

## EMISSIONS OF CARBON DIOXIDE

Carbon dioxide (CO<sub>2</sub>) makes up the largest share of man-made 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

Emissions refer to CO<sub>2</sub> from burning oil, coal, natural gas and waste materials for energy use. Carbon dioxide also enters the atmosphere from deforestation and from some industrial processes such as cement production. However,

### Overview

Global emissions of carbon dioxide have more than doubled since 1971, increasing on average 2% per year. In 1971, the current OECD countries were responsible for 67% of 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 37% in 2013. By far, the largest increase in non-OECD countries occurred in Asia, where China's emissions of CO<sub>2</sub> from fuel combustion have risen, on average, by 6% per annum between 1971 and 2013. Driven primarily by increased use of coal, CO<sub>2</sub> emissions from fuel combustion in China increased over tenfold between 1971 and 2013.

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 in the 1990s, 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 economic crisis in 2008/2009, world CO<sub>2</sub> emissions declined by 2% in 2009. However, growth in CO<sub>2</sub> emissions have rebounded, with emissions increasing by 1% in 2012 and 2% in 2013.

Disaggregating the emissions estimates shows substantial variations within individual sectors. Between 1971 and 2013, the combined share of electricity and heat generation and transport shifted from one-half to two-thirds of the total. The share of the respective fuels in overall emissions also changed significantly during the period. The share of oil decreased from 48% to 34%, while the share of natural gas increased from 15% to 20% and that of coal in global emissions increased from 38% to 46%. Fuel switching, including the penetration of nuclear, and the increasing use of other non-fossil energy sources only reduced the CO<sub>2</sub>/total primary energy supply ratio by 6% over the past 40 years.

emissions of CO<sub>2</sub> from these other sources represent a smaller share of global emissions, and are not included. The 2006 IPCC *Guidelines for National Greenhouse Gas Inventories* provide a fuller, technical definition of how CO<sub>2</sub> emissions have been estimated.

### Comparability

These emissions estimates are affected by the quality of the underlying energy data. For example, some countries, both OECD and non-OECD members, have trouble reporting information on bunker fuels and may not be able to accurately split fuel consumption between domestic and international transport. 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

- International Energy Agency (2015), *CO<sub>2</sub> Emissions from Fuel Combustion*, IEA, Paris.

### Further information

#### Analytical publications

- IEA (2015), *Energy Technology Perspectives*, IEA, Paris.
- IEA (2015), *World Energy Outlook*, IEA, Paris.
- IEA (2014), *Energy, Climate Change and Environment: 2014 Insights*, IEA, Paris.
- IEA (2013), *Electricity and a Climate-Constrained World: Data and Analyses*, IEA, Paris.
- OECD (2013), *Aligning Policies for a Low-Carbon Economy*, OECD Publishing.
- OECD (2013), *Effective Carbon Prices*, OECD Publishing.
- OECD (2013), *Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels 2013*, OECD Publishing.
- OECD (2013), *Taxing Energy Use, A Graphical Analysis*, OECD Publishing.

#### Methodological publications

- Intergovernmental Panel on Climate Change (IPCC) (2006), *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds), IGES, Japan.

#### Online databases

- IEA CO<sub>2</sub> Emissions from Fuel Combustion Statistics.
- OECD Environment Statistics.



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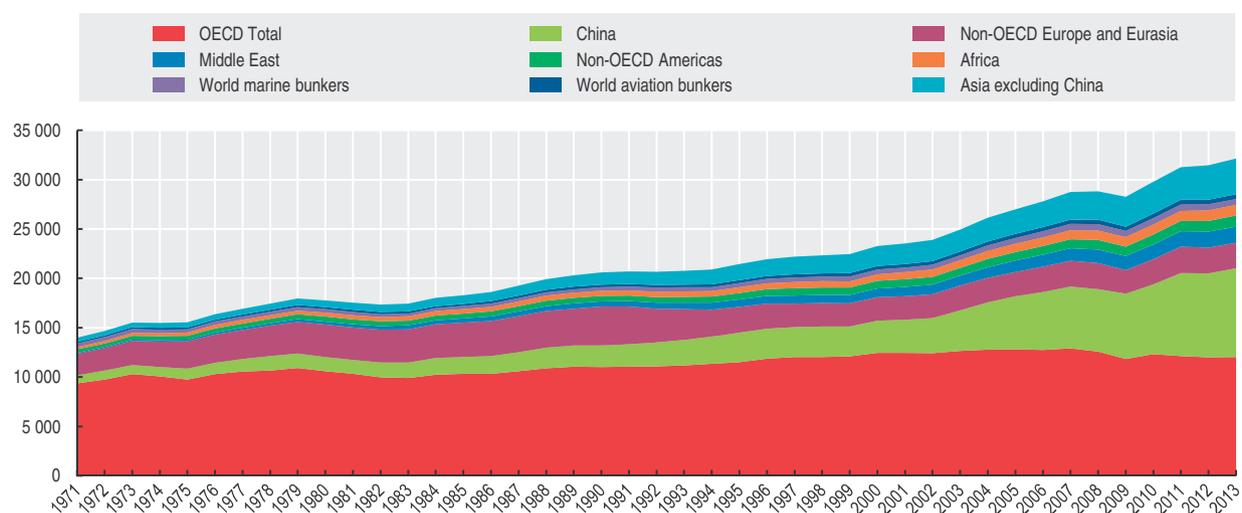
**CO<sub>2</sub> emissions from fuel combustion**

