

News & Highlights

Global CO₂ Emissions Level Off in 2019, with a Drop Predicted in 2020

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Global energy-related carbon dioxide (CO₂) emissions plateaued in 2019, at 33 Gt, according to a February 2020 report released by the International Energy Agency (IEA) [1]. This leveling off occurred against a backdrop of global economic growth of 2.9% [2]. The apparent stasis in emissions belies a multiplicity of emissions increases and reductions resulting from geographical, technological, and commercial swings. It also hides a tale of “two worlds”: a drop in emissions from advanced nations that are transitioning towards clean, renewable energy sources—primarily wind and solar—offset against the growing emissions of poorer nations that continue to increase their reliance on coal, particularly in Asia (Fig. 1) [1].

Advanced economies saw their energy-related emissions drop, with declining emissions in the power-generation sector responsible for 85% of that drop (Fig. 2) [1]. Emissions from the United States fell by 2.9% (140 Mt), mainly due to a switch from coal to gas-based power generation, with benchmark gas prices that were an average of 45% lower in 2019 than in 2018, according to the IEA report. The European Union's emissions dropped by 5% (160 Mt) overall, on the back of a 12% reduction in power-generation emissions that were also linked to coal-to-gas switching, as well as growth in renewables. In Germany, for the first time, renewables contributed more power than coal-fired generation, while in the

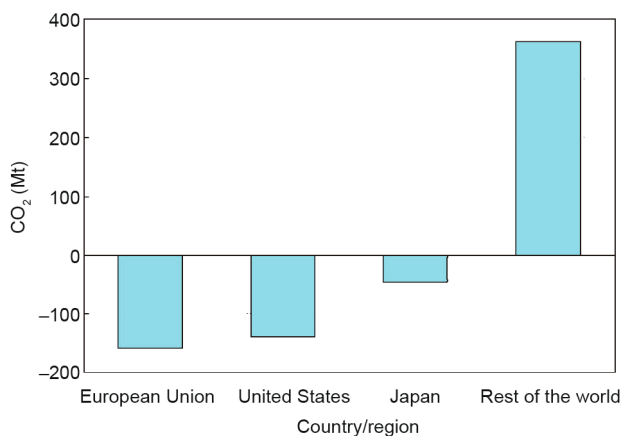


Fig. 1. A tale of “two worlds”: the energy-related CO₂ emissions of the European Union, the United States, and Japan dropped significantly in 2019, compared with 2018, but emissions in the rest of the world rose by a similar amount, resulting in a levelling off overall [1]. Credit: IEA, with permission.

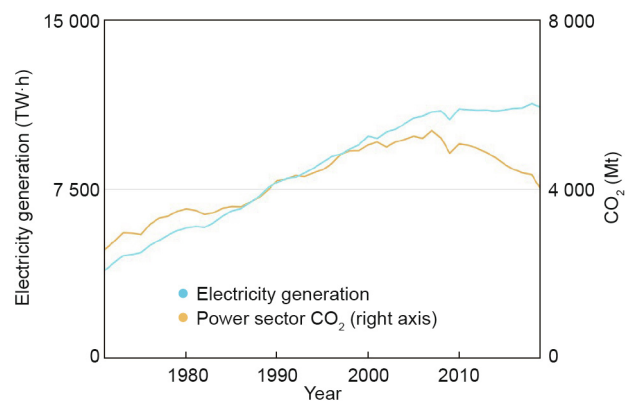


Fig. 2. While electricity generation continues to trend upwards, the amount of CO₂ emitted per terawatt hour generated has been dropping for about a decade in advanced economies (defined by the IEA as Australia, Canada, Chile, European Union, Iceland, Israel, Japan, Republic of Korea, Mexico, Norway, New Zealand, Switzerland, Turkey, and the United States). In 2019, this “emissions intensity” dropped by 6.5%—three times faster than the average over the last decade [1]. Credit: IEA, with permission.

United Kingdom, wind, solar, and other power sources beat all fossil fuels combined for several months of the year. Japan's energy-related emissions dropped by 4% (45 Mt)—its fastest decline in a decade—after nuclear reactors deactivated in the wake of the Fukushima nuclear accident in 2011 came back online [3].

