



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

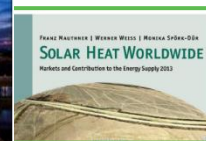
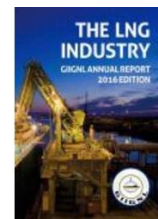
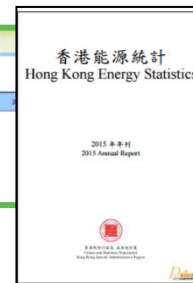
Country	Anthracite		Coking coal		Other bituminous coal		bbl
	10 ¹² t	10 ¹² t	10 ¹² t	10 ¹² t	10 ¹² t	10 ¹² t	
SUPPLY AND TRANSFORMATION SECTOR							
Underground production	1	B	B	B	B	B	
Surface production	2	B	B	B	B	B	
From other sources	3	B	B	B	B	B	
Total production	4	B	B	B	B	B	
Total imports (Balance)	5	B	B	B	B	B	
Total exports (Balance)	6	B	B	B	B	B	
International marine bunkers	7	B	B	B	B	B	
Stock changes (traditional territories)	8	B	B	B	B	B	
Island consumption (Calculated)	9	B	B	B	B	B	
Statistical differences	10	B	B	B	B	B	

Non-OECD:

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

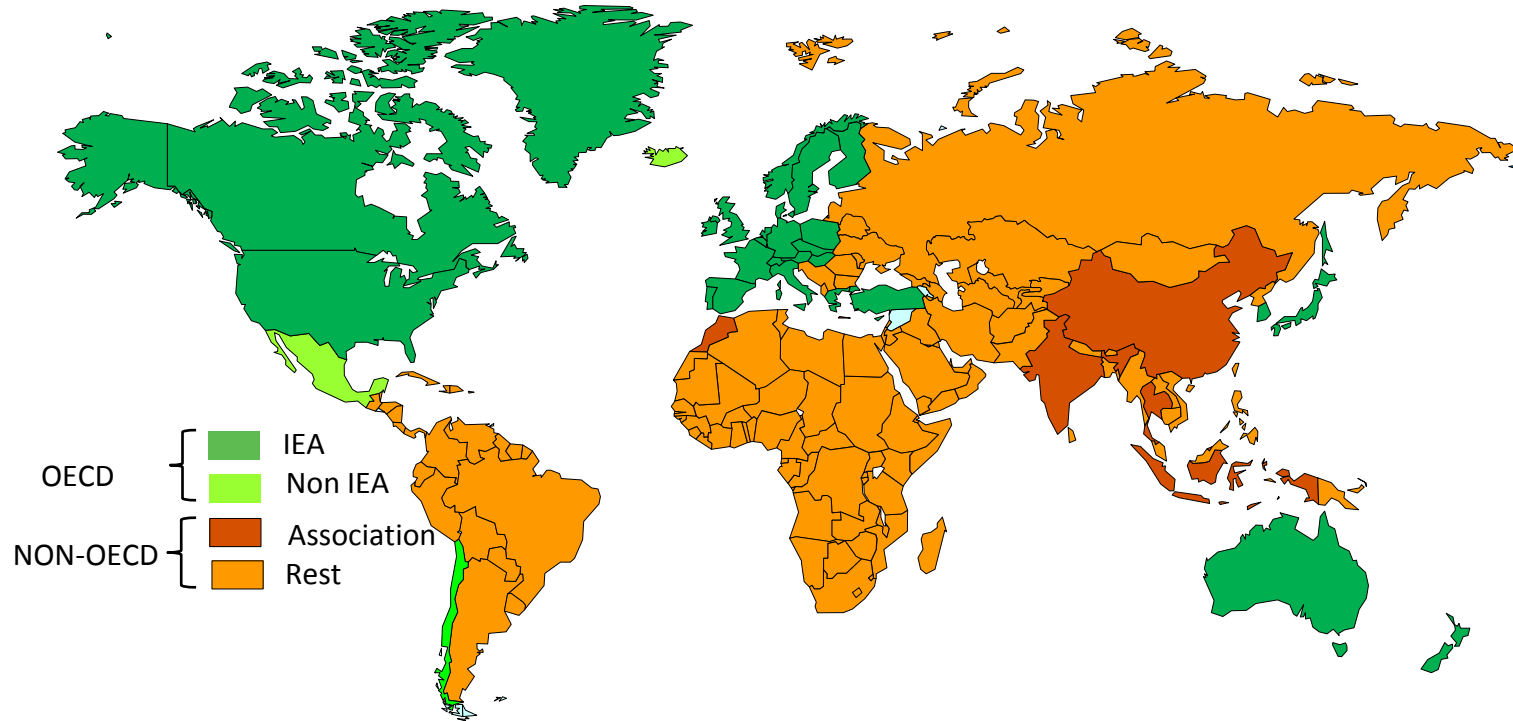
9-3 Overall Energy Balance Sheet

Item	1990	1995	2000	2005	2010	2015
Total Energy Available for Consumption	94308	129035	144234	256919	365588	
Primary Energy Output	103622	128034	138570	226637	312126	
Recovery of Energy		2312	3087	7462	8958	
Imports	1310	5468	14327	28623	57671	
Exports (1)	6875	6776	9327	11257	8803	



