

## Current and future global climate impacts resulting from COVID19

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The COVID19 pandemic led to rapidly imposed lockdowns across much of the industrialised world, and as such global emissions of greenhouse gases and air pollution were much reduced in the first half of 2020 compared to recent years. Using newly available bottom-up mobility data provided by Google and Apple covering 123 countries and 99% of global emissions, we can corroborate top-down estimates of emissions from satellites and air quality station data, improving our confidence on the magnitude of emissions reductions. The largest reductions in emissions were from the transport, commercial and industrial sectors, confirming the affect that lockdown had on personal movement and economic activity.

There is a “tug-of-war” between greenhouse gases, which are long-lived and warming, and air pollution, which is short-lived and cooling. Air pollutants are often co-emitted with CO<sub>2</sub> as products of incomplete combustion. Owing to these opposing effects, the climate impact of global lockdowns over the short term is negligible: about a 0.01 °C reduction compared to a no-COVID counterfactual. These global temperature impacts were determined using a simple climate model that is set up to emulate the global-mean temperature responses of state-of-the-art Earth System Models such as those developed by the Met Office. The small climate impact of a temporary COVID19 emissions reduction also plays out into the medium term due to climate system inertia, in which changes in radiative forcing do not translate instantaneously into global temperature response, and because carbon dioxide emissions, the main driver of warming, are only slightly reduced. Although CO<sub>2</sub> emissions were down about 25% in April at the height of lockdown, the 2020 total emissions are expected to be only 4-8% lower than would have been projected without COVID, at a level comparable to 2012.

We argue that as devastating as COVID19 has been, it can act as a springboard for sustained emissions mitigation. Homeworking and the associated reduction in business travel has proven to be more successful than first thought. Improved urban air quality, the elimination of stressful commutes, and the return of nature has had a positive impact on health and wellbeing, offsetting some of the negativity of social isolation. The long-term success of our response to COVID19 will depend on the pathways of economic and social recovery that we take out of the crisis. We analyse several different recovery pathways, ranging from a green recovery in which emissions reductions kickstarted due to the crisis are sustained and “well-below 2 °C” Paris Agreement targets are met, through to a fossil-fuel driven economic rebound in which emissions growth is overshoot compared to pre-COVID trends, such was the case following the global financial crisis.

Note: this talk is based on the paper by PM Forster et al., <https://www.nature.com/articles/s41558-020-0883-0>, which has several authors.