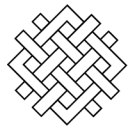


Climate and Atmosphere

Sources: Carbon Dioxide Information Analysis Center (CDIAC), International Energy Agency (IEA), Netherlands Institute for Public Health (RIVM)

EarthTrends Data Tables:
Climate
and
Atmosphere



	Carbon Dioxide (CO2) Emissions					Emissions of		CO2 Emissions by Economic Sector					Carbon Intensity:			
	Total		Per Capita		Cumulative 1800-2000 (million metric tons)	Nitrous Methane Oxide (million metric tons CO2e equivalent)		Sector, 1999					CO2 Emissions per GDP (PPP)			
	(million metric tons)	(percent change since 1990)	(metric tons per person)	(percent change since 1990)		Industry	entia	Road Trans- portation	Public Electricity	and Heat	All Economic Sectors	Industry Sector		1999	1990	
	1999	1990	1999	1990	metric tons	1999	1999	million metric tons	million metric tons	million metric tons	million metric tons	million metric tons	million metric tons	million metric tons	million metric tons	million metric tons
WORLD	23,172.2	8.9	3.9	(4.2)	1,017,359	6,340	3,570	4336.6	1802.1	4064.7	7424.4	582	689	..	..
ASIA (EXCL. MIDDLE EAST)	6,901.7	38.0	2.1	19.3	..	2,562	1,177	1915.4	471.0	789.0	2446.9	540	616	422	543	
Armenia	3.0	..	0.8	..	290 a	2	1	1.1	0.0	0.1	1.5	347	..	384	..	
Azerbaijan	33.2	..	4.2	..	2,300 a	10	3	4.1	4.9	0.9	13.9	1,756	..	653	..	
Bangladesh	26.3	83.4	0.2	46.2	442 b	85	29	8.3	3.2	2.5	8.6	144	119	186	168	
Bhutan	..	..	..	..	4	1	0	..	..	..	..	..	..	..	..
Cambodia	..	..	..	..	16	13	4	..	..	..	..	..	..	..	..
China	3,051.1 c	25.6 c	2.5 c	16.6 c	72,615 c	959	538	979.4 c	210.7 c	142.8 c	1247.1 c	700 c	1,355 c	442 c	1,249 c	
Georgia	5.3	..	1.0	..	380 a	3	1	0.7	0.8	1.4	0.9	376	..	305	..	
India	903.8	52.9	0.9	31.9	20,275	655	257	205.5	56.2	119.3	399.1	417	446	360	517	
Indonesia	244.9	76.9	1.2	56.0	4,872	215	67	46.0	42.3	52.6	49.7	449	365	174	188	
Japan	1,158.5	10.5	9.1	7.7	36,577 d	61	30	260.6	71.2	224.0	314.4	391	396	259	234	
Kazakhstan	114.5	..	7.0	..	8,264 a	42	18	36.4	..	4.1	55.2	1,651	..	1,360	..	
Korea, Dem People's Rep	214.3	(1.2)	9.7	(10.8)	6,114 e	10	8	158.4	0.7	9.1	32.3	..	..	..	..
Korea, Rep	410.4	75.5	8.8	62.2	7,120 e	27	12	75.7	24.8	59.3	94.3	578	546	247	385	
Kyrgyzstan	4.7	..	1.0	..	440 a	4	3	1.2	..	0.7	1.7	405	..	391	..	