“This welcome halt in emissions growth is grounds for optimism that we can tackle the climate challenge this decade,” said Fatih Birol, executive director of the IEA [4]. “It is evidence that clean energy transitions are underway—and it is also a signal that we have the opportunity to meaningfully move the needle on emissions through more ambitious policies and investments.”

Responding to this sentiment, Joeri Rogelj, lecturer in climate change and the environment at the Grantham Institute at Imperial College London and an author on various publications of the Intergovernmental Panel on Climate Change, said: “It is clear that the impressive successes in renewable energy present an opportunity to further decarbonize this sector and eliminate all CO₂ emissions from our economies. Although there is an opportunity, that does not mean we are already on track for doing it.”

Despite the plateauing of energy-related emissions, it remains difficult to be an optimist about climate change. In December 2019, the Global Carbon Project (GCP), an international academic

consortium, issued its annual report on global CO₂ emissions from all sources, including cement production and deforestation [5]. The GCP estimated 2019's total CO₂ emissions at 36.8 Gt—a 0.6% increase from 2018 and a new record high—though with an uncertainty range of –0.2%–1.5%, it is not inconsistent with the IEA finding.

In addition, 2018 was the fourth hottest year on record and saw power-sector CO₂ emissions hit an all-time high [6,7]. In 2019, the amount of atmospheric CO₂ continued its steep climb, hitting an average of 414.8 ppm (1 ppm = 1.96 mg·m⁻³ for CO₂) in May, according to Scripps Institution of Oceanography, in La Jolla, CA, USA, the highest seasonal peak in the 61 years of available observations. That is 3.5 ppm higher than the May peak of 2018, representing the second-highest annual jump on record [8].

Meeting the climate targets of the Paris Agreement—keeping global warming well below 2°C and targeting 1.5°C above pre-industrial levels—will now require a phenomenal global effort [9]. A synthesis of all ten editions of the United Nations Environment Programme's Emissions Gap Report—an annual analysis of the “gap” between what individual countries have pledged for reducing their emissions and what is collectively needed to meet temperature goals—has revealed that the gap is as much as four times bigger than it was in 2010 [10]. In the synthesis, published in March in the journal *Nature*, the authors—a distinguished group that includes Rogelj—write that individual countries' commitments on climate are “woefully inadequate” and that the “gap is so huge that governments, the private sector and communities need to switch into crisis mode, make their climate pledges more ambitious and focus on early and aggressive action. Otherwise, the Paris Agreement's long-term goals are out of reach.”

Now, however, 2020 has brought with it a new global crisis which is having sharp short-term reductive effects on global emissions. “With the COVID-19 pandemic, the use of oil in transport is dramatically reduced, at least temporarily. The way road transport will be transformed by this crisis will potentially have a big impact on the course of global CO₂ emissions,” said Corinne Le Quéré, co-author of the GCP report and a Royal Society research professor of climate change science at the University of East Anglia in Norwich, England.

In a paper recently published in *Nature Climate Change* (May 2020), Le Quéré and colleagues estimated that daily global CO₂ emissions had decreased by about 17% by early April 2020, compared with 2019 levels, with changes in surface transport responsible for just under half of this decrease [11]. The team predicts the annual drop in emissions in 2020 compared to 2019 will be 4%–7%, depending on how long it takes national economies to return to pre-pandemic conditions. The authors additionally note that this decrease is of a similar magnitude to the year-on-year decrease that would be required through long-term structural change, for

decades, to limit climate change to a warming of 1.5 °C. The IEA, meanwhile, predicts the pandemic will result in a record annual decline in CO₂ emissions of almost 8% [12].

“The COVID-19 crisis shows that we fail to take global systemic risks seriously and that we are unprepared to face large-scale crises,” said Le Quéré. “The response to the COVID-19 crisis should be shaped in a way that makes us resilient to future crises. This means reducing our vulnerabilities by preparing better, for example by adapting to ongoing climate change. It also means reducing the risks themselves, by cutting our carbon emissions until they reach net zero.”

Rogelj echoes this idea: “Governments are putting in place large stimulus measures to counteract the economic downturn created by the COVID-19 pandemic. These recovery plans provide an opportunity to take society in a more sustainable direction, in which we tackle the other large global crisis that science is sure about—the climate crisis.”

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