

Greenhouse Gas Emissions from Fossil Fuel Burning by Sector

Source: International Energy Agency

EarthTrends Data Tables:
Climate
and
Atmosphere



Carbon Dioxide Emissions from Selected Sectors (thousands metric tons of carbon dioxide)

	Carbon Dioxide Emissions from Selected Sectors (thousands metric tons of carbon dioxide)															
	Industry		Domestic Transportation				Agriculture		Public Electricity and Heat		Commercial and Public Sectors		Residential			
	All Industries		Iron & Steel		Total		Road									
	1999	Percent Change Since 1990	1999	Percent Change Since 1990	1999	Percent Change Since 1990	1999	Percent Change Since 1990	1999	Percent Change Since 1990	1999	Percent Change Since 1990	1999	Percent Change Since 1990		
WORLD	4,336,570	(9.7)	..	..	5,505,120	22.7	4,064,730	26.3	..	..	7,424,440	16.3	..	..	1,802,070	5.2
ASIA (EXCL. MIDDLE EAST)	1,915,410	9.4	..	..	942,870	65.6	788,960	74.8	..	..	2,446,920	84.5	..	..	470,970	(10.6)
Armenia	1,070	..	0	..	70	..	70	..	40	..	1,450	..	..	..	20	..
Azerbaijan	4,120	..	0	..	1,200	..	900	..	120	..	13,880	..	60	..	4,850	..
Bangladesh	8,290	95.1	0	..	3,370	104.2	2,450	105.9	1,380	79.2	8,570	82.7	190	18.8	3,220	58.6
Bhutan	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cambodia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
China (a)	979,350	1.6	291,600	67.5	220,570	80.4	142,780	118.0	84,530	9.1	1,247,080	103.3	67,780	84.5	210,730	(38.1)
Georgia	690	..	60	..	1,430	..	1,430	..	280	..	900	..	240	..	830	..
India	205,490	7.4	59,070	20.7	126,320	66.6	119,300	99.8	2,560	201.2	399,110	93.0	7,540	(42.9)	56,160	44.9
Indonesia	45,970	49.8	5,990	72.1	57,820	86.6	52,610	83.9	5,490	79.4	49,660	108.4	1,940	131.0	42,320	100.9
Japan	260,550	0.7	80,130	(0.9)	252,840	25.6	223,950	24.6	29,400	(11.2)	314,380	5.7	64,000	13.1	71,210	13.4
Kazakhstan	36,410	..	5,130	..	5,670	..	4,130	..	1,180	..	55,200	..	170	..	..	..
Korea, Dem People's Rep	158,350	0.6	760	(92.6)	9,130	(10.6)	9,130	(10.6)	..	..	32,250	(1.0)	..	..	710	(19.3)
Korea, Rep	75,660	3.7	6,780	88.3	81,390	87.2	59,250	85.6	9,350	96.4	94,320	164.1	39,250	85.1	24,750	(42.9)
Kyrgyzstan	1,210	..	0	..	830	..	710	..	..	..	1,650	..	..	..	..	..
Lao People's Dem Rep	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Malaysia	23,990	63.1	0	..	29,250	104.5	29,250	104.5	320	..	27,660	102.3	1,600	..	2,260	12.4