Lao People's Dem Rep	..	..	..	..	11	7	4	..	..	..	..	..	..	..	..
Malaysia	101.3	90.4	4.6	55.7	1,832 f	24	12	24.0	2.3	29.3	27.7	578	552	321	362	
Mongolia	..	..	..	..	237	8	13	..	..	..	..	..	..	..	..
Myanmar	9.0	122.2	0.2	90.0	257	50	16	1.3	0.8	3.2	2.7	54	41	90	102	
Nepal	3.0	234.4	0.1	225.0	32	34	6	1.1	0.8	0.7	0.0	107	49	171	80	
Pakistan	92.2	48.9	0.7	17.9	1,952 b	92	68	26.2	9.0	22.9	26.8	389	370	467	490	
Philippines	66.3	69.0	0.9	39.1	1,555	44	20	11.2	3.5	20.6	19.1	239	180	122	106	
Singapore	53.2	53.1	13.6	17.9	1,690 g	1	1	2.4	..	5.8	27.4	643	803	82	130	
Sri Lanka	9.6	141.5	0.5	121.7	220	11	3	1.9	0.3	4.9	1.3	161	105	116	48	
Tajikistan	5.7	..	0.9	..	270 a	4	2	0.0	..	3.1	0.7	568	..	..	..
Thailand	155.8	95.5	2.5	73.1	2,535	73	24	35.4	3.9	46.3	49.6	445	335	250	159	
Turkmenistan	33.9	..	7.3	..	910 a	19	5	0.0	..	1.5	8.7	2,213	..	..	..
Uzbekistan	117.5	..	4.8	..	5,020 a	45	10	19.2	32.6	6.1	35.0	2,241	..	1,423	..	
Viet Nam	36.6	103.7	0.5	74.1	1,061 h	59	20	9.7	2.2	12.2	7.2	259	248	198	427	
EUROPE	5,892.3	..	8.1	..	411,552	1,164	607	1010.0	714.9	988.8	1816.4	568	..	320	..	
Albania	1.5	(77.4)	0.5	(76.6)	198	2	2	0.4	0.2	0.6	0.1	146	667	138	585	
Austria	60.5	6.1	7.5	1.5	4,099	8	7	13.9	8.2	16.6	9.3	319	365	214	250	
Belarus	57.1	..	5.6	..	3,457 a	17	11	7.7	4.3	5.4	22.3	853	..	255	..	
Belgium	118.7	11.8	11.6	8.9	10,569	10	12	32.0	20.3	23.3	21.2	487	517	466	440	
Bosnia and Herzegovina	5.3	..	1.4	..	185 i	1	1	0.2	..	0.8	2.6	..	..	..	..
Bulgaria	43.8	(42.5)	5.4	(37.7)	3,144	7	9	9.7	1.4	5.2	22.2	1,147	1,545	924	501	
Croatia	19.0	..	4.1	..	576 i	3	3	3.7	2.1	4.1	4.5	..	..	..	..
Czech Rep	110.6	(26.5)	10.8	(26.3)	10,139 j	16	8	25.0	7.1	10.6	51.8	860	1,122	458	857	
Denmark	53.3 k	7.2 k	10.0 k	3.9 k	3,342	6	8	5.1 k	4.7 k	11.4 k	24.8 k	401 k	457 k	128 k	170 k	
Estonia	14.7	..	10.4	..	349 a	2	1	1.0	0.5	1.2	10.7	1,294	..	315	..	
Finland	57.8	8.4	11.2	4.8	2,001	7	6	14.0	3.9	11.2	18.0	495	536	349	437	
France	361.4 l	(0.7) l	6.1 l	(4.5) l	30,997 l	50	90	79.4 l	58.6 l	128.1 l	25.1 l	276 l	320 l	224 l	227 l	
Germany	821.7 m	(15.0) m	10.0 m	(17.7) m	75,606	93	78	128.7 m	118.9 m	173.8 m	274.4 m	444 m	599 m	218 m	282 m	
Greece	81.5	18.2	7.7	13.4	2,390	6	14	9.6	7.0	15.8	41.6	556	565	253	297	
Hungary	57.9	(14.4)	5.8	(11.4)	3,920	12	7	7.4	8.8	8.7	26.2	538	647	..	392	
