

The IEA energy data collection and CO2 estimates: an overview

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IEA Energy data collection

How does the IEA collect national energy statistics?



OECD:

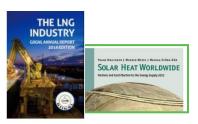
5 harmonized annual questionnaires from official sources on mandatory basis

Non-OECD:

- Questionnaires or national formats from official sources on voluntary basis
- From secondary sources if needed (utilities, associations, trade reports; etc)



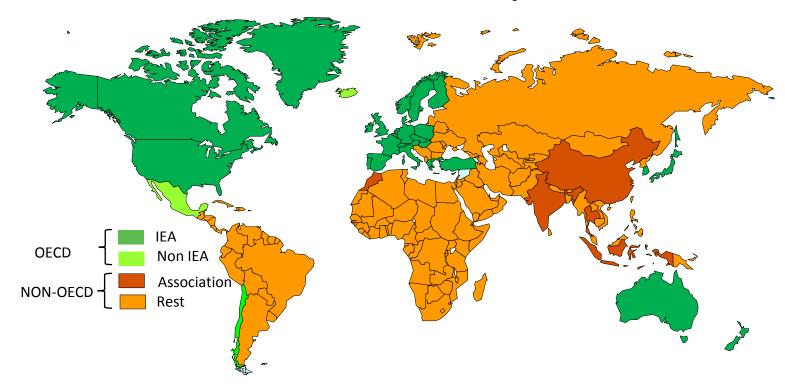




Data collection at the IEA: the road to global outreach



• IEA collects data from 150 countries, on a voluntary basis for all non-OECD countries



From energy statistics to energy balances



- Energy statistics collected in the natural units (kt, kWh, TJ...)
- Needs to be converted in a common energy units (TJ, ktoe)
- => Calorific values are required
- Then aggregation and formatting work (products aggregation, sectors, etc...)

The quality of the balance depends on the quality of the statistics collected AND the precision of the calorific values used.

