

## EMISSIONS OF CARBON DIOXIDE

Carbon dioxide (CO<sub>2</sub>) makes up the largest share of greenhouse gases. The addition of man-made greenhouse gases to the atmosphere disturbs the earth's radiative balance (i.e. the balance between the solar energy that the earth absorbs and radiates back into space). This is leading to an increase in the earth's surface temperature and to related effects on climate, sea level and world agriculture.

### Definition

The table refers to emissions of CO<sub>2</sub> from burning oil, coal and gas for energy use. Carbon dioxide also enters the atmosphere from burning wood and waste materials and from some industrial processes such as cement production. However, emissions of CO<sub>2</sub> from these other sources are a relatively small part of global emissions, and are not included in the statistics shown here. The *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (see below) provide a fuller, technical definition of how CO<sub>2</sub> emissions have been estimated for this table. The forecasts provided in the table refer to the Reference Scenario of the *World Energy Outlook*.

### Overview

Global emissions of carbon dioxide have risen by 105%, or on average 2.0% per year, since 1971. They are projected to rise by another 39% by 2030, or by 1.4% per year. In 1971, the current OECD countries were responsible for 66% of the world CO<sub>2</sub> emissions. As a consequence of rapidly rising emissions in the developing world, the OECD contribution to the total fell to 45% in 2007, and is expected to fall further to 31% by 2030. By far, the largest increases in non-OECD countries occurred in Asia, where China's emissions of CO<sub>2</sub> from fuel combustion have risen by 5.8% per annum between 1971 and 2007. The use of coal in China increased the levels of CO<sub>2</sub> emissions by 5.2 billion tonnes over the 36 years to 2007.

Two significant downturns in OECD CO<sub>2</sub> emissions occurred following the oil shocks of the mid-1970s and early 1980s. Emissions from the economies in transition declined over the last decade, helping to offset the OECD increases between 1990 and the present. However, this decline did not stabilise global emissions as emissions in developing countries continued to grow. With the current economic crisis, early indicators suggest that growth in CO<sub>2</sub> emissions from fuel combustion slowed in 2008 and may have declined in 2009.

Disaggregating the emissions estimates shows substantial variations within individual sectors. Between 1971 and 2007, the combined share of electricity and heat generation and transport shifted from one-half to two-thirds of the total. The share of fossil fuels in overall emissions changed slightly during the period. The weight of coal in global emissions has remained at approximately 40% since the early 1970s, while the share of natural gas increased from 15% in 1971 to 20% in 2007. The share of oil decreased from 49% to 38%. Fuel switching and the increasing use of non-fossil energy sources reduced the CO<sub>2</sub>/total primary energy supply (TPES) ratio by 5% over the past 36 years.

### Comparability

These emissions estimates are affected by the quality of the underlying energy data. For example, some countries, both OECD and non-OECD, have trouble reporting information on bunker fuels and incorrectly define bunkers as fuel used abroad by their own ships and planes. Since emissions from bunkers are excluded from the national totals, this affects the comparability of the estimates across countries. On the other hand, since these estimates have been made using the same method and emission factors for all countries, in general, the comparability across countries is quite good.

### Sources

- IEA (2009), *CO<sub>2</sub> Emissions from Fuel Combustion: 2009 Edition*, IEA, Paris.
- IEA (2009), *World Energy Outlook 2009*, IEA, Paris.

### Further information

#### Analytical publications

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- IEA (2009), *Transport Energy and CO<sub>2</sub>: Moving towards Sustainability*, IEA, Paris.
- OECD (2008), *Economic Aspects of Adaptation to Climate Change: Costs, Benefits and Policy Instruments*, OECD, Paris.
- OECD (2008), *Space Technologies and Climate Change*, OECD, Paris.

#### Statistical publications

- IEA (2009), *Energy Balances of Non-OECD Countries*, IEA, Paris.
- IEA (2009), *Energy Balances of OECD Countries*, IEA, Paris.

#### Methodological publications

- WMO, UNEP, OECD, IEA (1996), *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, IPCC/OECD/IEA, Paris.

#### Online databases

- CO<sub>2</sub> Emissions from Fuel Combustion.

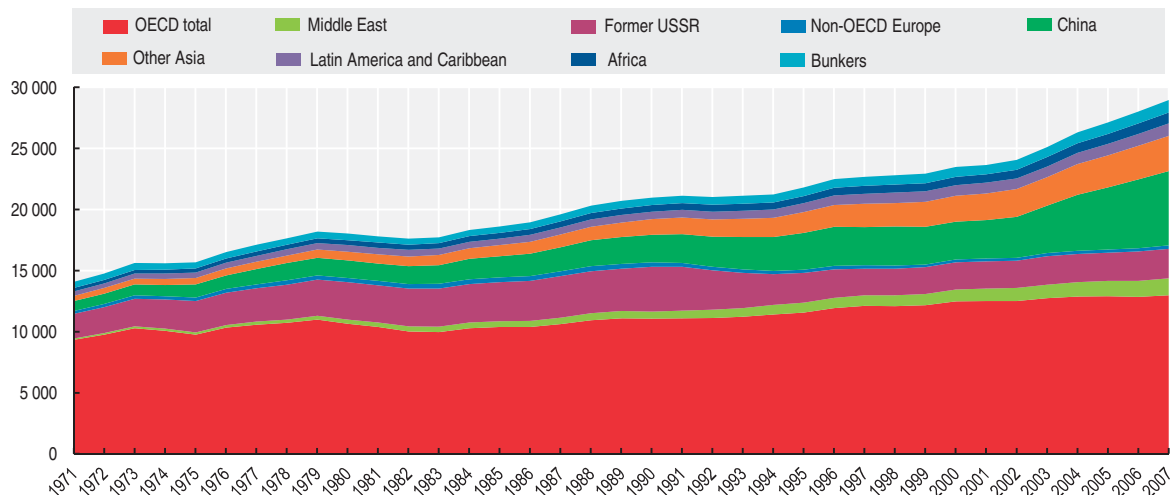
CO<sub>2</sub> emissions from fuel combustion