Mongolia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Myanmar	1,330	23.1	0	..	3,260	158.7	3,240	157.1	50	..	2,660	111.1	..	..	790	..
Nepal	1,050	337.5	0	..	690	146.4	660	135.7	40	(42.9)	40	..	120	300.0	770	305.3
Pakistan	26,200	26.9	1,790	(12.3)	23,750	74.1	22,900	79.5	800	(14.0)	26,820	72.4	2,880	138.0	9,030	27.2
Philippines	11,230	35.6	1,080	(18.2)	23,550	279.8	20,610	293.3	1,410	(61.4)	19,100	80.9	3,870	800.0	3,490	4.8
Singapore	2,360	21.6	0	..	5,840	(39.5)	5,840	44.9	..	..	27,420	96.1	..	..	..	..
Sri Lanka	1,880	300.0	0	..	5,730	130.1	4,890	122.3	..	..	1,300	..	100	400.0	270	237.5
Tajikistan	0	..	0	..	3,060	..	3,060	..	..	..	690	..	..	..	..	..
Thailand	35,350	140.0	910	30.0	46,800	73.7	46,280	81.4	6,650	19.8	49,570	79.1	..	..	3,880	57.7
Turkmenistan	0	..	0	..	1,460	..	1,460	..	..	..	8,720	..	..	..	..	..
Uzbekistan	19,180	..	0	..	10,440	..	6,090	..	3,900	..	35,000	..	6,710	..	32,620	..
Viet Nam	9,670	37.4	0	..	12,580	215.3	12,160	220.8	1,420	425.9	7,210	58.5	2,660	421.6	2,240	40.9
EUROPE	1,010,040	..	281,930	..	1,147,160	..	988,840	..	110,650	..	1,816,380	..	192,700	..	714,850	..
Albania	370	(86.5)	250	150.0	620	(12.7)	620	(12.7)	..	..	110	(78.8)	..	..	240	(22.6)
Austria	13,880	1.0	4,900	3.4	17,420	16.4	16,570	15.5	1,760	..	9,290	(21.9)	2,520	110.0	8,160	(12.7)
Belarus	7,650	..	240	..	6,650	..	5,380	..	1,690	..	22,300	..	30	..	4,300	..
Belgium	31,950	6.6	11,810	(10.1)	24,670	21.2	23,290	18.8	2,710	77.1	21,160	(0.3)	7,150	19.6	20,340	10.1
Bosnia and Herzegovina	160	..	60	..	1,370	..	800	..	..	..	2,570	..	..	..	..	..
Bulgaria	9,680	(28.1)	3,090	(20.2)	5,700	(12.2)	5,220	(10.6)	870	(47.9)	22,190	(39.1)	420	320.0	1,410	(50.7)
Croatia	3,650	..	70	..	4,490	..	4,120	..	780	..	4,470	..	640	..	2,120	..
Czech Rep	24,960	(55.6)	8,460	(53.0)	11,490	57.6	10,640	52.0	1,000	(73.3)	51,840	6.2	3,690	(54.8)	7,060	(70.7)
Denmark (b)	5,100	(5.6)	120	0.0	12,480	6.6	11,350	20.6	2,520	86.7	24,820	4.1	830	(39.4)	4,670	(17.2)
Estonia	980	..	0	..	1,340	..	1,170	..	80	..	10,680	..	160	..	450	..
Finland	13,950	(7.7)	4,380	12.3	12,300	4.2	11,210	2.2	1,730	(18.8)	17,970	13.1	1,200	..	3,870	(41.0)
France (c)	79,370	(1.1)	14,870	(28.4)	136,280	17.6	128,060	16.9	8,530	(7.6)	25,140	1.9	36,180	19.6	58,550	4.7
Germany (d)	128,710	(28.3)	35,720	(12.4)	178,410	11.5	173,790	14.9	6,180	(17.6)	274,400	(11.6)	40,150	(40.6)	118,920	(7.2)