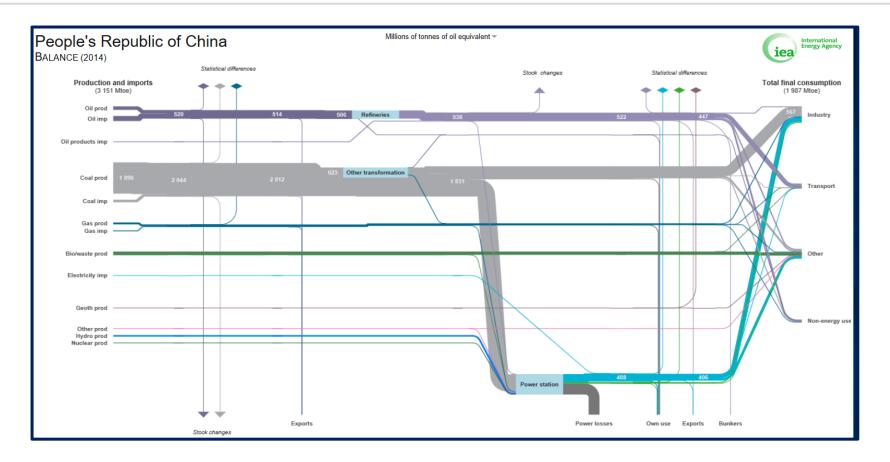
How to read an energy balance



Exercise on paper

Energy balances: a key output of the IEA energy data collection



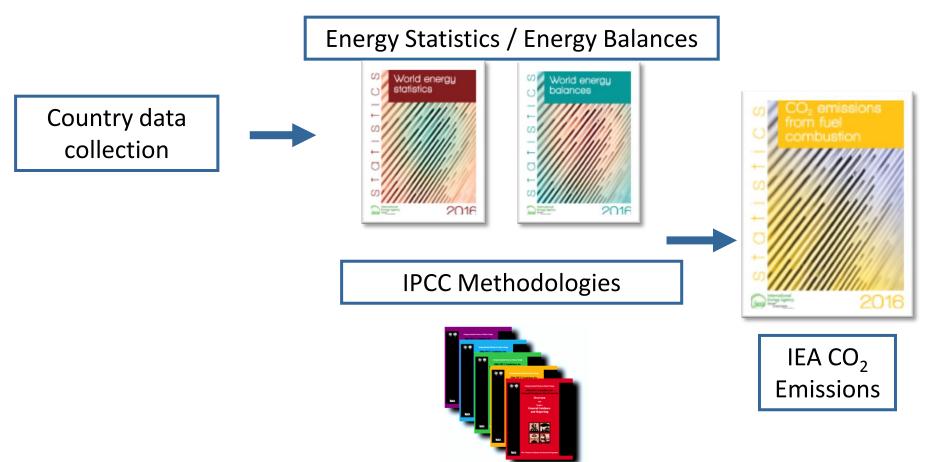




IEA CO₂ emissions estimates

From energy data collection to CO₂ emissions estimates





Coverage for emissions estimates – Important principles



Territorial principle

- Energy data are based on national boundaries (IRES)
- As a consequence, emissions from electricity generation are based on the electricity generated within that country.
- Similarly, emissions relating to goods or services produced for export are accounted for in the producing country.

Sectors

- Emissions from fuel combustion are calculated within each of the energy sectors (disaggregated in 40 flows).
- Fugitive emissions, and emissions from other sectors (e.g. industrial processes, agriculture etc...) are not included.

Fuels

- Fuels include coal, oil, gas and non-renewable waste (disaggregated in 47 products)

Gases

- IEA emissions estimates cover all CO_2 emission from fuel combustion. They do not include the CO_2 equivalent emissions of other greenhouse gases e.g. CH_4 or N_2O .

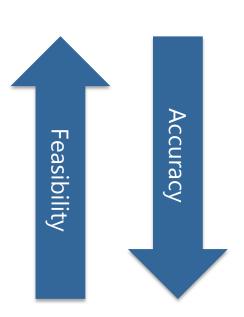
From energy balances to CO₂ emissions estimates



Tiered approach:

- Tier 1
 - Simplest method
 - Use fuel consumption (activity) data available from all countries
- Tier 2
 - Country or technology-specific emission factor
- Tier 3
 - More detailed or country-specific methods

Although Tier 2 and 3 are more accurate in general, in the case of CO_2 from fuel combustion, the Tier 1 approach produces accurate results, as emissions are based on the carbon content of the fuels (conservation of carbon).



From IEA energy balances to CO₂ emissions estimates



- Basic computation for CO2 emissions using the **Tier 1** approach:
 - CO2 emissions = Fuel quantity x product-specific emission factor
 - Sum across all products
 - Excludes non-energy use of fuels

• Where:

Fuel quantity = data collected in natural units x product specific net calorific value
Calorific values vary with time, country and products.

E.g. Different coal types have specific NCVs for production, imports, exports, inputs to main activity power plants and coal used in coke ovens, blast furnaces and industry, and can vary over time for each country.

Can be done from two independent sets of data:



