

# Global CO<sub>2</sub> emissions in 2019

Data Release: Global energy-related CO<sub>2</sub> emissions flattened in 2019 at around 33 gigatonnes (Gt), following two years of increases

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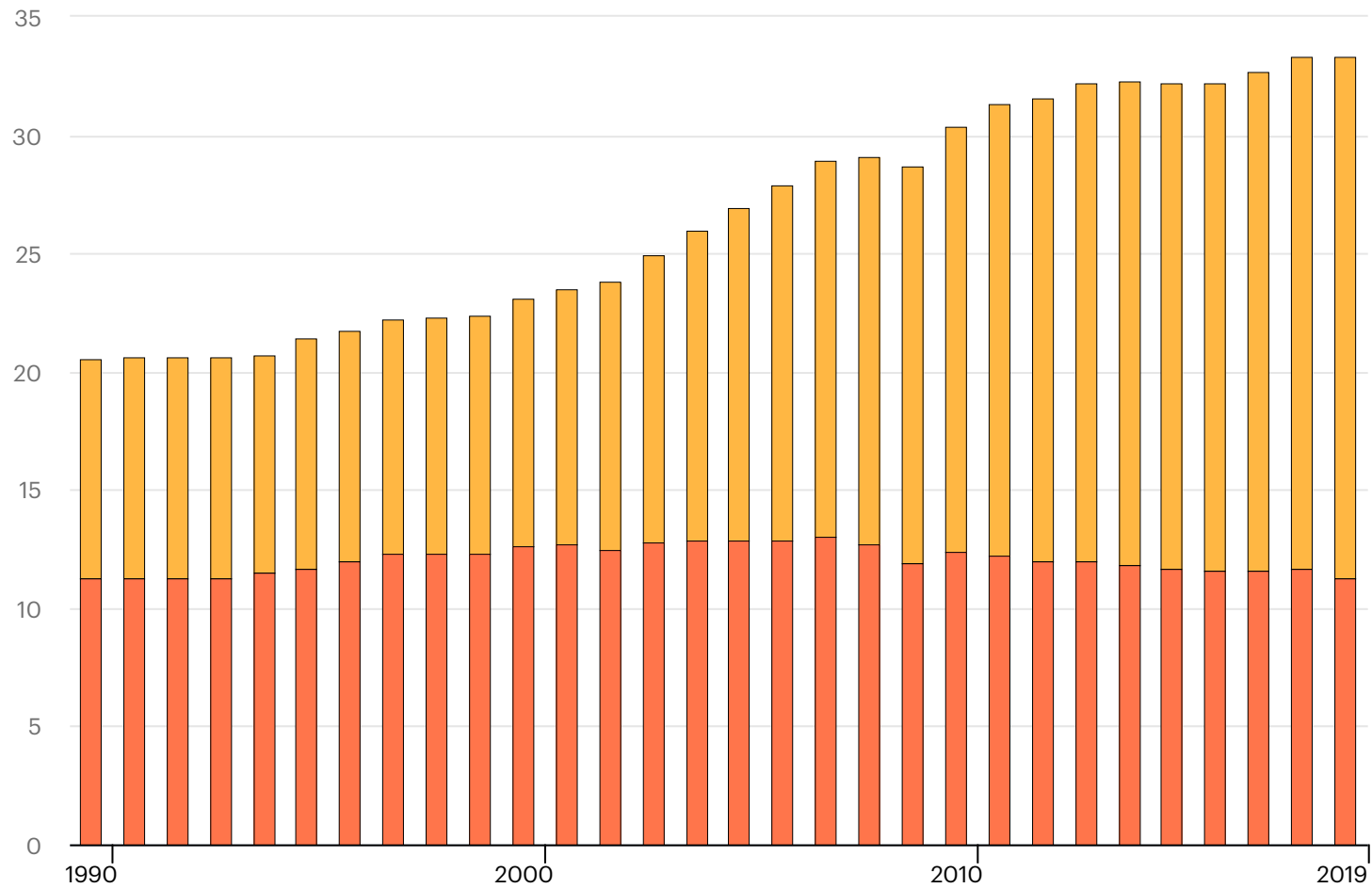
## Global emissions trends

Global energy-related CO<sub>2</sub> emissions flattened in 2019 at around 33 gigatonnes (Gt), following two years of increases. This resulted mainly from a sharp decline in CO<sub>2</sub> emissions from the power sector in advanced economies <sup>1</sup>, thanks to the expanding role of renewable sources (mainly wind and solar PV), fuel switching from coal to natural gas, and higher nuclear power output.