Iceland	2.1	3.0	7.4	(5.2)	88	0	0	0.6	0.0	0.6	0.0	294	345	..	261	
Ireland	39.9	24.1	10.6	15.8	1,269	12	14	4.9	5.8	9.1	15.2	430	620	143	259	
Italy	420.5	6.0	7.3	4.4	16,337 e	40	33	79.0	72.4	110.9	97.1	342	366	217	231	
Latvia	6.8	..	2.8	..	470 a	2	1	1.2	0.3	1.7	2.7	481	..	291	..	
Lithuania	13.0	..	3.5	..	889 a	4	2	1.9	0.6	3.2	4.8	560	..	251	..	
Macedonia, FYR	10.0	4.7	5.0	(1.0)	300 i	1	1	0.9	0.3	1.1	6.2	..	..	..	..
Moldova, Rep	6.6	..	1.5	..	590 a	4	2	0.8	0.8	0.4	2.8	754	..	445	..	
Netherlands	166.6 n	6.4 n	10.5 n	0.8 n	9,404	18	17	34.8 n	18.9 n	28.7 n	46.8 n	442 n	529 n	337 n	387 n	
Norway	37.1	30.5	8.3	24.3	1,717	10	3	6.9	0.9	9.8	0.2	323	336	164	203	
Poland	310.0	(11.0)	8.0	(12.3)	20,764	83	32	48.1	32.3	29.0	151.5	926	1,432	389	351	
Portugal	61.1 o	53.1 o	6.1 o	51.6 o	1,509	8	7	12.4 o	2.1 o	15.8 o	21.4 o	390 o	319 o	237 o	235 o	
Romania	86.6	(49.5)	3.9	(47.9)	6,440	29	17	18.9	6.1	7.4	35.7	666	1,059	389	734	
Russian Federation	1,486.3	..	10.2	..	86,705 a	498	64	192.4	146.1	101.0	495.5	1,482	..	530	..	
Serbia and Montenegro	41.9	(30.3)	4.0	(33.0)	2,390 j	10	7	7.4	0.1	4.2	26.1	..	..	..	..
Slovakia	39.4	(28.9)	7.3	(30.7)	3,644 i	6	3	14.4	3.6	4.1	10.2	718	1,096	818	844	
Slovenia	15.0 p	17.0 p	7.5 p	12.9 p	455	2	1	2.2 p	1.8 p	3.8 p	5.7 p	.. p	.. p	.. p	.. p	
Spain	272.0	28.6	6.8	26.6	9,151	31	36	47.7	16.2	77.5	76.9	395	379	223	236	
Sweden	48.2 q	(0.6) q	5.4 q	(3.9) q	4,058	8	7	10.4 q	3.6 q	20.0 q	7.1 q	246 q	283 q	.. q	197 q	
Switzerland	39.9	(3.1)	5.6	(7.7)	2,262	5	3	6.1	12.0	14.7	0.2	208	227	..	..
Ukraine	379.0	..	7.6	..	22,729 a	101	33	105.8	61.8	10.1	110.4	2,329	..	1,726	..	
United Kingdom	535.3	(6.5)	9.0	(9.2)	68,803	52	66	74.4	81.6	114.4	143.5	440	567	205	226	
MIDDLE EAST & N. AFRICA	1,339.2	45.0	3.6	19.7	..	289	186	299.5	118.5	233.7	395.5	721	655	..	374	
Afghanistan	..	..	..	..	82	11	7	..	..	..	..	..	..	..	..
Algeria	68.2	19.8	2.3	0.4	2,178	20	9	7.0	9.6	6.2	16.4	463	444	63	77	
Egypt	110.3	33.7	1.7	13.0	2,682	27	19	29.4	11.3	16.6	32.9	529	580	448	612	
Iran, Islamic Rep	263.2	45.6	3.8	23.0	6,664	67	53	58.4	45.5	66.4	62.1	783	765	762	647	
Iraq	81.1	47.7	3.6	14.5	1,985	9	6	17.2	6.4	25.9	16.2	2,816	1,178	..	..
Israel	55.9	58.2	9.5	20.8	1,203	1	2	6.0	1.9	9.5	30.9	517	510	..	..
Jordan	13.4	43.1	2.8	(2.8)	286	1	1	2.0	1.7	3.3	4.9	744	824	42		