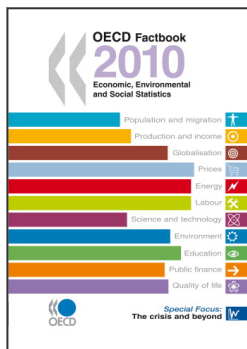
Million tonnes

	1971	1990	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2030
Australia	144	260	303	323	332	339	351	359	360	368	386	391	396	..
Austria	49	56	62	63	61	61	65	68	73	74	74	74	70	..
Belgium	117	108	118	121	117	119	119	112	120	117	113	110	106	..
Canada	339	432	497	500	511	533	526	533	555	551	556	538	573	..
Czech Republic	151	155	124	118	111	122	122	117	121	122	120	121	122	..
Denmark	55	50	61	57	54	50	51	51	56	51	47	55	50	..
Finland	40	54	60	57	56	54	59	62	72	67	55	67	64	..
France	432	352	362	385	378	377	384	376	385	385	388	378	369	..
Germany	979	950	867	860	829	827	845	833	842	843	811	823	798	..
Greece	25	70	79	83	82	87	90	90	94	93	95	94	98	..
Hungary	62	67	57	57	57	54	56	55	57	56	56	56	54	..
Iceland	1	2	2	2	2	2	2	2	2	2	2	2	2	..
Ireland	22	31	35	38	39	41	43	43	42	42	44	45	44	..
Italy	293	398	410	421	422	424	426	433	449	450	454	455	438	..
Japan	759	1 065	1 157	1 126	1 166	1 181	1 167	1 203	1 210	1 211	1 218	1 202	1 236	984
Korea	52	229	418	361	395	431	449	457	459	479	469	477	489	..
Luxembourg	15	10	8	7	7	8	8	9	10	11	11	11	11	..
Mexico	97	293	329	349	342	357	356	364	373	376	404	418	438	..
Netherlands	130	157	173	174	169	173	179	179	184	185	183	178	182	..
New Zealand	14	21	29	29	31	32	34	35	36	36	36	37	35	..
Norway	24	28	35	37	38	34	33	33	35	37	35	36	37	..
Poland	287	344	336	313	304	292	290	280	291	295	294	306	305	..
Portugal	14	39	49	53	60	59	59	63	58	60	63	56	55	..
Slovak Republic	39	57	41	40	39	37	38	38	38	37	38	37	37	..
Spain	120	206	241	249	269	284	285	302	310	327	340	332	345	..
Sweden	82	53	57	58	57	53	52	54	55	54	50	48	46	..
Switzerland	39	41	41	43	43	42	43	41	43	44	44	44	42	..
Turkey	41	127	177	178	177	201	182	192	202	207	216	240	265	..
United Kingdom	623	553	516	520	517	526	539	524	536	536	534	536	523	..
United States	4 291	4 863	5 477	5 475	5 501	5 693	5 673	5 614	5 689	5 772	5 784	5 698	5 769	5 535
EU27 total	..	4 059	3 882	3 882	3 813	3 831	3 905	3 877	3 993	4 003	3 970	3 988	3 926	3 516
OECD total	9 337	11 073	12 122	12 097	12 169	12 492	12 527	12 520	12 755	12 887	12 922	12 866	13 001	12 494
Brazil	91	193	275	283	293	303	312	311	304	321	327	333	347	..
Chile	21	33	55	57	60	56	54	55	58	63	64	66	71	..
China	800	2 211	3 101	3 156	3 046	3 038	3 084	3 309	3 830	4 546	5 058	5 604	6 028	11 615
Estonia	..	36	17	16	15	14	15	14	16	17	16	15	18	..
India	199	589	869	878	942	976	985	1 015	1 041	1 112	1 154	1 244	1 324	3 362
Indonesia	25	140	235	232	253	265	282	291	299	316	331	344	377	..
Israel	14	34	51	50	51	56	57	60	62	61	61	63	66	..
Russian Federation	..	2 180	1 444	1 438	1 474	1 514	1 514	1 505	1 540	1 524	1 531	1 587	1 587	1 928
Slovenia	..	13	15	15	14	14	15	15	15	15	16	16	16	..
South Africa	174	255	299	310	291	299	284	295	321	338	331	332	346	..
World	14 095	20 981	22 684	22 813	22 954	23 497	23 664	24 067	25 110	26 336	27 147	28 028	28 962	40 226

StatLink <http://dx.doi.org/10.1787/826007022078>World CO<sub>2</sub> emissions from fuel combustion, by region

Million tonnes

StatLink <http://dx.doi.org/10.1787/821401265015>



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