All sources are listed in databases documentation

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

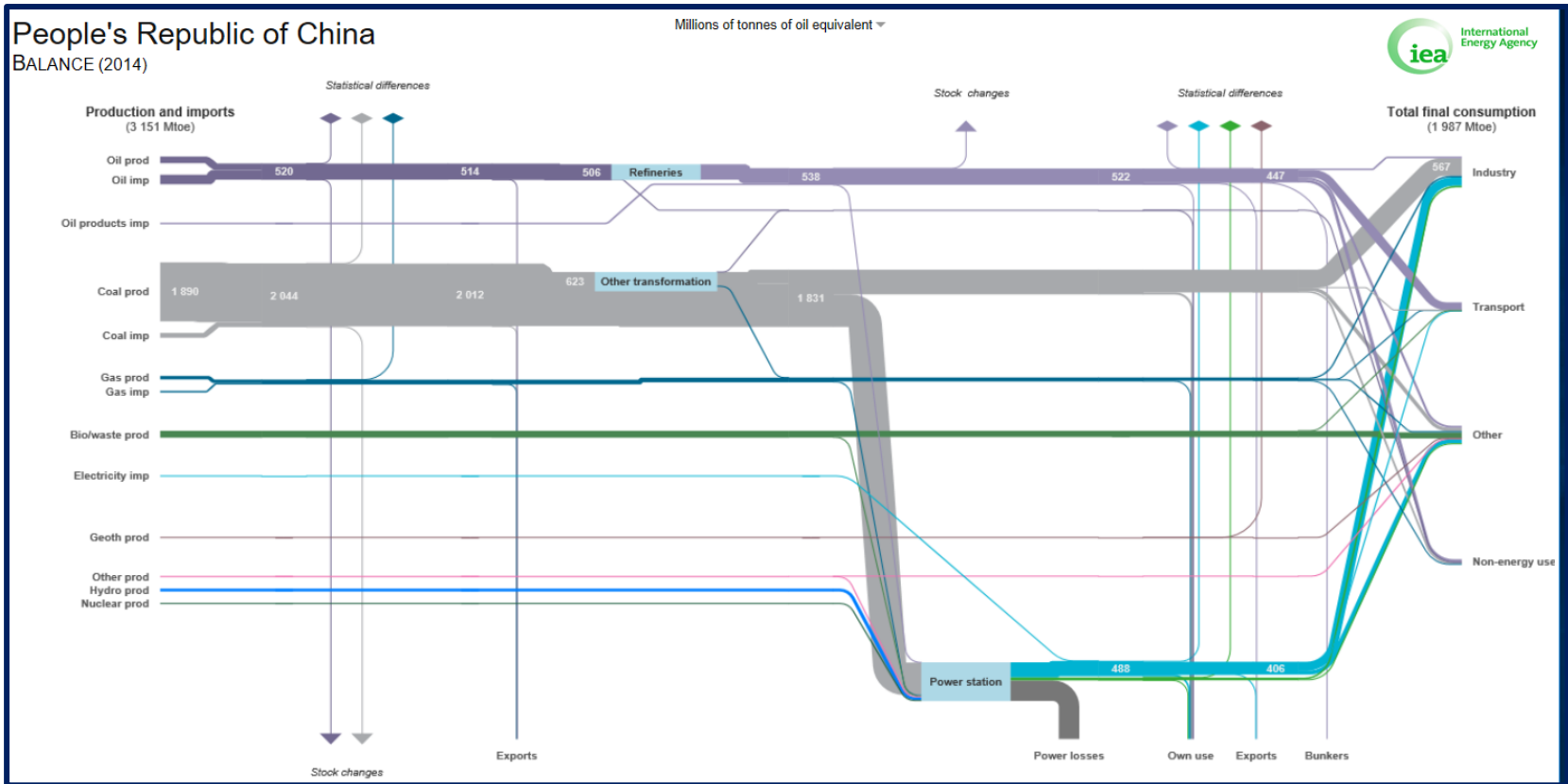


- Energy statistics collected in the natural units (kt, kWh, TJ...)
- Needs to be converted in a common energy units (TJ, ktoe)
- => Calorific values are required
- Then aggregation and formatting work (products aggregation, sectors, etc...)