	Carbon Dioxide (CO2) Emissions					Emissions of		CO2 Emissions by Economic Sector				Carbon Intensity: CO2 Emissions per GDP (PPP)				
	Total		Per Capita		Cumulative 1800-2000 (million metric tons)	Nitrous Methane	Oxide (million metric tons CO2 equivalent)	Industry	Residential	Road Transportation	Public Electricity and Heat	All Economic Sectors		Industry Sector		
	(million metric tons)	(percent change since 1990)	(metric tons per person)	(percent change since 1990)								1999	1999	1999	1999	1999
	1999	1990	1999	1990	metric tons)	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999
SUB-SAHARAN AFRICA	17,665	488	378
Angola	4.8	11.6	0.4	(17.8)	219	14	5	1.6	0.3	1.2	0.4	428	410	185	401	
Benin	1.2	391.7	0.2	280.0	19	3	2	0.2	0.3	0.8	0.0	216	54	193	62	
Botswana	..	..	..	..	54	6	4	..	..	..	..	..	..	..	..
Burkina Faso	..	..	..	..	16	8	11	..	..	..	..	..	..	..	..
Burundi	..	..	..	..	6	2	1	..	..	..	..	..	..	..	..
Cameroon	2.6	(5.5)	0.2	(26.1)	143	11	9	0.2	0.6	1.6	0.0	115	131	44	36	
Central African Rep	..	..	..	..	8	6	5	..	..	..	..	..	..	..	..
Chad	..	..	..	..	7	9	8	..	..	..	..	..	..	..	..
Congo	0.4	(53.2)	0.1	(65.7)	50	3	1	0.0	0.0	0.3	..	164	321	..	59	
Congo, Dem Rep	2.5	(41.0)	0.0	(63.6)	178	29	20	0.7	0.3	0.5	0.0	78	74	..	56	
Côte d'Ivoire	4.7	52.8	0.3	20.8	156	6	3	0.7	0.4	1.3	3.3	184	162	112	130	
Equatorial Guinea	..	..	..	..	14	0	0	..	..	..	..	..	..	..	..
Eritrea	0.6	..	0.2	..	9	2	1	0.1	0.1	0.2	0.1	181	..	52	..	
Ethiopia	2.9	22.1	0.0	(20.0)	81	42	53	0.8	0.5	1.6	0.0	76	86	186	170	
Gabon	1.5	30.7	1.2	2.5	161	..	..	0.4	0.1	0.5	0.3	209	190	132	80
Gambia	..	..	..	..	5	1	0	..	..	..	..	..	..	..	..
Ghana	4.4	67.6	0.2	35.3	127	6	7	0.5	0.6	1.9	1.0	129	112	53	123	
Guinea	..	..	..	..	40	5	2	..	..	..	..	..	..	..	..
Guinea-Bissau	..	..	..	..	6	1	1	..	..	..	..	..	..	..	..
Kenya	7.7	17.2	0.3	(7.4)	239	20	20	1.5	0.5	2.2	1.1	260	259	288	297	
Lesotho	..	..	..	..	3	1	1	..	..	..	..	..	..	..	..
Liberia	..	..	..	..	42	1	1	..	..	..	..	..	..	..	..
Madagascar	..	..	..	..	45	17	10	..	..	..	..	..	..	..	..
Malawi	..	..	..	..	27	3	2	..	..	..	..	..	..	..	..
Mali	..	..	..	..	15	11	12	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	46	4	6	..	..	..	..	..	..	..	..
Mozambique	1.1	7.0	0.1	(28.6)	102	10	3	0.1	0.1	0.8	0.0	76	115	26	88	
Namibia	2.2	..	1.3	..	16	4	4	0.2	..	1.1	0.0	252	..	12	..	
Niger	..	..	..	..	25	6	4	..	..	..	..	..	..	..	..
Nigeria	38.4	0.4	0.3	(22.7)	2,276	70	33	9.3	3.0	15.7	5.9	387	480	265	160	
Rwanda	..	..	..	..	14	2	1	..	..	..	..	..	..	..	..
Senegal	3.3	49.8	0.4	20.7	99	6	8	0.6	0.3	1.0	1.2	255	225	182	131	
Sierra Leone	..	..	..	..	30	2	1	..	..	..	..	..	..	..	..
Somalia	..	..	..	..	26	17	22	..	..	..	..	..	..	..	..
South Africa	346.3	19.0	8.1	1.3	12,162	54	24	60.6	5.9	33.4	167.8	960	916	508	521	
Sudan	5.4	(1.5)	0.2	(22.7)	166	42	42	0.7	0.2	3.5	0.9	316	589	266	..	
Tanzania, United Rep	2.2	7.8	0.1	(14.3)	94	29	24	0.4	0.3	0.8	0.1	120	143	138	154	
Togo	0.9	63.0	0.2	33.3	24	2	2	0.3	0.1	0.3	0.1	143	91	256	129	
