20.3
Services	1.51	1.59	1.76	1.54	1.48	1.33	11.6	12.0	13.3	12.8	12.3	11.9
Agriculture and Fisheries	0.36	0.34	0.36	0.31	0.30	0.28	2.8	2.6	2.7	2.6	2.5	2.5
<b>Total</b>	<b>13.06</b>	<b>13.30</b>	<b>13.24</b>	<b>12.02</b>	<b>11.97</b>	<b>11.16</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 Authority of Ireland



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**Table 19.5 Greenhouse gas emissions (net)**

Kilotonnes

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Carbon dioxide (CO <sub>2</sub> )	45,612	45,060	45,945	47,673	47,296	47,465	46,961	41,649	41,268
Methane (CH <sub>4</sub> )	638	664	626	610	613	589	583	568	553
Nitrous oxide (N <sub>2</sub> O)	28	27	27	26	26	25	25	24	25
<b>Total</b>	<b>46,277</b>	<b>45,751</b>	<b>46,598</b>	<b>48,309</b>	<b>47,935</b>	<b>48,079</b>	<b>47,568</b>	<b>42,241</b>	<b>41,846</b>

Source: Environmental Protection Agency

**Table 19.6 Greenhouse gas emissions (net), in CO<sub>2</sub> equivalents**

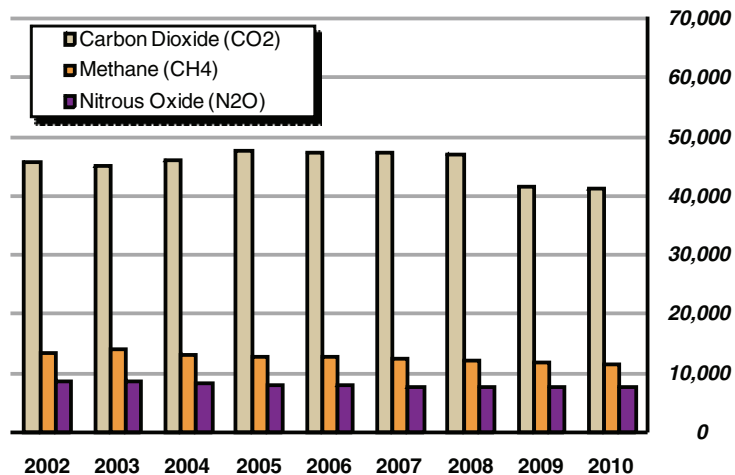
CO<sub>2</sub> equivalent kilotonnes

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Carbon dioxide (CO <sub>2</sub> )	45,612	45,060	45,945	47,673	47,296	47,465	46,961	41,649	41,268
Methane (CH <sub>4</sub> )	13,394	13,937	13,153	12,808	12,883	12,365	12,242	11,924	11,605
Nitrous oxide (N <sub>2</sub> O)	8,560	8,476	8,300	8,090	7,960	7,743	7,637	7,544	7,806
HFCs, PFCs and SF <sub>6</sub>	588	725	666	744	758	730	728	625	635
<b>Total</b>	<b>68,155</b>	<b>68,199</b>	<b>68,064</b>	<b>69,315</b>	<b>68,897</b>	<b>68,303</b>	<b>67,567</b>	<b>61,742</b>	<b>61,314</b>
Base year 1990=100	124	124	123	126	125	124	122	112	111

Source: Environmental Protection Agency

### Greenhouse gas emissions

CO<sub>2</sub> equivalent kilotonnes





**Table 19.7 Acid rain and ozone precursors**

Kilotonnes

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sulphur dioxide (SO <sub>2</sub> )	134.11	101.22	79.07	71.69	71.05	61.14	55.31	45.41	32.56	25.82
Nitrogen oxides (NO <sub>x</sub> )	136.21	127.11	126.17	126.83	126.39	121.75	119.07	108.73	86.51	74.83
Ammonia (NH <sub>3</sub> )	112.29	112.13	111.72	110.06	109.12	108.99	106.21	107.49	108.43	106.23
Volatile organic compounds (VOC)	70.00	64.65	61.65	58.33	56.29	54.92	53.20	50.71	47.58	44.73
Carbon monoxide (CO)	241.11	222.04	210.52	200.74	190.54	181.80	169.98	157.85	150.46	137.74
<b>Total</b>	<b>693.72</b>	<b>627.15</b>	<b>589.14</b>	<b>567.65</b>	<b>553.39</b>	<b>528.59</b>	<b>503.77</b>	<b>470.19</b>	<b>425.53</b>	<b>389.35</b>