## Energy related CO2 emissions, 1990-2019

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Gt CO2



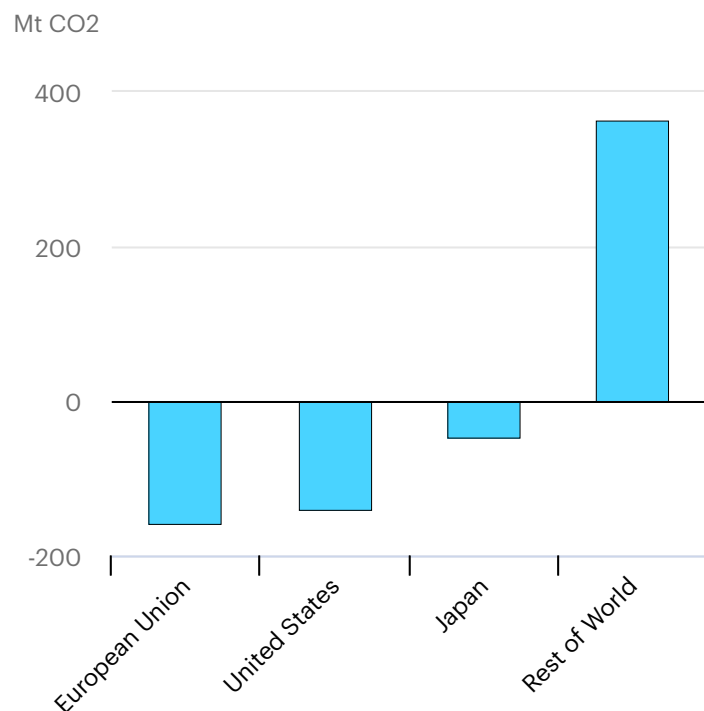
● Advanced economies ● Rest of the World

Global CO<sub>2</sub> emissions from coal use declined by almost 200 million tonnes (Mt), or 1.3%, from 2018 levels, offsetting increases in emissions from oil and natural gas. Advanced economies saw their emissions decline by over 370 Mt (or 3.2%), with the power sector responsible for 85% of the drop. Milder weather in many large economies compared with 2018 had an important effect on the trends, reducing emissions by around 150 Mt. Weaker global economic growth also played a role, moderating the increase in emissions in major emerging economies such as India.

Emissions trends for 2019 suggest clean energy transitions are underway, led by the power sector. Global power sector emissions declined by some 170 Mt, or 1.2%, with the biggest falls taking place in advanced economies where CO<sub>2</sub> emissions are now at levels not seen since the late 1980s (when electricity demand was one-third lower).

Change in energy related CO<sub>2</sub> emissions by region, 2018-2019

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## Regional trends

Economic growth in advanced economies averaged 1.7% in 2019, but total energy-related CO<sub>2</sub> emissions fell by 3.2%. The power sector led the decline and now accounts for 36% of energy-related emissions across advanced economies, down from a high of 42% in 2012. The average CO<sub>2</sub> emissions intensity of electricity generation declined

by nearly 6.5% in 2019, a rate three times faster than the average over the past decade. In absolute terms, an average emissions intensity of 340 grams of CO<sub>2</sub> per kilowatt hour in 2019 is lower than all but the most efficient gas-fired power plants.

Generation from coal-fired plants in advanced economies declined by nearly 15% as a result of continued growth of renewables, coal-to-gas fuel switching, a rise in nuclear power and weaker electricity demand. The growth of renewables in electricity generation in advanced economies delivered 130 Mt of CO<sub>2</sub> emissions savings in 2019. Wind accounted for the biggest share of the increase, with output expanding 12% from 2018 levels. Solar PV saw the fastest growth amongst renewable sources, helping to push renewables' share of total electricity generation close to 28%. Coal-to-gas fuel switching for power generation avoided 100 Mt of CO<sub>2</sub> in advanced economies and was particularly strong in the United States due to record low natural gas prices. Higher nuclear power generation in advanced economies, particularly in Japan and Korea, avoided over 50 Mt of CO<sub>2</sub>.