Uganda	..	..	..	..	38	10	8	..	..	..	..	..	..	..	..
Zambia	1.9	(22.9)	0.2	(40.0)	167	10	5	0.8	..	0.6	..	259	352	387	318	
Zimbabwe	13.7	(6.0)	1.1	(22.0)	586	10	8	2.4	0.1	2.0	5.3	425	562	311	545	
NORTH AMERICA	6,074.0	15.3	19.5	4.8	..	958	535	645.6	392.2	1528.2	2124.2	649	738	..	..
Canada	489.2	16.1	16.0	5.5	22,363	123	62	89.8	40.4	115.3	113.4	635	683	..	366	
United States	5,584.8	15.2	19.9	4.7	301,279	835	473	555.8	351.8	1412.9	2010.9	650	743	..	..
C. AMERICA & CARIBBEAN	464.3	22.1	2.8	4.1	13,376	149	105	90.6	26.5	122.8	127.7	463	497	300	404	
Belize	..	..	..	..	9	0	0	..	..	..	..	..	..	..	..
Costa Rica	4.7	67.3	1.2	29.3	110	3	3	0.8	0.1	3.0	0.1	169	161	80	139	
Cuba	28.4	(10.7)	2.5	(14.8)	1,179	9	9	11.9	0.9	2.1	11.2	906	834	760	..	
Dominican Rep	17.8	91.1	2.2	64.1	284	6	4	1.4	2.5	5.6	3.5	396	342	94	93	
El Salvador	5.3	126.9	0.9	91.1	107	3	2	1.1	0.4	2.6	1.0	208	138	150	119	
Guatemala	8.3	126.7	0.8	82.9	173	6	5	1.4	0.5	3.7	0.8	212	136	171	147	
Haiti	1.4	46.8	0.2	30.8	33	3	3	0.4	0.1	0.3	0.3	127	72	176	78	
Honduras	4.3	97.7	0.7	54.5	93	5	3	1.2	0.1	1.9	0.8	290	194	246	258	
Jamaica	10.1	26.6	3.9	17.3	282	1	1	0.8	0.4	1.4	2.2	1,112	890	275	159	
Mexico	358.2	20.6	3.7	3.1	9,930	98	64	62.7	20.4	96.2	101.3	472	516	271	440	
Nicaragua	3.4	94.8	0.7	51.1	85	5	4	0.4	0.1	1.3	1.2	282	186	80	144	
Panama	4.8	77.5	1.7	51.3	179	3	3	0.9	0.2	1.9	1.2	311	264	357	328	
Trinidad and Tobago	15.6	27.6	12.1	20.4	699	3	0	7.2	0.1	1.6	3.7	1,489	1,494	1,679	1,251	
SOUTH AMERICA	744.9	41.3	2.2	22.5	..	588	433	183.2	52.2	235.8	86.2	330	310	276	195	
Argentina	142.7	36.9	3.9	21.9	4,895	87	67	20.4	16.9	37.0	25.1	335	385	174	169	
Bolivia	9.8	85.0	1.2	50.0	190	16	15	1.1	0.9	3.0	1.8	526	404	304	225	
Brazil	305.6	52.0	1.8	34.1	8,140	302	244	87.2	17.0	109.9	17.5	271	222	267	158	
Chile	59.0	92.4	3.9	68.2	1,457	16	9	11.4	3.4	14.6	16.4	465	431	242	207	
Colombia	56.5	15.8	1.4	(2.2)	1,854	54	21	19.3	3.4	18.3	4.4	245	268	294	175	
Ecuador	19.3	44.3	1.6	19.2	490	14	10	2.6	1.8	5.5	2.4	544	440	196	186	
Guyana	..	..	..	..	57	1	1	..	..	..	..	..	..	..	..
Paraguay	4.0	101.5	0.7	60.9	69	12	10	0.3	0.2	3.4	..	179	108	48	34	
Peru	21.2	18.4	0.8	1.2	984	19	15	6.6	2.8	8.8	2.3	188	229	214	162	
Suriname	..	..	..	..	62	1	0	..	..	..	..	..	..	..	..
Uruguay	6.8	73.8	2.0	63.2	254	17	16	1.1	0.5	2.7	1.3	240	187	143	98	
Venezuela	120.0	19.9	5.1	(1.4)	4,475	49	23	33.2	5.2	32.6	15.1	946	920	720	538	
OCEANIA	..	..	..	..	11,839	133	139	..	..	..	..	..	..	..	..
Australia	321.6	23.8	17.0	10.4	10,524	101	95	50.5	6.7	63.9	166.3	687	779	352	420	
Fiji	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..
New Zealand	30.6	33.1	8.2	19.5	1,229	26	31	7.9	0.5	6.7	4.7	449	429	..	409	
Papua New Guinea	..	..	..	..	68	3	2	..	..	..	..	..	..	..	..
Solomon Islands	..	..	..	..	4	0	0	..	..	..	..	..	..	..	..
DEVELOPING	14,196.7	..	10.8	..	..	2,494	1,367	2103.8	1231.6	2872.4	4742.2	594	..	..	..
DEVELOPING	8,020.2	37.2	1.8	18.2	197,323	3,836	2,192	2180.8	564.4	1167.5	2613.3	532	628	413	561	