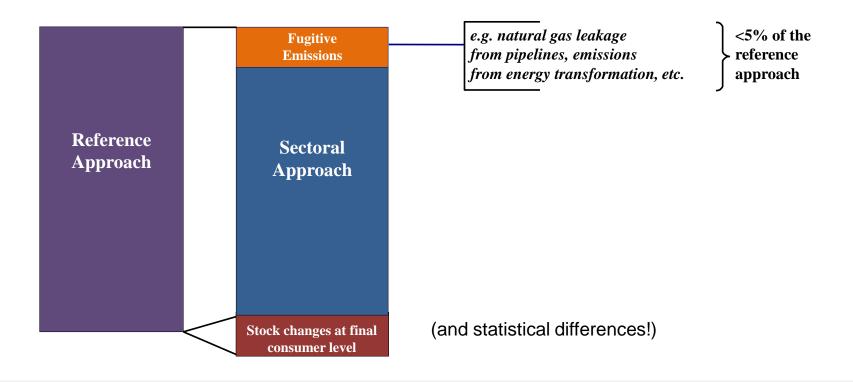


Supply of fuels to the country **Reference Approach**

Consumption by end-use sectors **Sectoral Approach**

Reference vs. Sectoral Approach

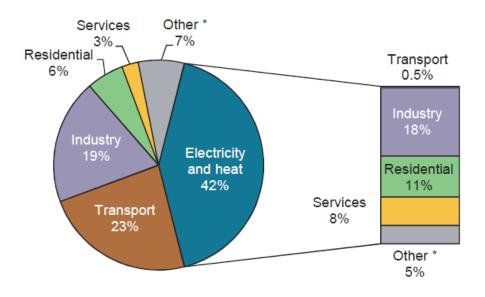




Reference Approach is generally an upper limit for Sectoral Approach

World CO₂ emissions from fuel combustion by sector





Note: Also shows allocation of electricity and heat to end-use sectors.

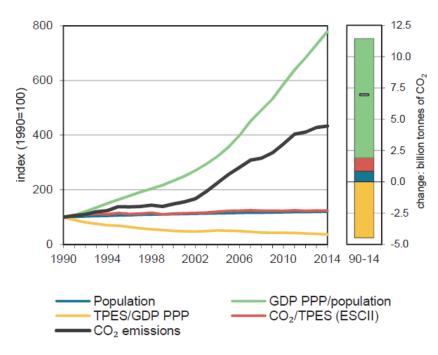
Source: IEA/OECD CO2 emissions from fuel combustion, 2016

^{*} Other includes agriculture/forestry, fishing, energy industries other than electricity and heat generation, and other emissions not specified elsewhere.

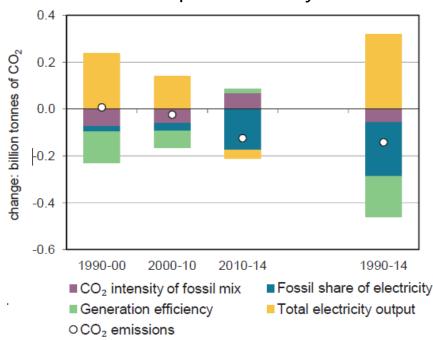
Examples of further analysis of CO₂ estimates







OECD Europe, Electricity emissions



Source: IEA/OECD CO2 emissions from fuel combustion, 2016

Comparability of IEA estimates and UNFCCC inventories



- Because of harmonized methodology, IEA estimates are comparable across all countries
- For most Annex II countries, IEA and UNFCCC CO₂ totals are expected to be within 5-10%
- Some of the reasons for potential differences are:
 - Energy activity data reported to the IEA may differ from those used for the UNFCCC calculations (e.g. different institutions/departments may be involved, different calorific values, etc...).
 - The IEA uses a Tier 1 method (with default carbon factors by product).
 - The IEA estimates include all CO₂emissions from fuel combustion. Countries may have included parts of these emissions in the IPCC category industrial processes and product use.
 - The IEA cannot allocate emissions from auto-producers into the end-use sectors (it does not impact the total).
 - Military emissions may be treated differently.

Publication of the IEA CO₂ estimates



The CO2 Emissions from Fuel Combustion (2017 edition) will be released in Fall 2017.