The **United States** saw the largest decline in energy-related CO<sub>2</sub> emissions in 2019 on a country basis – a fall of 140 Mt, or 2.9%, to 4.8 Gt. US emissions are now down almost 1 Gt from their peak in the year 2000, the largest

absolute decline by any country over that period. A 15% reduction in the use of coal for power generation underpinned the decline in overall US emissions in 2019. Coal-fired power plants faced even stronger competition from natural gas-fired generation, with benchmark gas prices an average of 45% lower than 2018 levels. As a result, gas increased its share in electricity generation to a record high of 37%. Overall electricity demand declined because demand for air-conditioning and heating was lower as a result of milder summer and winter weather.

Energy-related CO<sub>2</sub> emissions in the **European Union**, including the United Kingdom, dropped by 160 Mt, or 5%, to reach 2.9 Gt. The power sector drove the trend, with a decline of 120 Mt of CO<sub>2</sub>, or 12%, resulting from increasing renewables and switching from coal to gas. Output from the European Union's coal-fired power plants dropped by more than 25% in 2019, while gas-fired generation increased by close to 15% to overtake coal for the first time.

**Germany** spearheaded the decline in emissions in the European Union. Its emissions fell by 8% to 620 Mt of CO<sub>2</sub>, a level not seen since the 1950s, when the German economy was around 10 times smaller. The country's coal-fired power fleet saw a drop in output of more than 25% year on year as electricity demand declined and generation from renewables, especially wind (+11%),

increased. With a share of over 40%, renewables for the very first time generated more electricity in 2019 than Germany's coal-fired power stations.

The **United Kingdom** continued its strong progress with decarbonisation as output from coal-fired power plants fell to only 2% of total electricity generation. Rapid expansion of output from offshore wind, as additional projects came online in the North Sea, was a driving factor behind this decline. Renewables provided about 40% of electricity supply in the United Kingdom, with gas supplying a similar amount. The share of renewables became even higher in the later part of the year, with wind, solar PV and other sources generating more electricity than all fossil fuels combined during the third quarter.

**Japan** saw energy-related CO<sub>2</sub> emissions fall 4.3% to 1 030 Mt in 2019, the fastest pace of decline since 2009. The power sector experienced the largest drop in emissions as reactors that had recently returned to operation contributed to a 40% increase in nuclear power output. This allowed Japan to reduce electricity generation from coal-, gas- and oil-fired power plants.

Emissions outside advanced economies grew by close to 400 Mt in 2019, with almost 80% of the increase coming from Asia. In this region, coal demand continued to expand, accounting for over 50% of energy use, and is