a. Emissions for the Former Soviet Union countries prior to 1992 are estimates. b. Emissions prior to 1972 are estimates. c. China includes the People's Republic of China and Hong Kong but excludes Taiwan. d. Includes the Ryukyu Islands only

VARIABLE DEFINITIONS AND METHODOLOGY

Total Carbon Dioxide (CO₂) Emissions and **Per Capita CO₂ Emissions** include the total and the average emissions of carbon dioxide per person, respectively, from combustion of all fossil fuels used by a country.

The CO₂ emissions presented here are based on the International Energy Agency's (IEA) energy data gathered and rectified for their *Energy Balances of OECD Countries* and *Energy Balances of non-OECD Countries* databases (please see the notes for the Energy and Resource Use table in this book for more information on how these data are gathered and adjusted). Methods and emissions factors are spelled out in the Revised 1996 International Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>. The IPCC allows countries to use either the reference or the sectoral approach when reporting their emissions. The figures provided here are based on the reference approach, which calculates emissions using data on a country's energy supply, and captures refining, flaring, and other "fugitive emissions" that do not result directly from end-use fossil fuel combustion. In contrast, the sectoral approach estimates emissions based on the combustion rather than the supply of fossil fuels.

The reference approach accounts for the carbon in fuels supplied to the economy. Apparent consumption of fuels is calculated as production minus exports plus imports. Net stock changes are either added or subtracted. International marine and aviation bunkers (fuels used for international transport) are subtracted from the national total as well, as these figures are accounted for separately. The production of secondary fuels is not accounted for, because the carbon contained in those fuels is already included in the primary fuel. However, imports and exports of secondary fuels are included in the calculations. Stored carbon from fuels used for non-energy purposes is subtracted from the total carbon emissions. Emissions from biomass fuels are not included in these estimates because the IPCC assumes that such emissions are equal to sequestration during regrowth.

Cumulative CO₂ contribution 1800-2000 consists of the sum of CO₂ produced during consumption of solid, liquid, and gaseous fuels; gas flaring; and cement manufacture from 1800 to the year 2000. The variable does not include emissions from land use change, or from bunker fuels used in international transportation.

WRI calculates cumulative CO₂ emissions levels based on the Carbon Dioxide Information Analysis Center's (CDIAC) emissions data from 1800 to 1980, and on Energy Information Administration (EIA) data from 1980 to 2000. CDIAC and EIA both report CO₂ emissions as the weight of the elemental carbon portion of CO₂; WRI converted the values to the actual mass of CO₂ by multiplying the carbon mass by 3.664 (the ratio of the mass of CO₂ to that of carbon). CDIAC bases CO₂ emissions from before 1950 on several compilations of fossil fuel production and trade: *World Energy Production 1800-1985* by Etemad et al. and four regional volumes of *International Historical Statistics* authored by B.R. Mitchell. Emissions and estimates from 1950 to the present are derived primarily from energy statistics published by the United Nations in their "Energy Statistics Yearbook." UN gas flaring estimates are supplemented with data from the U.S. Energy Information Administration, G. Marland at CDIAC, and a 1974 paper authored by R.M. Rotty entitled "First estimates of global flaring of natural gas." Emissions are calculated from data on fuel production, trade, and net apparent consumption by CDIAC. More information on the data, methodology, and sources used can be found at: http://cdiac.esd.ornl.gov/trends/emis/meth_reg.htm. A complete record of the formulas and assumptions used to calculate CO₂ emissions is available on-line at <http://cdiac.esd.ornl.gov/trends/emis/factors.htm>.