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

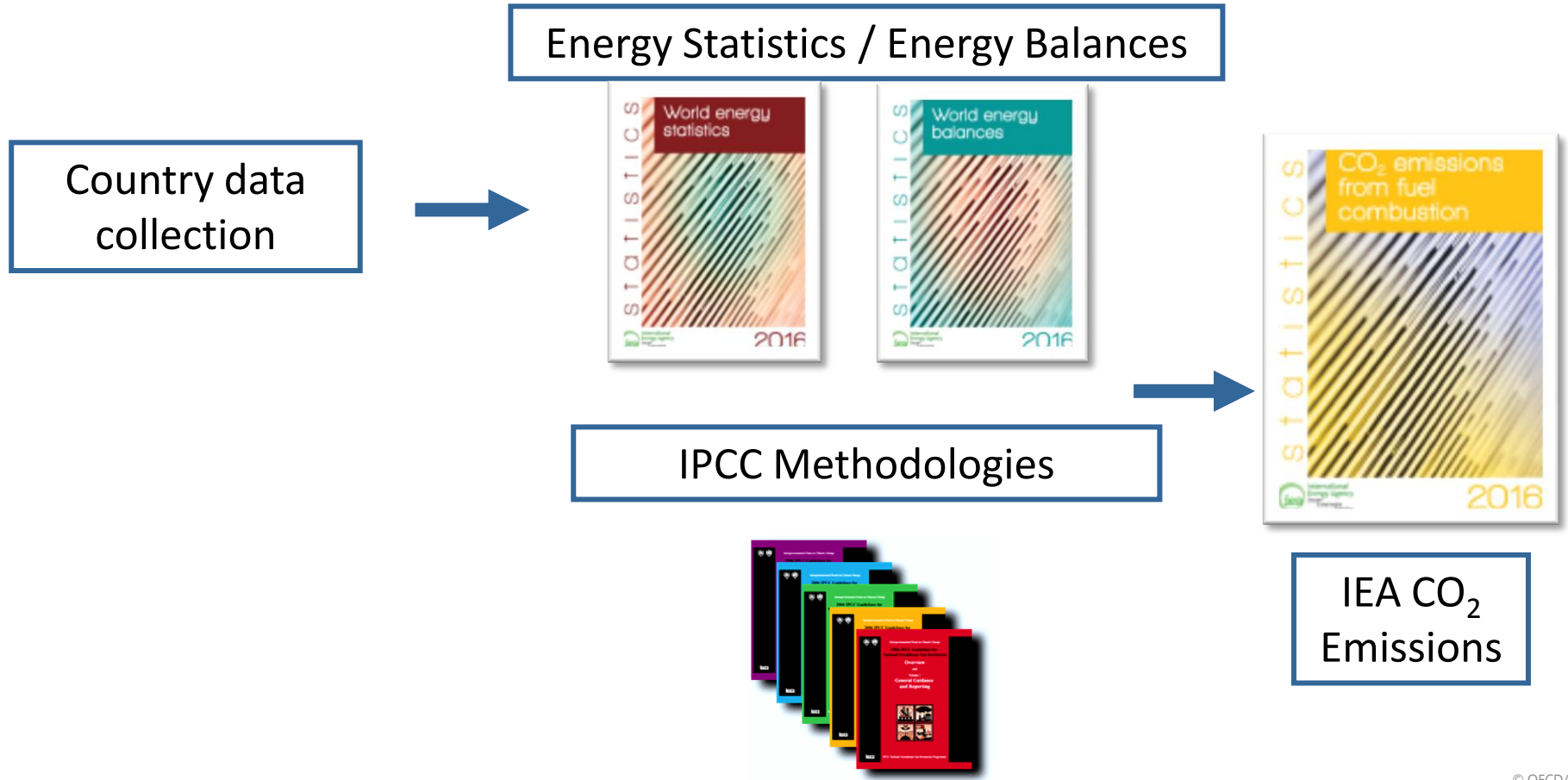
Exercise on paper

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



IEA CO₂ emissions estimates

From energy data collection to CO₂ emissions estimates



- **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**

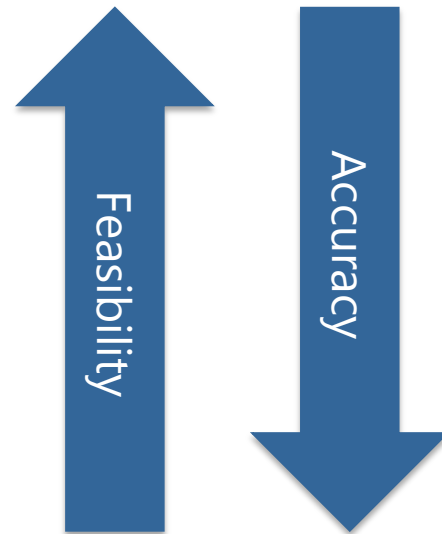
- Fuels include coal, oil, gas and non-renewable waste (disaggregated in 47 products)

- **Gases**

- IEA emissions estimates cover all CO₂ emission from fuel combustion. They do not include the CO₂ equivalent emissions of other greenhouse gases e.g. CH₄ or N₂O.

Tiered approach:

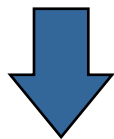
- Tier 1
 - Simplest method
 - Use fuel consumption (activity) data available from all countries
- Tier 2
 - Country or technology-specific emission factor
- Tier 3
 - More detailed or country-specific methods



Although Tier 2 and 3 are more accurate in general, in the case of CO₂ from fuel combustion, the Tier 1 approach produces accurate results, as emissions are based on the carbon content of the fuels (conservation of carbon).

- 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:

