SDG Indicator 9.4.1
CO2 Emissions per unit of value added

Tier I indicator

Custodian agencies: International Energy Agency (IEA) and United Nations Industrial Development Organization (UNIDO)

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Policy context - examples

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- **SDG Target 9.4:** By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities
- **Climate policy:** reduce emissions
- **Green growth:** Increase carbon and energy productivity

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Indicator definition

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$$= \frac{CO2\ emissions\ from\ fuel\ combustion}{value\ added\ of\ associated\ economic\ activities}$$

- can be computed for the **whole economy** (total CO2 emissions/GDP) or for **specific sectors**, notably the manufacturing sector (CO2 emissions from manufacturing industries per manufacturing value added (MVA)
- CO2 emissions per unit of GDP are expressed in kilogrammes of CO2 per USD constant 2010 PPP GDP. CO2 emissions from manufacturing industries per unit of MVA are measured in kilogrammes of CO2 equivalent per unit of MVA in constant 2010 USD.

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Rationale

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- CO_2 emission accounts for around 80% of all GHG emission from the manufacturing processes
- Represents the amount of emissions from fuel combustion produced by an economic activity, per unit of economic output.
- Computed for the whole economy: Combines effects of the average carbon intensity of the energy mix; of the structure of an economy; of the average efficiency in the use of energy.
- Computed for the manufacturing sector: Measures the carbon intensity of the manufacturing economic output, and its trends result from changes in the average carbon intensity of the energy mix used, in the structure of the manufacturing sector, in the energy efficiency of production technologies in each sub-sector, and in the economic value of the various output.

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Trends (UNSD, 2015)

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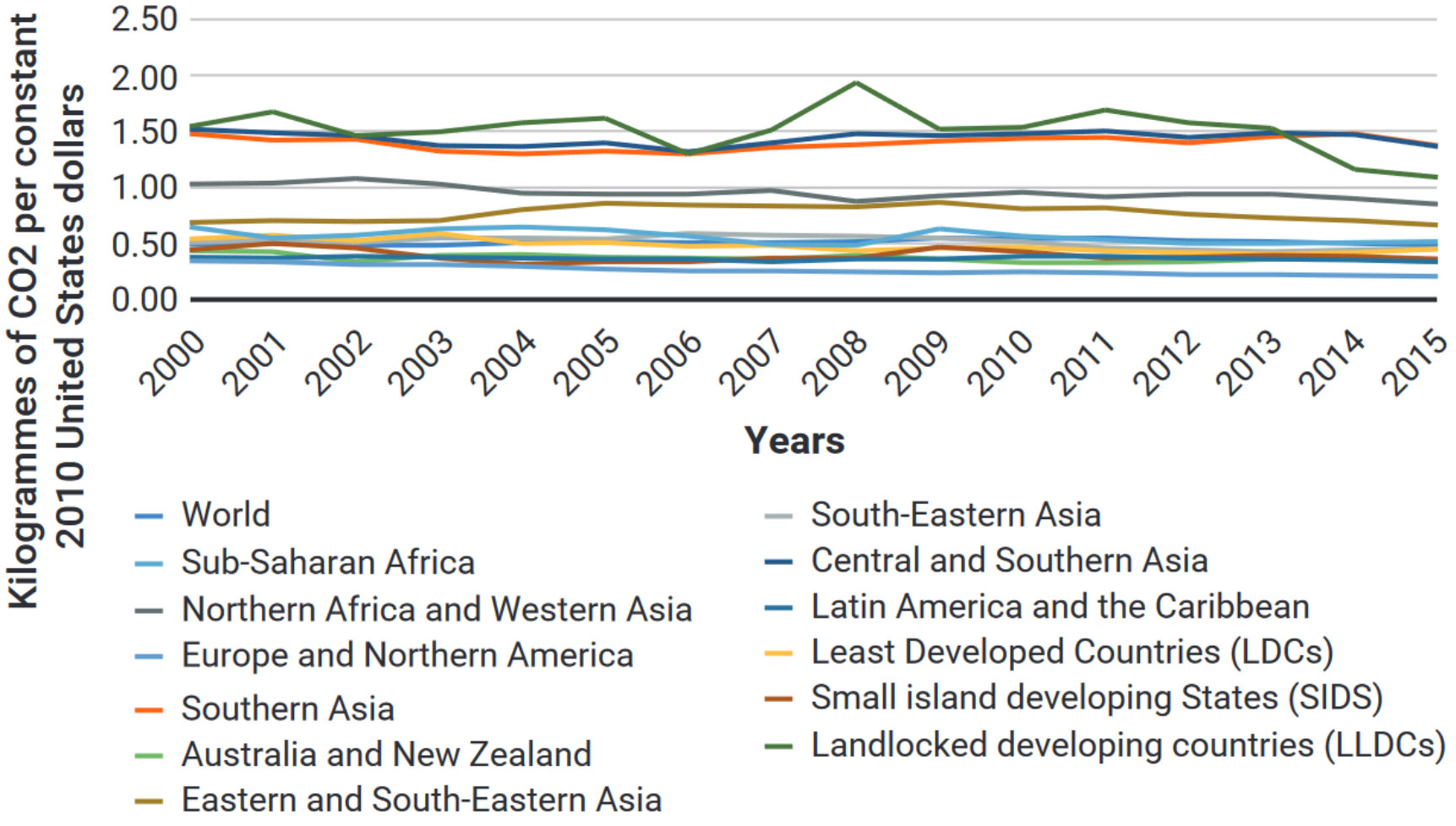