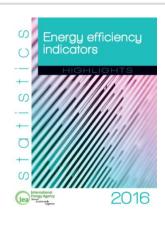


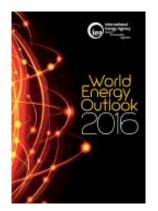
A condensed, *Highlights edition* can be downloaded for free from: http://www.iea.org/statistics/topics/CO2emissions

Publication of the IEA CO₂ estimates



CO₂ data also used in other IEA publications:





In addition, a large amount of data are made available online for free at:

http://www.iea.org/statistics/statisticssearch



Stack to the table of contents.	1971	1977	1973	1974	1975	1976	1977	1979	1979	1988	1981	1902	1983	1984	1965	1986	1987	1900	1989	199
World	14.005	14 772	15 624	15 602	15 679	16.516	17 112	17.655	19 206	19.652	17 819	17.619	17 725	19.217	18 628	18 995	19 629	20 225	29 723	20 16
Annes I Parties																				12:00
		8 997	0.400	9349	0.004	0 300	0.530	0.695		0.544	0.202	8911	0.022	0 170				9.672		12:90
Annex II Parties North America	4631	4 997	9-496 5-072	1934	4738	9.398 5.020	9 599 5 222	9 495 5 242	9:820 5:291	9.544 5.000	9 2 9 2 5 0 0 0	4758	4719	9 109	9 172	9 175	9.360 5.074	9.472 5.315	9.811 5.309	9 80 5 30
		2 145																		3 15
Europe	3.060		2.330	3229	2 092	3.292	3250	2.236	2494	3.351	3205	2 087	3 054	3 060	3 106	2 541	3 151	2 141	3 165	
Asia Oceania	917	962	1 082	1 086	1 652	1 086	1 128	1 117	1 146	1 105	1 091	1 065	1 060	1 126	1 119	1118	1 136	1215	1257	1.34
Annex I EIT																				2.97
Non-Annex / Parties																				644
Annex I Kyoto Parties																				8.79
OECD Total	9 370	9 796	10 220	10 124	9 798	10 372	10 628	10 796	11 050	19711	10 449	10 009	10 021	10 346	10 444	19 463	10 698	11 016	11 171	11 15
Non-OECD Total	4 204	4 440	4 730	4 947	5 279	5 632	5 954	6 222	6 600	6796	6 951	7 006	7 238	7 493	7 667	7 974	9.274	8 729	2 949	9 19
International marine bunkers	343	259	279	254	229	229	340	342	352	245	329	287	268	271	294	212	209	325	325	25
International aviation bunkers	168	177	185	179	172	172	188	195	201	200	200	207	209	217	223	245	259	274	288	25
Region/Country/Economy	1971	1972	1973	1974	1975	1976	1977	1978	1979	1900	1991	1902	1983	1994	1985	1986	1907	1988	1909	130
Canada	229.4	357.2	375.1	365.3	377.1	391.4	405.0	407.4	421.8	426.9	410.3	392.5	394.6	401.3	402.2	393.7	405.6	435.9	451.7	432
Chile	20.8	204	19.8	19.5	17.0	17.8	18.6	19.3	20.5	21.2	21.2	18.2	18.9	20.0	19.4	20.1	20.4	24.6	29.8	36.
Mexico	97.1	110.2	121.4	131.8	138.8	149.8	158.9	176.1	1904	212.1	228.6	238.8	232.2	241.5	251.6	248.8	259.5	260.1	273.8	264
United States	4 291.3	4 532.0	4 697.7	4 548.3	4 360.8	4 629.1	4.917.1	4 934.2	4.968.7	4 661.6	4 595.9	4.365.4	4.334.7	4 521.7	4 545.7	4 522.0	4 668.6	4 979.2	4 937.3	4 968