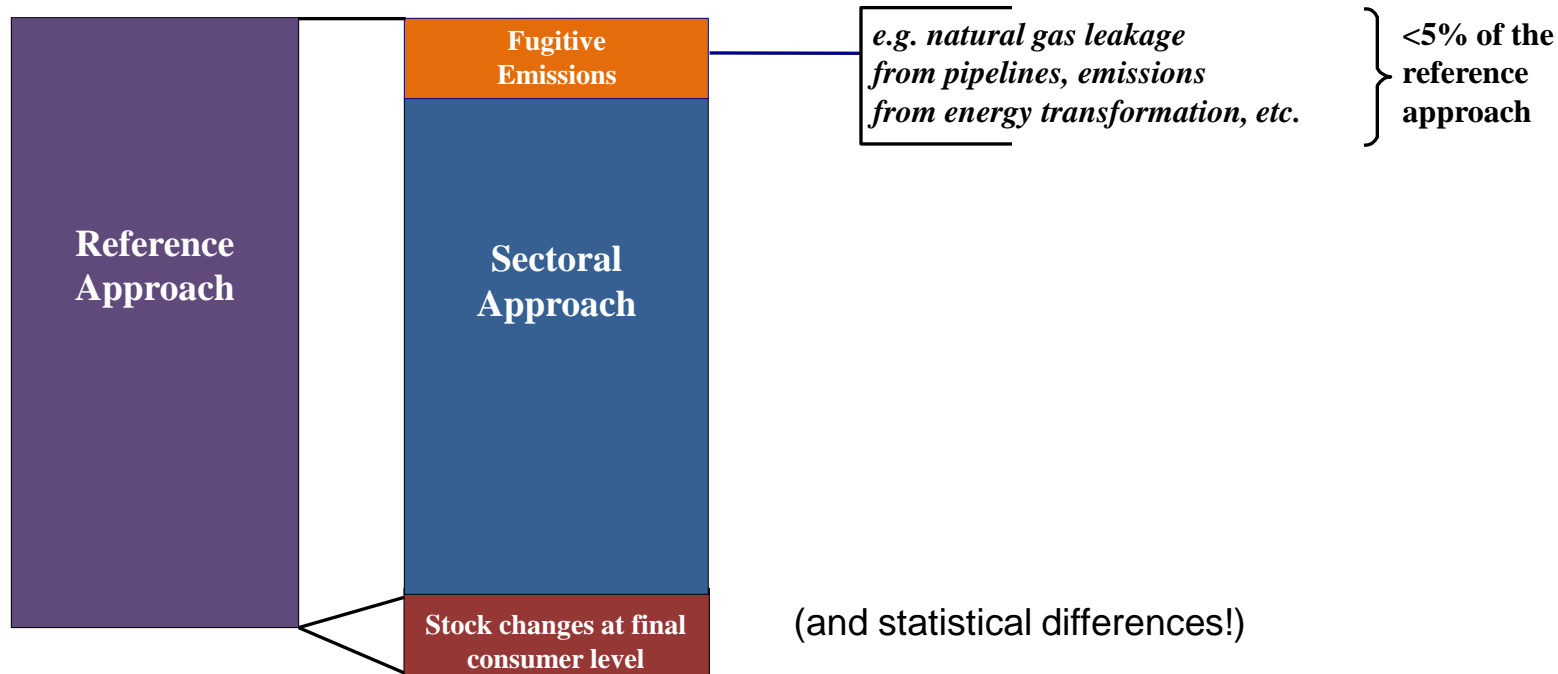


Supply of fuels to the country
Reference Approach



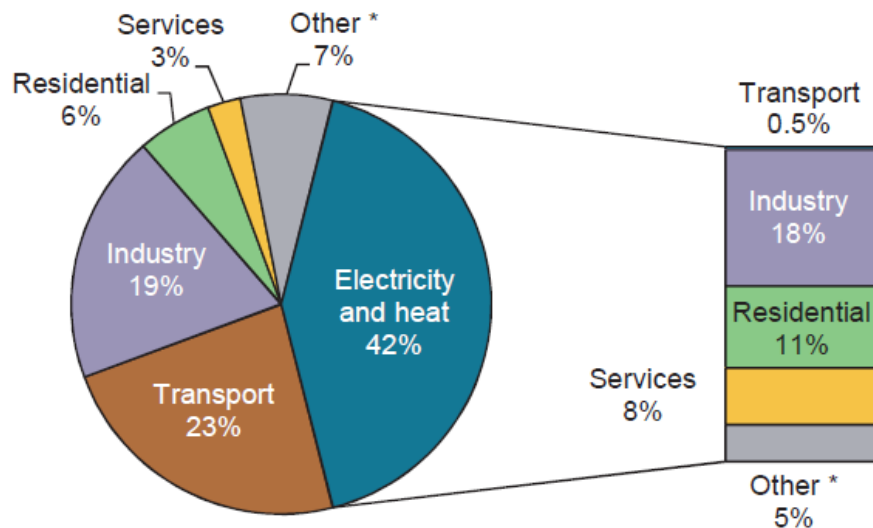
Consumption by end-use sectors
Sectoral Approach