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Trends (UNSD, 2015)

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- **Global** energy intensity in manufacturing **decreased by an average annual rate of 1.3 %** between 1990 and 2014.

- The **Asia and Pacific region has dominated global manufacturing production** since 2002, covering almost half of global manufacturing production in 2016. **Eastern and South Eastern Asia had the highest consumption of energy** and produced 3.3Gt of CO2 in the manufacturing sector, accounting for **more than 50 % of manufacturing emissions** (IEA 2018). **Energy intensity fell 44 % in Central and South Asia.** India was the most energy-intensive manufacturing economy in 2014.

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Concepts

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- Total CO2 emissions for an economy are estimated based on energy consumption data for all sectors.
- CO2 emissions from manufacturing are based on energy data collected across the following subsectors (energy used for transport by industry is not included):
  - Iron and steel industry [ISIC Group 241 and Class 2431];
  - Chemical and petrochemical industry [ISIC Divisions 20 and 21] excluding petrochemical feedstocks;
  - Non-ferrous metals basic industries [ISIC Group 242 and Class 2432];
  - Non-metallic minerals such as glass, ceramic, cement, etc. [ISIC Division 23];
  - Transport equipment [ISIC Divisions 29 and 30];
  - Machinery comprises fabricated metal products, machinery and equipment other than transport equipment [ISIC Divisions 25 to 28];
  - Food and tobacco [ISIC Divisions 10 to 12];
  - Paper, pulp and printing [ISIC Divisions 17 and 18];
  - Wood and wood products (other than pulp and paper) [ISIC Division 16];
  - Textile and leather [ISIC Divisions 13 to 15];
  - Non-specified (any manufacturing industry not included above) [ISIC Divisions 22, 31 and 32].

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Data sources and standards

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- CO2 emissions estimated based on energy data and internationally agreed methodologies (IPCC Guidelines for GHG inventories)
- Energy statistics: UN International Recommendations on Energy Statistics
- System of National Accounts and ISIC:
  - gross value added is defined as output minus intermediate consumption and equals the sum of employee compensation, gross operating surplus of government and corporations, gross mixed income of unincorporated enterprises and taxes less subsidies on production and imports, except for net taxes on products.
  - Manufacturing refers to industries belonging to the sector C defined by ISIC Revision 4, or D defined by ISIC Revision 3.

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Data availability

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- Data are available for more than 130 countries, 1990 onwards with 3 years lag to the current calendar year
- Possible sources of discrepancies:
  - Energy consumption data not adequately disaggregated
  - Conversion of value data into USD
- International databases:
  - IEA database (total CO2 emissions from fuel combustion): https://www.iea.org/statistics/relateddatabases/co2emissionsfromfuelcombustion/
  - UNIDO: MVA database

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Thank you!

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