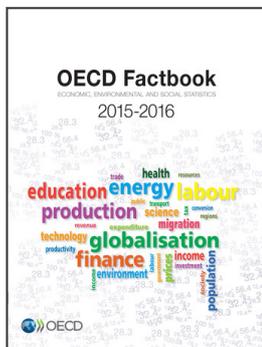
Million tonnes

	1971	1990	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Australia	143	260	354	367	371	376	386	389	394	385	385	387	389
Austria	49	56	73	74	75	73	70	71	65	70	68	65	65
Belgium	118	106	112	111	107	104	100	104	93	102	94	89	89
Canada	340	419	534	526	536	524	554	539	504	515	524	524	536
Chile	21	29	49	53	54	56	63	67	64	69	75	77	82
Czech Republic	154	150	121	122	118	119	121	116	109	111	110	106	101
Denmark	55	51	57	52	48	56	52	49	47	47	42	37	39
Estonia	..	36	17	17	17	16	19	18	15	19	18	16	19
Finland	40	54	71	67	55	66	64	56	53	62	54	49	49
France	423	346	368	369	370	361	353	349	333	340	310	312	316
Germany	978	940	821	805	787	799	767	775	720	759	731	745	760
Greece	25	70	94	94	95	94	98	94	90	83	82	77	69
Hungary	60	66	57	55	55	54	53	52	47	48	46	42	40
Iceland	1	2	2	2	2	2	2	2	2	2	2	2	2
Ireland	22	30	42	42	44	45	44	44	39	39	35	36	34
Israel	14	33	61	61	59	62	64	64	64	68	68	75	68
Italy	289	389	445	455	456	449	441	429	384	392	384	367	338
Japan	751	1 049	1 188	1 189	1 196	1 183	1 221	1 137	1 076	1 126	1 178	1 217	1 235
Korea	53	232	438	460	458	465	477	489	502	551	574	575	572
Luxembourg	16	11	10	11	11	11	11	11	10	11	11	10	10
Mexico	94	260	358	364	382	391	405	399	396	414	428	434	452
Netherlands	128	145	167	169	163	161	162	164	158	168	157	157	156
New Zealand	14	22	33	32	34	34	33	33	30	30	30	31	31
Norway	23	27	35	36	35	36	36	35	36	38	36	36	35
Poland	287	345	293	297	296	308	307	302	291	310	303	297	292
Portugal	14	38	57	58	61	56	55	53	53	48	47	46	45
Slovak Republic	39	55	37	36	37	36	36	35	33	35	33	31	32
Slovenia	..	14	15	15	15	16	16	17	15	15	15	15	14
Spain	119	203	303	319	334	325	338	310	276	262	265	260	236
Sweden	82	52	54	52	49	47	45	43	41	46	42	39	38
Switzerland	39	41	43	43	44	43	41	43	42	43	39	40	42
Turkey	42	127	203	207	216	240	265	265	257	265	285	303	284
United Kingdom	621	548	532	533	531	533	521	508	459	477	439	462	449
United States	4 288	4 802	5 609	5 688	5 702	5 602	5 686	5 512	5 120	5 355	5 219	5 032	5 120
EU 28	..	4 024	3 939	3 940	3 916	3 922	3 868	3 790	3 499	3 611	3 465	3 425	3 340
OECD	9 342	11 006	12 653	12 781	12 816	12 742	12 907	12 573	11 819	12 306	12 132	11 990	12 038
Brazil	87	184	292	310	311	314	330	348	324	370	390	422	452
China	831	2 184	4 117	4 788	5 360	5 881	6 276	6 338	6 618	7 095	8 420	8 519	8 977
India	182	534	954	1 034	1 086	1 157	1 266	1 342	1 513	1 597	1 660	1 780	1 869
Indonesia	25	134	312	319	322	343	358	355	370	383	390	416	425
Russian Federation	..	2 163	1 494	1 488	1 482	1 537	1 533	1 554	1 440	1 529	1 604	1 551	1 543
South Africa	157	244	348	375	372	374	391	423	399	409	395	408	420
World	13 995	20 623	24 992	26 177	27 048	27 856	28 783	28 871	28 322	29 838	31 293	31 491	32 190

 1 2 <http://dx.doi.org/10.1787/888933336022>
**World CO<sub>2</sub> emissions from fuel combustion, by region**

Million tonnes


 1 2 <http://dx.doi.org/10.1787/888933334826>



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