Reference vs. Sectoral Approach



Reference Approach is generally an upper limit for Sectoral Approach

World CO₂ emissions from fuel combustion by sector

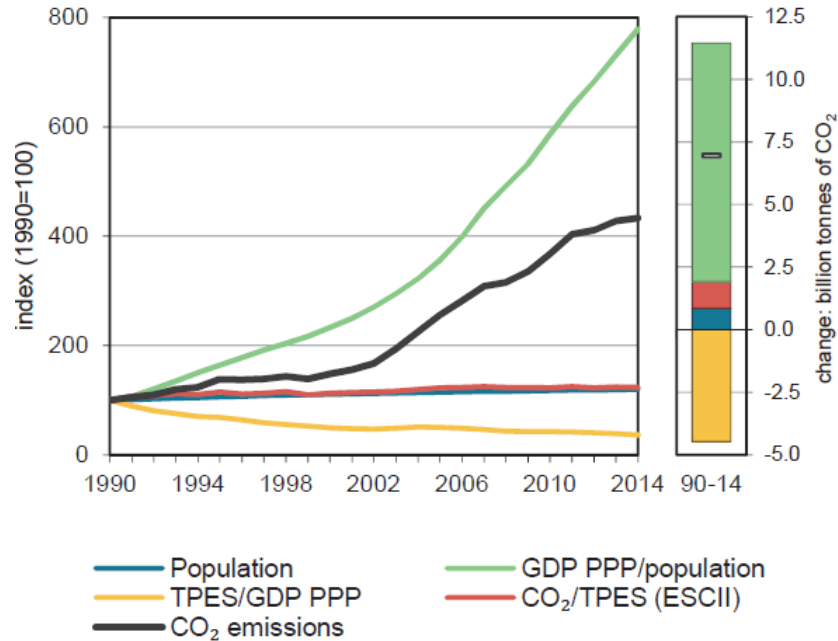


Note: Also shows allocation of electricity and heat to end-use sectors.

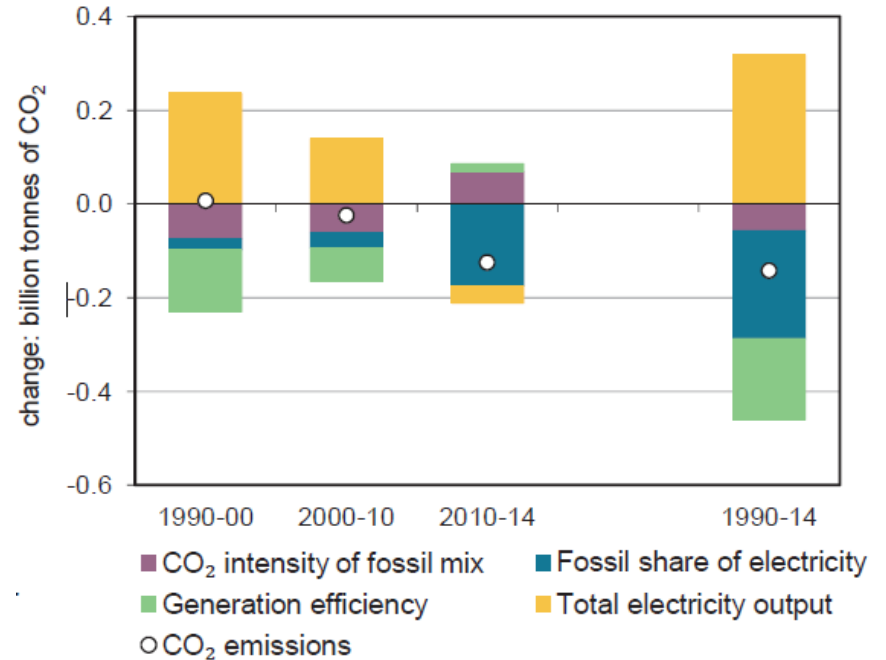
* Other includes agriculture/forestry, fishing, energy industries other than electricity and heat generation, and other emissions not specified elsewhere.