Methane and Nitrous Oxide emissions include emissions, in thousand metric tons of CO₂ equivalent, from energy, agriculture, waste, and other sources. Energy emissions from energy comprise the production, handling, transmission, and combustion of fossil and biofuels (IPCC categories 1A and 1B). Agriculture comprises animals, animal wastes, rice production, agricultural waste burning not intended for energy production, and savanna burning (IPCC category 4). Waste includes emissions from landfills, wastewater treatment and disposal, and waste incineration not intended for energy production (IPCC category 6). Other sources include industrial process emissions, and tropical and temperate forest fires (IPCC categories 2 and 5).

The Emission Database for Global Atmospheric Research (EDGAR) uses activity data taken from international statistical data to estimate emissions of the individual gases reported by the database. Activity data were multiplied by emissions factors specific to that activity. The emissions factors were primarily from Olivier et al. (1999), "Sectoral emission inventories of greenhouse gases for 1990 on a per country basis as

well as on 1° x 1°." Various factors were taken from other international and national-level sources. For more information, please see: <http://www.rivm.nl/env/int/coredata/edgar/v2/index.html>.

CO₂ Emissions by Economic Sector represents total CO₂ emissions from fossil fuel burning by individual economic sectors. It is important to note that emissions from electricity generation are not distributed to end users, but is treated as an independent sector. **Industry** represents CO₂ emissions from manufacturing industries and construction. Carbon dioxide emissions from **residential** sources include emissions from combustion of all fossil fuel types in households but excludes transportation. **Road transportation** refers to emissions from all road vehicles and agricultural vehicles while they are on highways. Emissions from **public electricity and heat** production include the sum of emissions from combustion of all fossil fuel types used for public electricity generation, public combined heat and power generation, and public heat plants. Emissions from electricity and heat production for use by the producer (autoproduction) are not included in this variable.

These data are produced by IEA in the same manner as described above under Total Carbon Dioxide Emissions.

Carbon Intensity: All Economic Sectors is the amount of CO₂ emitted per amount of Gross Domestic Product (GDP) in Purchasing Power Parity (PPP) terms generated by the country's economy. This measure provides an indicator of how efficiently a country performs, in carbon emission terms, relative to its wealth generation. Please see the notes after the Economic Indicators data table for more information on GDP PPP. WRI calculated CO₂ emissions per GDP PPP using data from IEA. Total energy consumption in each country was divided by total GDP PPP in constant dollar terms.

Carbon Intensity: Industry Sector is the amount of CO₂ emitted by the sector per amount of income generated. The industry sector is defined as including 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). This measure provides an indicator of how efficiently, in greenhouse gas emission terms, a country's industrial sector is able to generate wealth.

Industrial carbon intensity was calculated as follows: Industrial CO₂ emissions were divided by the amount of GDP PPP generated by the industry sector. Industrial GDP, as defined by the World Bank, includes International Standard Industrial Classification (ISIC) divisions 15-37. WRI adjusted IEA's value for industrial CO₂ emissions by subtracting emissions from mining and quarrying (ISIC Divisions 13-14) and construction (ISIC division 45) from IEA's total industrial CO₂ emissions figure. The only differences remaining after this adjustment are that the World Bank definition includes emissions from the manufacture of coke, petroleum products, and other derived fossil fuels (ISIC division 23), manufacture of coke oven products (ISIC group 231), manufacture of refined petroleum products (ISIC group 232), and processing of nuclear fuels. According to the IEA, however, the energy consumed for these activities, and therefore the CO₂ emissions, are captured in the energy contained in the original fuels used for these processes. The differences remaining between the World Bank and IEA definitions of the industry and manufacturing sector should therefore be small. After the definitions for industrial CO₂ emissions and the percentage of GDP generated by industry were brought into agreement, industrial GDP PPP was calculated by dividing total GDP PPP by the percentage generated by industry, and industrial CO₂ emissions was divided by this value.

FREQUENCY OF UPDATE BY DATA PROVIDERS:

The IEA, World Bank, CDIAC, and IEA update their data annually. National Institute for Public Health and the Environment (RIVM) calculates emissions of methane and nitrous oxide periodically. The UN Population Division updates population data every other year.