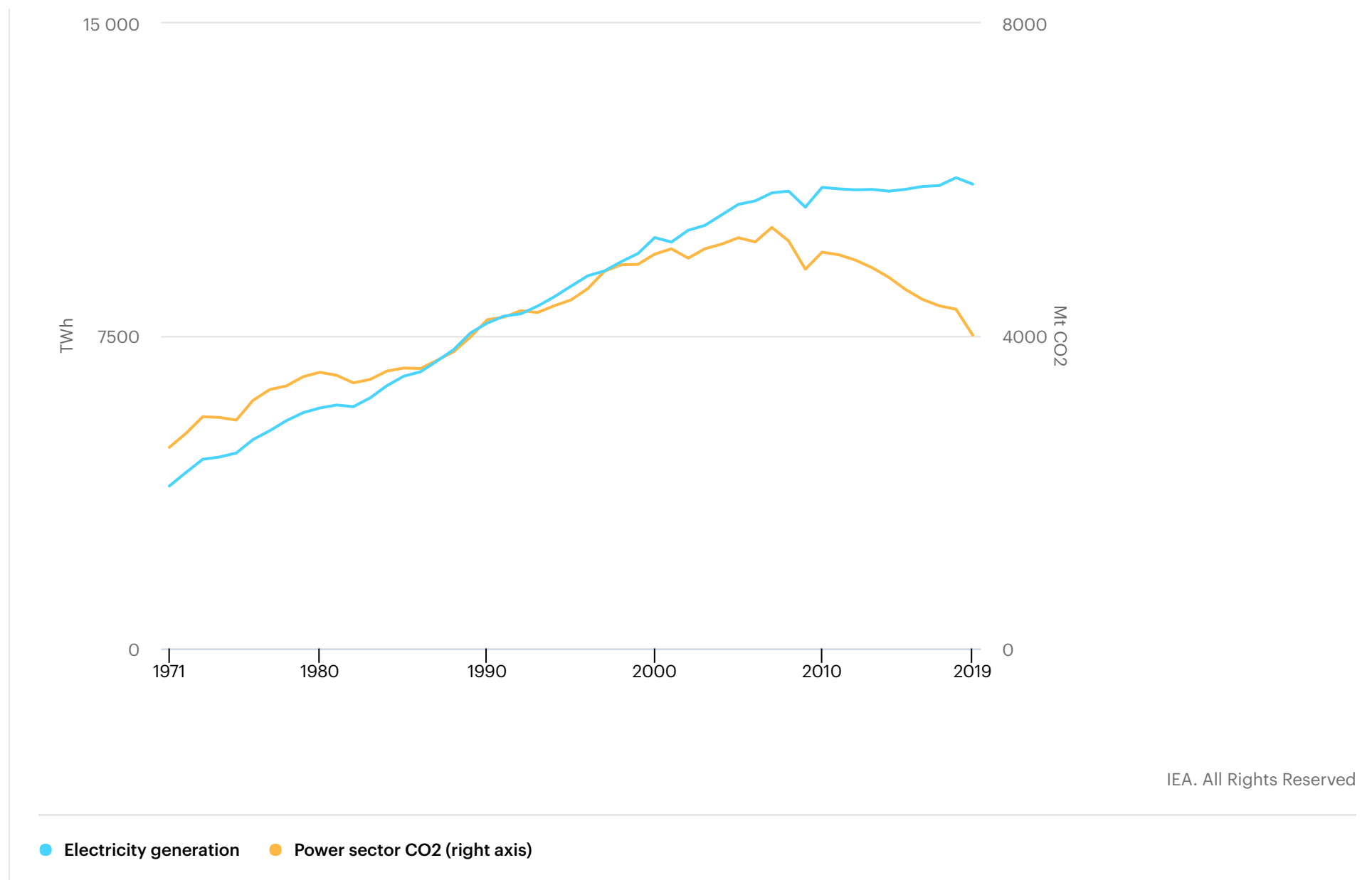
responsible for around 10 Gt of emissions. In **China**, emissions rose but were tempered by slower economic growth and higher output from low-carbon sources of electricity. Renewables continued to expand in China, and 2019 was also the first full year of operation for seven large-scale nuclear reactors in the country.

Emissions growth in **India** was moderate in 2019, with CO<sub>2</sub> emissions from the power sector declining slightly as electricity demand was broadly stable and strong renewables growth prompted coal-fired electricity generation to fall for the first time since 1973. Continued growth in fossil-fuel demand in other sectors of the Indian economy, notably transport, offset the decline in the power sector. Emissions grew strongly in Southeast Asia, lifted by robust coal demand.

Electricity generation and power sector CO2 emissions in advanced economies, 1971-2019

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### **Methodological note**

*This release is based on data for 2019 from numerous sources available as of 10 February 2020. These include the latest monthly IEA country data submissions through end-November and end-December when available; other statistical releases from national administrations around the world; and recent market data from upcoming IEA Market Report publications that cover coal, oil, natural gas, renewables and electricity.*

*Updated data for 2019, with greater disaggregation by country, will be published in mid-March.*

### **Read our press release**

**Defying expectations of a rise, global carbon dioxide emissions flatlined in 2019** ➤

## References

- 1 Advanced economies: Australia, Canada, Chile, European Union, Iceland, Israel, Japan, Korea, Mexico, Norway, New Zealand, Switzerland, Turkey, and United States.

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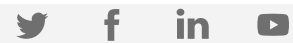
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# Analysis

## Data and statistics



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