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

China, Kaya decomposition



OECD Europe, Electricity emissions



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

- 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 CO₂ emissions 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.

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

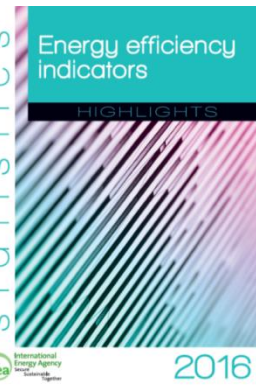


A condensed, *Highlights edition* can be downloaded for free from:
<http://www.iea.org/statistics/topics/CO2emissions>

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>



CO ₂ emissions: Sectoral Approach	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050	
Annex A countries	14 980	14 772	15 524	15 640	15 576	16 574	17 112	17 450	18 206	18 652	17 919	17 725	18 128	18 586	19 029	19 529	20 028	20 528	21 028	21 528	22 028	22 528	23 028	23 528	24 028
Annex B Parties	4 627	4 607	4 646	4 684	4 722	4 760	4 798	4 836	4 874	4 912	4 950	4 988	5 026	5 064	5 102	5 140	5 178	5 216	5 254	5 292	5 330	5 368	5 406	5 444	5 482
Non-Annex B Parties	10 353	10 165	10 878	10 956	10 854	11 814	12 314	12 652	13 332	13 702	12 969	12 737	13 102	13 522	13 927	13 889	14 850	15 312	15 732	16 236	16 736	17 236	17 736	18 236	18 736
Annex A & B Parties	15 000	14 772	15 524	15 640	15 576	16 574	17 112	17 450	18 206	18 652	17 919	17 725	18 128	18 586	19 029	19 529	20 028	20 528	21 028	21 528	22 028	22 528	23 028	23 528	24 028
Annex B Parties	4 627	4 607	4 646	4 684	4 722	4 760	4 798	4 836	4 874	4 912	4 950	4 988	5 026	5 064	5 102	5 140	5 178	5 216	5 254	5 292	5 330	5 368	5 406	5 444	5 482
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Annex A & B Parties	15 000	14 772	15 524	15 640	15 576	16 574	17 112	17 450	18 206	18 652	17 919	17 725	18 128	18 586	19 029	19 529	20 028	20 528	21 028	21 528	22 028	22 528	23 028	23 528	24 028
OECD Total	9 270	9 266	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330
Non-OECD Total	4 264	4 446	4 728	4 546	4 228	5 424	5 624	5 624	6 406	6 722	6 029	6 029	6 722	7 029	7 429	7 607	7 607	7 607	7 607	7 607	7 607	7 607	7 607	7 607	7 607
Non-Annex B Parties	148	137	166	178	172	172	168	166	166	201	206	206	206	206	206	211	222	224	224	224	224	224	224	224	224
International aviation & shipping	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
International aviation & shipping	148	137	166	178	172	172	168	166	166	201	206	206	206	206	206	211	222	224	224	224	224	224	224	224	224
OECD Total	9 270	9 266	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330	9 330
Non-OECD Total	4 264	4 446	4 728	4 546	4 228	5 424	5 624	5 624	6 406	6 722	6 029	6 029	6 722	7 029	7 429	7 607	7 607	7 607	7 607	7 607	7 607	7 607	7 607	7 607	7 607
Non-Annex B Parties	148	137	166	178	172	172	168	166	166	201	206	206	206	206	206	211	222	224	224	224	224	224	224	224	224
International aviation & shipping	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
International aviation & shipping	148	137	166	178	172	172	168	166	166	201	206	206	206	206	206	211	222	224	224	224	224	224	224	224	224
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International aviation & shipping	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
International aviation & shipping	148	137	166	178	172	172	168	166	166	201	206	206	206	206	206	211	222	224	224	224	224	224	224	224	224



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