Greece	9,560	(8.3)	270	(38.6)	19,810	29.0	15,790	34.8	2,640	(4.7)	41,550	22.2	760	46.2	6,990	49.7
Hungary	7,380	(55.9)	2,100	(63.5)	9,000	6.3	8,660	12.3	1,750	(33.2)	26,190	28.3	4,280	60.3	8,760	(37.8)
Iceland	590	7.3	180	(18.2)	630	0.0	580	7.4	760	16.9	30	..	..	..	30	(40.0)
Ireland	4,890	1.7	70	(63.2)	9,690	94.2	9,080	95.3	790	19.7	15,240	45.1	2,930	25.2	5,770	(11.6)
Italy	78,990	(7.2)	10,710	(27.3)	113,420	17.5	110,850	19.1	8,380	(1.3)	97,090	(9.1)	100	400.0	72,400	9.5
Latvia	1,160	..	300	..	1,990	..	1,730	..	190	..	2,680	..	420	..	310	..
Lithuania	1,940	..	0	..	3,470	..	3,210	..	190	..	4,800	..	410	..	610	..
Macedonia, FYR	880	(49.4)	410	(32.8)	1,080	40.3	1,060	41.3	100	(28.6)	6,210	12.9	250	..	260	(39.5)
Moldova, Rep	750	..	0	..	520	..	360	..	400	..	2,810	..	510	..	800	..
Netherlands (e)	34,800	(4.4)	6,320	1.3	31,310	18.2	28,710	19.5	8,640	15.2	46,800	20.7	3,490	1.5	18,910	(1.5)
Norway	6,900	(0.3)	2,610	9.2	13,070	18.6	9,790	26.5	1,950	200.0	210	61.5	1,000	(7.4)	940	(33.3)
Poland	48,050	7.3	11,790	(28.5)	29,990	43.9	29,010	61.3	15,290	96.3	151,450	(4.4)	5,100	(58.0)	32,300	(0.1)
Portugal (f)	12,400	26.4	580	3.6	16,820	70.8	15,800	71.7	1,830	34.6	21,350	49.8	1,030	90.7	2,120	26.9
Romania	18,850	(68.3)	6,600	(63.3)	8,900	(24.6)	7,440	(30.9)	920	(83.4)	35,700	(46.9)	1,080	..	6,100	(29.4)
Russian Federation	192,380	..	91,050	..	182,480	..	100,980	..	20,770	..	495,480	..	11,750	..	146,140	..
Serbia and Montenegro	7,350	..	0	..	4,170	..	4,170	..	..	..	26,080	..	..	..	100	..
Slovakia	14,400	(42.8)	4,790	(7.2)	4,190	43.5	4,120	41.1	710	(64.5)	10,220	8.1	3,830	(33.6)	3,610	(37.7)
Slovenia	2,190	(20.7)	220	(42.1)	3,840	45.5	3,800	45.6	..	..	5,680	28.2	1,310	..	1,770	(1.7)
Spain (g)	47,710	5.1	7,470	(23.5)	89,640	39.9	77,480	44.3	5,540	30.7	76,860	24.0	5,770	55.1	16,200	27.4
Sweden	10,410	(8.8)	2,710	(11.7)	22,120	8.4	19,970	10.1	1,150	(14.8)	7,060	4.9	4,320	1.9	3,570	(27.6)
Switzerland (h)	6,130	16.8	180	..	15,130	3.1	14,710	4.0	420	16.7	170	(52.8)	5,570	(13.6)	12,000	1.0
Ukraine	105,840	..	38,880	..	15,690	..	10,110	..	7,850	..	110,370	..	22,340	..	61,770	..
United Kingdom	74,420	(10.0)	10,210	(45.7)	132,100	7.5	114,400	5.4	2,500	(7.4)	143,520	(28.9)	23,480	18.9	81,570	8.7
MIDDLE EAST & N. AFRICA	299,510	43.2	15,010	16.3	241,880	35.0	233,710	34.5	19,890	12.1	395,490	82.6	14,670	58.8	118,490	62.0
Afghanistan	..															