Source: Environmental Protection Agency

**Table 19.8 Acid rain precursors, in SO<sub>2</sub> equivalents**

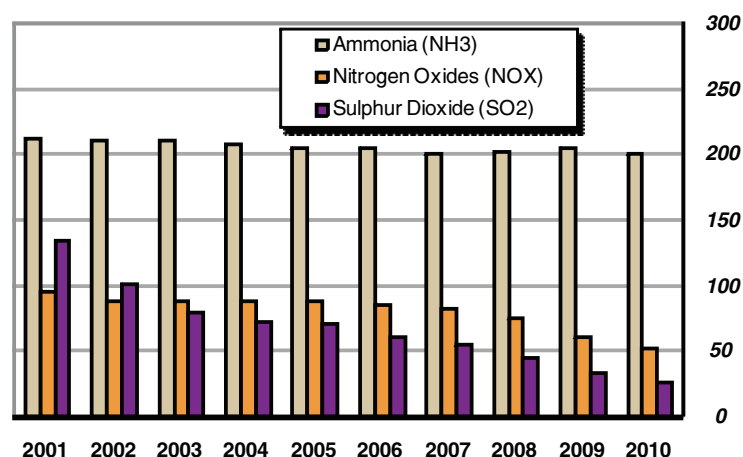
SO<sub>2</sub> equivalent kilotonnes

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Sulphur dioxide (SO <sub>2</sub> )	134.11	101.22	79.07	71.69	71.05	61.14	55.31	45.41	32.56	25.82
Nitrogen oxides (NO <sub>x</sub> )	94.76	88.43	87.78	88.24	87.93	84.70	82.84	75.64	60.18	52.06
Ammonia (NH <sub>3</sub> )	211.37	211.07	210.31	207.18	205.42	205.16	199.92	202.33	204.10	199.97
<b>Total</b>	<b>440.24</b>	<b>400.72</b>	<b>377.16</b>	<b>367.10</b>	<b>364.40</b>	<b>351.00</b>	<b>338.07</b>	<b>323.38</b>	<b>296.84</b>	<b>277.85</b>
Base year 1990=100	94.33	85.86	80.82	78.66	78.08	75.21	72.44	69.29	63.61	59.54

Source: Environmental Protection Agency

**Acid rain precursors**

SO<sub>2</sub> equivalent  
(kilotonnes)



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**Table 19.9 Air quality – 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	2005	2006	2007	2008	2009	2010
Wood Quay	74	66	45	-	28	14	28	14	8	10	7	7	1	7
Rathmines	9	12	3	6	18	12	27	6	7	13	7	11	1	5
Phoenix Park	5	5	6	4	12	8	9	2	2	2	2	1	0	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	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
<b>Total</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: Environmental Protection Agency

**Table 19.11 Total municipal waste generated**

Tonnes

	2003	2004	2005	2006	2007	2008	2009	2010
Household waste	1,704,844	1,728,154	1,746,408	1,978,716	1,761,167	1,677,338	1,626,469	1,686,387
Commercial waste	1,141,264	1,202,824	1,235,629	1,327,068	1,549,075	1,477,397	1,299,807	1,141,015
Cleansing waste	71,779	69,661	58,677	78,822	87,441	69,546	26,701	18,713
<b>Total municipal waste</b>	<b>2,917,886</b>	<b>3,000,638</b>	<b>3,040,714</b>	<b>3,384,606</b>	<b>3,397,683</b>	<b>3,224,281</b>	<b>2,952,977</b>	<b>2,846,115</b>
Base year 1995 = 100	157.9	162.4	164.5	183.1	183.8	174.5	159.8	154.0