DATA RELIABILITY AND CAUTIONARY NOTES

CO₂ Emissions Data: The IEA CO₂ emissions data are based on well-established and institutionalized accounting methodologies and undergo thorough review and adjustments. The reference and sectoral approaches will, in most cases, give very similar results. However, because the reference approach is calculated using energy supply, it can lead to slight overestimates. For some countries, especially developing countries, statistical differences in basic data or unexplained differences in the two approaches can lead to significant discrepancies. Individual countries may use different energy figures than the IEA or treat bunker

fuels differently. Countries may use specific calorific values, instead of the averages used by IEA. Also, military emissions may be treated differently by the IEA. As a result, the data shown here can differ from the numbers reported by a country to the IPCC.

Cumulative CO₂ contribution since 1900: The share of carbon emissions for recently formed countries such as the independent republics of the former Soviet Union is estimated based on each country's CO₂ emissions in the years immediately following its formation. For example, Kazakhstan was formed in 1992. Total 1992-1996 emissions for the former Soviet Union were 3,802,544 tons; Kazakhstan's emissions from 1992-1996 were 6.3% of this total. It is then assumed that Kazakhstan produced roughly 6.3% of the carbon emitted in the former Soviet Union each year before 1992. As a result, total contributions from the former Soviet republics, the former Yugoslav republics, and other newly formed countries should be taken only as rough approximations.

Methane and Nitrous Oxide Emissions: The methane and nitrous oxide emissions data are calculated using a standardized methodology and reviewed for accuracy by the UNFCCC. The data can therefore be used with considerable confidence in their accuracy.

Carbon Intensity Indicators: While CO₂ emissions per GDP PPP is a useful indicator of greenhouse gas efficiency at the scale of the entire economy, it does not necessarily indicate how efficient the individual elements that make up the economy are. For example, it does not differentiate between economies that are more focused on industry as opposed to services, which generally require less energy and generate comparatively more income than industry. Interpretation of between-country comparisons should therefore be made with care. In addition, a number of countries, particularly rapidly-developing countries, over-report their GDP and GDP growth rate, which makes them appear more efficient than they actually are. Given the close match achieved between the World Bank and IEA's definitions when calculating the **industrial sector** indicator, the results of WRI's calculation can serve as an acceptable indicator of how efficiently, in terms of greenhouse gas emissions, the industry sector is able to generate economic goods. However, this match is not perfect and could lead to slight distortions in some countries. In addition, while focusing in on the industry sector reduces the potential for mismatched comparisons as discussed above, industries in different countries can have different foci. Between-country comparisons should therefore be made with care.

SOURCES:

Carbon Dioxide (CO₂) Emissions Variables: 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>. **Cumulative CO₂ Emissions Since 1900:** Carbon Dioxide Information Analysis Center (CDIAC), Environmental Sciences Division, Oak Ridge National Laboratory: 2001. *Global, Regional, and National CO₂ Emission Estimates from Fossil Fuel Burning, Cement Production, and Gas Flaring: 1751-1998*, NDP-030. Oak Ridge, Tennessee: CDIAC. Available online at <http://cdiac.esd.ornl.gov/ftp/ndp030/>. Energy Information Administration of the U.S. Department of Energy: 2001. Carbon Dioxide Emissions from Use of Fossil Fuels, International Energy Annual, 2000. Washington, DC: EIA. Available on-line at <http://www.eia.doe.gov/iea/carbon.html>. **Methane and Nitrous Oxide Emissions:** National Institute for Public Health (RIVM) and Netherlands Organisation for Applied Scientific Research (TNO). 2001. *The Emission Database for Global Atmospheric Research (EDGAR) 3.2: Emissions Database for Global Atmospheric Research*. The Netherlands: RIVM. Database available online at <http://www.rivm.nl/env/int/coredata/edgar/index.html>. **Carbon Intensity Indicators:** International Energy Agency (IEA), 2001. *CO₂ Emissions from Fossil Fuel Combustion (2001 Edition)*. Paris: Organisation for Economic Co-operation and Development (OECD). Electronic database available online at: <http://data.iea.org/ieastore/default.asp>. and Development Data Group, The World Bank. 2002. *World Development Indicators 2002 online*. Washington, DC: The World Bank. Available online at <http://www.worldbank.org/data/onlinedbs/onlinedbases.htm>. **Population** (used to calculate per capita values): Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2002. *World Population Prospects: The 2000 Revision*. New York: United Nations. Dataset available on CD-ROM.