Greenhouse Gas Emissions from Fossil Fuel Burning by Sector



Carbon Dioxide Emissions from Selected Sectors (thousands metric tons of carbon dioxide)																
	Industry				Domestic Transportation				Agriculture		Public Electricity and Heat		Commercial and Public Services		Residential	
	All Industries		Iron & Steel		Total		Road									
	1999	Percent Change Since 1990	1999	Percent Change Since 1990	1999	Percent Change Since 1990	1999	Percent Change Since 1990	1999	Percent Change Since 1990	1999	Percent Change Since 1990	1999	Percent Change Since 1990	1999	Percent Change Since 1990
SUB-SAHARAN AFRICA																
Angola	1,560	(15.7)	0	..	1,190	15.5	1,190	15.5	10	(66.7)	410	86.4	870	128.9	310	29.2
Benin	150	400.0	0	..	780	387.5	780	387.5	..	..	30	0.0	..	..	280	833.3
Botswana	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Burkina Faso	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Burundi	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cameroon	200	(9.1)	0	..	1,620	(6.9)	1,620	(6.9)	..	..	40	33.3	..	..	550	(19.1)
Central African Rep	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Chad	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Congo	0	..	0	..	320	(41.8)	250	(44.4)	..	..	..	..	..	..	40	(42.9)
Congo, Dem Rep	680	(23.6)	290	11.5	460	(17.9)	460	(17.9)	..	..	20	(33.3)	..	..	260	(18.8)
Côte d'Ivoire	700	20.7	0	..	1,450	22.9	1,260	23.5	170	21.4	3,270	717.5	90	12.5	360	63.6
Equatorial Guinea	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Eritrea	50	..	0	..	210	..	210	..	..	..	140	..	150	..	70	..
Ethiopia	790	31.7	0	..	1,610	75.0	1,610	75.0	..	..	40	(55.6)	..	..	480	380.0
Gabon	390	95.0	0	..	530	43.2	450	40.6	..	..	250	31.6	..	..	140	16.7
Gambia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ghana	460	(4.2)	0	..	1,960	26.5	1,870	27.2	130	18.2	990	..	70	75.0	630	53.7
Guinea	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Guinea-Bissau	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Kenya	1,530	7.7	0	..	3,690	5.4	2,150	(15.0)	270	50.0	1,120	..	..	..	480	(15.8)
Lesotho	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Liberia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Madagascar	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Malawi	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mali	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mozambique	130	(7.1)	0	..	830	315.0	760	280.0	20	(81.8)	10	(90.9)	30	(92.5)	110	37.5
Namibia	200	..	0	..	1,360	..	1,090	..	440	..	20	..	10	..	..	..
Niger	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Nigeria	9,280	76.4	160	14.3	15,970	37.2	15,700	37.5	..	..	5,850	3.4	..	..	2,990	(28.1)
Rwanda	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Senegal	600	150.0	0	..	1,090	51.4	990	50.0	200	17.6	1,240	49.4	..	..	340	161.5
Sierra Leone	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Somalia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
South Africa	60,560	(11.5)	17,410	(40.5)	35,970	23.2	33,430	19.7	3,800	26.7	167,790	27.1	2,010	(43.4)	5,930	(21.7)
Sudan	690	(25.8)	0	..	3,490	(11.0)	3,490	(11.0)	..	..	930	89.8	100	..	240	71.4
Tanzania, United Rep	400	5.3	0	..	750	8.7	750	8.7	..	..	80	(68.0)	..	..	250	(26.5)
Togo	330	106.3	0	..	310	34.8	310	34.8	..	..	60	(14.3)	..	..	120	71.4
