

# Are global CO<sub>2</sub> emissions rebounding to pre-COVID-19 levels?

November 10 2021, by Lois Yoksoulian

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The annual Carbon Budget Project report found that among other trends, global fossil carbon dioxide emissions in 2021 are set to rebound close to their pre-COVID-19 levels, says Illinois atmospheric sciences professor and report co-author Atul Jain. Credit: L. Brian Stauffer

The Global Carbon Project recently published its 2021 Global Carbon

Budget [report](#), providing data on atmospheric carbon concentrations, emissions and trends. University of Illinois Urban-Champaign atmospheric sciences professor Atul Jain was part of an international team of scientists that contributed data to the report. Jain discussed the carbon budget and this year's findings with News Bureau physical sciences editor Lois Yoksoulian.

## **What did the 2021 carbon budget reveal about carbon emissions, and how do they now compare with pre-COVID-19 levels?**

The most interesting but not so encouraging finding of this year's budget is that the global fossil [carbon](#) dioxide emissions in 2021 are set to rebound close to their pre-COVID-19 levels. In 2020, the fossil emissions dropped by 5.4 percent from the 2019 level. This year, emissions increased by 4.9 percent to a global total of 36 billion tons. However, these global emissions are projected to be about 0.8 percent below the 2019 level.

This rebound is somewhat expected. Such unusual events have also occurred in the past, such as the global financial crisis of 2008–09. But then, global emissions jumped in 2010 by 5.5 percent above 2009 levels. The 2020–21 emissions dip and recovery varied by country and region.

Emissions for China, the largest polluter, are projected to rise by 4 percent in 2021 on top of the 2020 rise of 1.4 percent. U.S. and European Union emissions are projected to rise about the same amount of 7.6 percent in 2021, following a fall of about 10.6 percent for the U.S. and 10.9 percent for the 27-nation EU in 2020.

Emissions for the fourth-largest polluter, India, are projected to rise by 12.6 percent in 2021, following a fall of 7.3 percent in 2020.

## **What is decarbonization, and what is the decarbonization trend of energy at a regional and global scale?**

Decarbonization is a process that controls emissions of CO<sub>2</sub> using low or zero carbon-intensive fuels—for example, controlling CO<sub>2</sub> as a result of transport or electricity generation. One way decarbonization can be accomplished is by shifting from high carbon-intensive coal to low carbon-intensive natural gas or using carbon-free [energy](#) sources, such as wind, solar and nuclear. By the way, coal emits roughly twice the carbon as natural gas on a per-unit basis.

This year, decarbonization of energy was not enough to overcome the growing energy demand, which has so far been fulfilled by fossil energy sources in many countries—despite renewables' continuing growth of greater than 10 percent per year over the past five years. Emissions from coal and natural gas in 2021 are projected to be higher by 1 percent and 2 percent, respectively, than the 2019 level. This increase is mainly because of the [economic growth](#) in China and India, which get most of the energy to run their power and industrial sectors from coal-fired power plants.

Only CO<sub>2</sub> emissions from oil remain well below 2019 levels in 2021. The emissions from the transportation sector are still below their 2019 level. However, they are also approaching the 2019 level, but at a slower rate. It gives me the impression that the countries didn't care much about climate change and its impact, and most of the countries used the dirtiest fossil fuel source to kickstart their economy.

## **Carbon dioxide net emissions from land-use changes are part of the budget equation. What was their**

## **contribution to the total carbon budget?**

Data from land-use change is one bright spot in the carbon budget, suggesting that the net CO<sub>2</sub> emissions—the difference between gross emissions and gross removals—have been declining since the 2010s.

Over the past decade, CO<sub>2</sub> emissions from land-use changes, such as deforestation, emitted about 14.1 billion tons of CO<sub>2</sub> per year. The gross amount of CO<sub>2</sub> removed was about 9.9 billion tons CO<sub>2</sub> per year. So, the global CO<sub>2</sub> net emissions from land-use change were 4.1 billion tons per year. The report results show that net land-use emissions in 2020 declined to 3.2 billion tons CO<sub>2</sub>, with a projected 2.9 billion tons CO<sub>2</sub> in 2021. This decline results from reduced deforestation in some tropical countries and enhanced CO<sub>2</sub> sequestration due to the regrowth of forests and soil recovery after agricultural abandonment and wood harvesting.

### **What does the report suggest about future projections of CO<sub>2</sub> emissions and concentrations? Are there ways to control those emissions to accomplish the Paris climate agreement?**

The report does not make projections for future emissions. However, I suspect that CO<sub>2</sub> emissions from fossil energy sources will continue to rise to meet growing energy demand, despite some countries' high deployment of renewables.

Carbon dioxide emissions from the transportation sector will return to pre-pandemic levels in 2022 as travel resumes, and coal consumption will further increase as more economies reopen.

The International Energy Agency projections suggest that global energy demand will increase by 4 percent in 2022. Electricity generation from renewables will also increase by more than 6 percent next year.

However, renewables are only able to fulfill half of the projected global

energy demand. At the same time, climate change reduced the global land carbon sink by about 15 percent and the ocean carbon sink by about 5 percent during 2011–2020. We expect climate change in the future will further reduce the carbon-storage capacity of land and oceans, suggesting that further accelerating the rate of increase of atmospheric CO<sub>2</sub> concentrations.

Meeting the Paris climate agreement goal would require cutting total CO<sub>2</sub> emissions by 1.4 billion tons CO<sub>2</sub> each year on average, reaching net-zero emissions by 2050. While a good amount of progress has already been made to decarbonize the primary energy use since the Paris agreement was adopted in 2015, there is an urgent need for the new investment and strong climate policy now. Rapid adoption could produce technological options that can allow both climate mitigation and green economic development, in addition to efforts to reduce end-use energy demand much more systematically, all within the next decade.

## **What do you hope to see come out of the Glasgow Climate Change Conference, also known as the COP 26?**

Emissions fell by 1.9 billion tons in 2020. So, the countries must cut emissions every year by an amount comparable to that seen during the COVID-19 pandemic, highlighting the scale of the needed action and hence the importance of the COP 26.

Accomplishing the Paris agreement is somewhat challenging but still possible if the countries have the political will to mitigate their greenhouse gas emissions. Failure to limit the global temperature increase to 1.5 degrees Celsius will pose one of the greatest threats to societies. The threat of economic instability, rapidly increasing population and climatic impacts will lead to a rising tide of

refugees—affecting all nations in one way or another. Therefore, nations do not have any other options but to change political and socioeconomic conditions to curb [climate change](#). I expect at COP 26 all nations, developed and developing, will accept their fair share of responsibility and exert the necessary self-restraint.

Provided by University of Illinois at Urbana-Champaign

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