OECD Americas	4 748.7	5 019.7	5 214.0	5 094.8	4 990.7	5 187.1	5 299.6	5 437.0	5 501.4	5 221.8	5 256.0	5 015.0	4 979.3	5 194.5	5 219.0	5 184.5	5 354.0	5 599.8	5 692.7	5 594.
Australia	144.1	148.9	158.5	173.3	1900	182.4	196.7	192.3	198.3	208.0	208.3	2145	202.5	209.0	221.0	222.1	232.0	242.1	255.3	260
locael	14.4	15.2	16.2	16.4	17.1	17.1	17.9	19.1	19.6	19.6	20.4	21.6	22.4	23.1	24.5	27.0	29.4	31.1	32.4	22
Japan	758.8	798.4	907.6	894.7	956.3	985.2	911.5	907.0	931.1	890.7	956.6	933.0	939.5	898.3	979.1	877.1	993.9	952.3	990.3	1 064
Konea	52.1	54.0	67.3	70.7	76.8	85.4	97.7	106.4	1200	124.4	129.4	129.0	137.0	148.9	153.3	159.7	166.0	189.3	200.5	229.
New Zealand	13.7	15.7	17.1	18.1	17.1	19.9	19.4	18.2	16.3	16.4	16.3	17.9	18.1	19.1	19.6	18.6	19.9	21.1	21.3	23.
OECD Asia Oceania	993.1	1 032.2	1 166.7	1 172.3	1147.2	1 188.9	1 243.1	1 2429	1 285.3	1 249.1	1 230.9	1 215.0	1 219.5	1 298.3	1 296.4	1 204.4	1 230.9	1 436.0	1 499.9	1 610.
Austria	48.7	50.5	54.0	\$1.3	50.2	54.3	\$1.8	54.5	57.2	55.7	52.8	\$1.0	\$1.1	52.9	54.3	53.2	54.2	52.1	52.5	56.
Beiglum	116.8	129.7	132.7	130.6	115.6	124.5	123.5	129.0	132.3	125.7	115.5	109.3	100.6	102.6	101.9	102.6	102.8	104.6	105.9	107.
Crech Republic	151.0	150.0	147.1	146.3	152.6	157.4	166.9	163.0	172.5	165.8	166.5	169.3	170.5	172.1	172.1	173.1	174.2	170.8	163.5	155.
Denmark	55.0	\$7.1	56.0	49.0	52.5	58.1	59.7	59.2	62.7	62.5	52.5	546	\$1.3	52.9	60.5	61.1	59.3	55.5	49.8	50.
Estonia																				36
	29.8	43.7	48.0	44.5	44.4	50.5	50.2	54.7	54.4	55.2	46.0	44.5	43.2	44.4	48.6	49.5	53.8	53.1	52.9	54.
	431.9	448.6	494.8	464.6	4304	469.3	455.3	474.7	491.8	461.4	414.1	396.7	381.0	369.5	360.3	347.8	342.3	340.5	355.9	352
France		1 009.2	1 053.1	1 028.5	975.5	1 032.2	1017.2	1 055.9	1 103.6	1 055.6	1 022.3	982.3	983.9	1 006.1	1014.6	1016.3	1 007.2	1 001.2	976.8	950.
Germany						29.1	40.4	42.8	45.1	45.3	44.9	463	49.3	\$1.0	54.6	79.3	60.0	75.3	69.2	70.
Germany Greece	25.2	29.2																		
Germany Greace Hungary	25.2 60.3	62:2	66.6	68.8	70.7	76.3	77.9	85.8	84.4	83.7	82.9	83.1	79.6	81.5	80.8		90.2		74.2	
Germany Greece Hungary Iceland	25.2 60.3 1.4	62:2 1.5	1.7	1.7	1.6	1.6	1.6	1.8	1.8	1.7	1.7	1.6	1.6	1.7	1.6	1.7	1.7	1.8	1.8	1
Germany Greece Hungary Iceland Invited	25-2 60-3 1.4 21.7	62:2 1.5 21.4	66.6 1.7 20.9	68.8 1.7 22.6	1.6 21.1	1.6 22.1	1.6 23.7	1.8 23.2	1.8 27.1	1.7 25.9	1.7 25.8	1.6 25.2	1.6 25.1	1.7 24.9	1.6 26.4	1.7 27.8	1.7 29.4	1.8	1.8 29.5	29.
Germany Greece Hungary Iceland	25.2 60.3 1.4	62:2 1.5	1.7	1.7	1.6	1.6	1.6	1.8	1.8	1.7	1.7	1.6	1.6	1.7	1.6	1.7	1.7	1.8	1.8	96. 1 29. 297.