Uganda	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Zambia	770	(35.8)	0	..	580	3.6	580	9.4	50	25.0	..	..	80	(33.3)	..	..
Zimbabwe	2,410	(48.2)	1,370	(24.7)	2,100	1.4	2,040	54.5	1,510	33.6	5,270	(18.7)	670	(5.6)	110	(54.2)
NORTH AMERICA	645,570	(8.1)	87,570	(2.8)	1,844,250	19.1	1,528,200	23.5	49,950	(2.1)	2,124,220	14.8	247,260	(1.2)	392,190	7.2
Canada	89,800	3.4	14,860	14.0	151,380	21.8	115,280	20.2	9,840	33.5	113,360	22.6	36,900	15.3	40,420	(1.4)
United States (i)	555,770	(9.7)	72,710	..	1,692,870	18.9	1,412,920	23.8	40,110	(8.2)	2,010,860	14.4	210,360	(3.6)	351,770	8.3
C. AMERICA & CARIBBEAN	90,610	(4.3)	13,670	(2.8)	125,990	20.0	122,760	22.0	8,200	21.1	127,660	51.8	4,770	2.8	26,480	9.8
Belize	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Costa Rica	790	12.9	0	..	3,100	97.5	3,010	410.2	310	933.3	130	225.0	120	71.4	130	225.0
Cuba	11,890	21.2	80	(83.3)	2,090	(52.7)	2,080	(52.6)	770	(38.4)	11,150	(1.8)	40	(33.3)	900	(63.6)
Dominican Rep	1,440	82.3	0	..	5,960	126.6	5,640	121.2	250	212.5	3,490	96.1	..	..	2,460	167.4
El Salvador	1,140	103.6	0	..	2,580	106.4	2,580	106.4	..	..	1,010	573.3	..	..	420	162.5
Guatemala	1,350	70.9	0	..	3,670	110.9	3,670	110.9	130	62.5	790	393.8	260	73.3	510	59.4
Haiti	390	95.0	0	..	660	57.1	290	61.1	..	..	290	31.8	..	..	130	62.5
Honduras	1,150	49.4	0	..	1,890	96.9	1,890	96.9	10	0.0	840	..	270	17.4	140	16.7
Jamaica	800	31.1	0	..	1,950	32.7	1,370	90.3	800	..	2,240	20.4	50	(28.6)	420	82.6
Mexico	62,680	(15.7)	12,440	(4.7)	97,810	13.4	96,220	14.3	5,910	12.6	101,300	56.0	3,800	(2.8)	20,440	6.4
Nicaragua	400	21.2	0	..	1,390	87.8	1,330	90.0	20	(71.4)	1,210	152.1	110	37.5	90	80.0
Panama	930	89.8	0	..	1,930	65.0	1,930	65.0	..	..	1,170	178.6	120	71.4	240	50.0
Trinidad and Tobago	7,230	53.2	1,150	121.2	1,570	18.0	1,570	21.7	..	..	3,650	51.5	..	..	80	(42.9)
SOUTH AMERICA	183,220	40.6	38,700	42.5	257,980	42.9	235,780	44.1	27,200	45.3	86,200	72.2	12,180	15.3	52,150	28.8
Argentina	20,440	24.0	3,320	331.2	41,460	46.9	36,960	41.3	7,720	70.0	25,080	63.8	3,390	(27.1)	16,880	33.2
Bolivia	1,070	69.8	0	..	3,610	68.7	3,010	71.0	50	25.0	1,790	184.1	10	..	940	64.9
Brazil	87,200	51.1	22,800	55.4	123,410	53.1	109,930	57.6	14,450	46.1	17,510	192.8	4,370	72.0	16,980	23.6
Chile	11,360	48.9	1,870	15.4	15,680	86.2	14,590	94.0	480	29.7	16,380	225.6	570	470.0	3,430	45.3
Colombia	19,270	55.7	1,780	158.0	18,900	13.7	18,280	16.7	1,340	55.8	4,390	(21.2)	1,320	69.2	3,440	20.3
Ecuador	2,620	13.4	0	..	6,860	10.1	5,510	12.2	1,030	47.1	2,380	90.4	310	(16.2)	1,780	53.4
Guyana	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Paraguay	280	75.0	0	..	3,450	115.6	3,410	117.2	..	..	..	..	..	..	240	71.4
Peru	6,640	129.8	3,010	109.0	8,970	29.4	8,810	34.1	1,000	(47.4)	2,280	204.0	970	12.8	2,800	15.7
Suriname	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Uruguay	1,110	56.3	0	..	2,730	80.8	2,700	87.5	590	40.5	1,330	343.3	120	(14.3)	480	9.1
Venezuela	33,230	13.1	5,920	(25.6)	32,910	16.4	32,580	15.4	540	..	15,060	(1.2)	1,120	0.0	5,180	25.1
OCEANIA																
Australia	50,470	11.9	9,690	7.2	72,200	16.9	63,880	16.3	4,160	22.0	166,250	37.5	3,480	18.0	6,730	19.5
Fiji	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
New Zealand	7,850	20.8	1,520	15.2	12,200	36.2	6,730	12.9	720	14.3	4,720	42.				