Source: Environmental Protection Agency

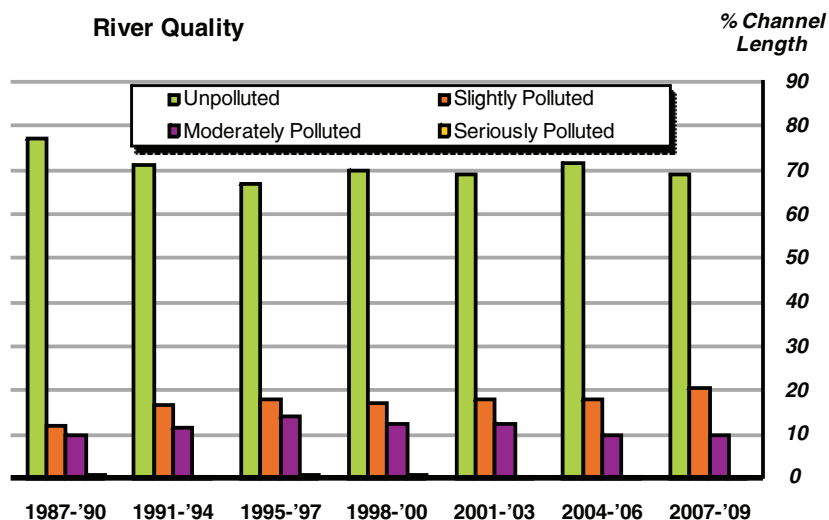


Table 19.12 Climate, 2011

	Carlow (Oak Park)	Ballyhaise	Shannon Airport	Cork Airport	Roches Point	Malin Head	Dublin Airport
<b>Rainfall (mm)</b>							
Total	735.9	1,074.7	1,016.6	1,022.7	770	1,231.6	671.8
% of average	94	103	111	86	82	116	90
Most in a day (mm)	46.5	27.7	33.0	33.8	28.4	22.4	69.1
Date(s)	30-Sep	15-Jan	05-Feb	02-May	02-May	17-Oct	24-Oct
<b>Temperature (°C)</b>							
Mean	10.3	9.5	10.7	9.9	10.8	10.2	10.1
Diff. from average	0.9	n/a	0.6	0.4	0.5	0.7	n/a
Highest	25.5	24.1	23.9	21.5	21.2	23.4	24.1
Lowest	-5.9	-7.0	-5.3	-3.7	-2.0	-3.6	-6.8
<b>Sunshine (hours)</b>							
Total	n/a	n/a	3.54	3.72	n/a	n/a	4.26
% of average	n/a	n/a	101	98	n/a	n/a	109
Most in a day amount (hours)	n/a	n/a	15.1	13.8	n/a	n/a	15.6
Date(s)	n/a	n/a	03-Jun	29-Apr	n/a	n/a	03-Jun
No. of days with:							
Rain (>0.1 mm)	215	249	237	235	212	267	195
Snow	n/a	n/a	7	9	n/a	n/a	5
Air frost	39	41	24	12	4	5	38
Hail	n/a	n/a	15	7	n/a	n/a	4
Thunder	n/a	n/a	3	1	n/a	n/a	4
Fog	n/a	n/a	28	95	n/a	n/a	18
Gale gusts	36	28	59	63	80	155	81

Source: Met Éireann

Table 19.12 Climate, 2011 (continued)

	Casement Aerodrome	Valentia Observatory	Belmullet	Knock Airport	Gurteen	Mullingar	Johnstown Castle
<b>Rainfall (mm)</b>							
Total	726.7	1,719.7	1,375.5	1,441.9	941	943.8	812.5
% of average	100	123	126	117	n/a	101	81
Most in a day (mm)	82.2	54.9	34.7	34.9	23.6	21.4	26.2
Date(s)	24-Oct	22-Oct	21-Jun	06-Jun	08-Jul	06-Feb	09-Feb
<b>Temperature (°C)</b>							
Mean	10.3	11.1	10.7	9	9.9	9.6	10.4
Diff. from average	1	0.5	0.7	n/a	n/a	0.8	0.8
Highest	24.4	22.5	20.6	22	23.7	24.1	21.4
Lowest	-5.3	-4.7	-3.8	-3.7	-6.1	-6.6	-3.0
<b>Sunshine (hours)</b>							
Total	4.06	3.34	3.79	3.09	n/a	n/a	n/a
% of average	111	98	108	n/a	n/a	n/a	n/a
Most in a day amount (hours)	15.9	15.3	15.0	13.8	n/a	n/a	n/a
Date(s)	03-Jun	03-Jun	11-Jun	02-May	n/a	n/a	n/a
No. of days with:							
Rain (>0.1 mm)	190	271	275	265	238	241	222
Snow	5	1	16	18	n/a	n/a	n/a
Air frost	32	13	7	29	36	46	11
Hail	11	21	44	21	n/a	n/a	n/a
Thunder	5	2	2	2	n/a	n/a	n/a
Fog	10	17	12	85	n/a	n/a	n/a
Gale gusts	84	95	151	89	41	16	47

Source: Met Éireann