Technical Notes

VARIABLE DEFINITIONS AND METHODOLOGY:

Carbon Dioxide (CO₂) Emissions represent the mass of CO₂ produced during the combustion of solid, liquid, and gaseous fossil fuels. Fossil fuel production and use are responsible for about three-quarters of man-made CO₂ emissions. These estimates do not include bunker fuels used in international transportation due to the difficulty of apportioning these fuels among the countries benefiting from that transport. Data are in thousand metric tons of carbon dioxide.

All Industry (listed in the original source as manufacturing industries and construction) represents all industrial sub-sectors, such as mining and quarrying, iron and steel, construction, etc. Emissions from transport by industry are not included here. This sector includes all industries listed in International Standard Industrial Classification (ISIC) divisions 15-37. (Please see <http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=17> for more information on ISIC classifications).

Iron & Steel refers to the iron and steel sub-sector of the industry sector. In order to correctly report the use of fuels (coke, coal (PCI), natural gas, oil) used in blast furnaces, only the consumed portion of fuel (i.e., about two-thirds of the total) is reported here. The remainder (about one-third of the total) contributes to blast furnace gas and is reported in the transformation sub-sector.

Domestic Transportation includes emissions from the combustion of fossil fuels for road, rail, air, and other forms of transport. The emissions include all sectors of the economy, but do not include international aviation or ship emissions, which are accounted for under bunker fuels. Emissions associated with international transport of people and goods are accounted for in the global total emissions and under bunker fuels. **Road transportation** includes emissions from combustion of fossil fuels for road transportation and agricultural vehicles while they are on highways.

Agriculture encompasses all emissions from tractors (excluding agricultural highway use), power, or heating (agricultural and domestic) activities defined under the International Standard Industrial Classification (ISIC) divisions of Agriculture, Hunting, and Forestry. These activities include operation of irrigation systems and agricultural machinery; animal husbandry; maintenance of parks and gardens; hunting and trapping; logging; and ocean, coastal, and inland fishing. (please see <http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=17> for more information on ISIC classifications).

Commercial & Public sectors refer to emissions from all activities defined under International Standard Industrial Classification (ISIC) divisions 41, 50, 51, 55, 63, 64, 65, 66, 70, 71, 72, 73, 74, 75, 80, 85, 90, 91, 93 and 99. These activities and services include, for example, wholesale and retail trade; the operation of hotels and restaurants; post and telecommunications activities; real estate, renting and business activities; the collection, purification and distribution of water; maintenance and repair of motor vehicles and motorcycles; financial intermediation (except insurance and pension funding); computer and related activities; sewage and refuse disposal; public administration and defense; education activities; and other community, health, social and personal service activities. (please see <http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=17> for more information on ISIC classifications).

Residential sector emissions include CO₂ released from all household activities except for transportation.

The emissions figures presented here are calculated by the International Energy Agency (IEA) using the methods and emissions factors from the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Guidelines) available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Figures are calculated by the IEA using the Reference Approach (corresponding with IPCC Source/Sink Category 1A) as opposed to the Sectoral Approach. The Reference Approach is based on a country's energy supply and will capture emissions from refining, flaring, and other "fugitive emissions" that do not result directly from end-use fossil fuel combustion. These emissions are usually included under IPCC reporting Category 1B. The International Panel on Climate Change (IPCC) allows countries to use either approach when reporting their emissions. As a result, IEA numbers may not be the same as numbers that a country

submits to the UNFCCC, even if a country has accounted for all its energy use and correctly applied the *IPCC Guidelines*.

Energy supply is calculated by the International Energy Agency (IEA). Their energy balance methodology is based on the calorific content of energy commodities, measured in a common unit of account known as the Metric Ton of Oil Equivalent (toe).

The IEA has two primary methods of obtaining data. Firstly, the IEA sends out 5 annual questionnaires to each OECD member country to collect energy data for the preceding two years. The questionnaires address each of the following subjects: crude oil and petroleum products; natural gas; electricity and heat; solid fuels and manufacture gases; and renewable fuels and wastes. The IEA gathers further data through its Monthly Oil Statistics questionnaires and various mini-questionnaires. Data for non-OECD countries are collected by way of other international organizations, i.e. United Nations, OLADE; close cooperation with national statistical bodies; direct contacts with energy consultants and companies; publications; and questionnaires for UN-ECE countries (identical to those sent to OECD countries).

FREQUENCY OF UPDATE BY DATA PROVIDERS:

Data cover the years 1960-1999 for countries that are members of the Organization for Economic Cooperation and Development (OECD). Data for OECD non-members usually runs from 1971 to 1999, but coverage varies. For example, data for many former Soviet Republics run from 1992 to 1999.

The IEA updates the carbon dioxide emissions data annually. Revisions of the extended time series often take place. Users looking to analyze emissions trends should therefore download the entire time series instead of adding the most recent data to those from a previous version.

DATA RELIABILITY AND CAUTIONARY NOTES:

IEA data do not distinguish between no data (denoted in these tables with "..") and zero values. WRI has distinguished between the two where possible, but some values represented as zero should probably be indicated by ".." and vice versa.

Extreme caution should be exercised if considering using the data to extrapolate into the future. Energy usage is extremely variable from year to year due to short-term factors such as the weather and the economy that significantly impact any one year's production.

SOURCE:

International Energy Agency (IEA), 2001. *CO2 Emissions from Fossil Fuel Combustion (2001 Edition)*. Paris: Organization for Economic Cooperation and Development (OECD). Electronic database available online at: <http://data.iea.org/ieastore/default.asp>.