

Carbon emissions: Our research shows a decade of steady decline across Europe and the US

February 26 2019, by Charlie Wilson



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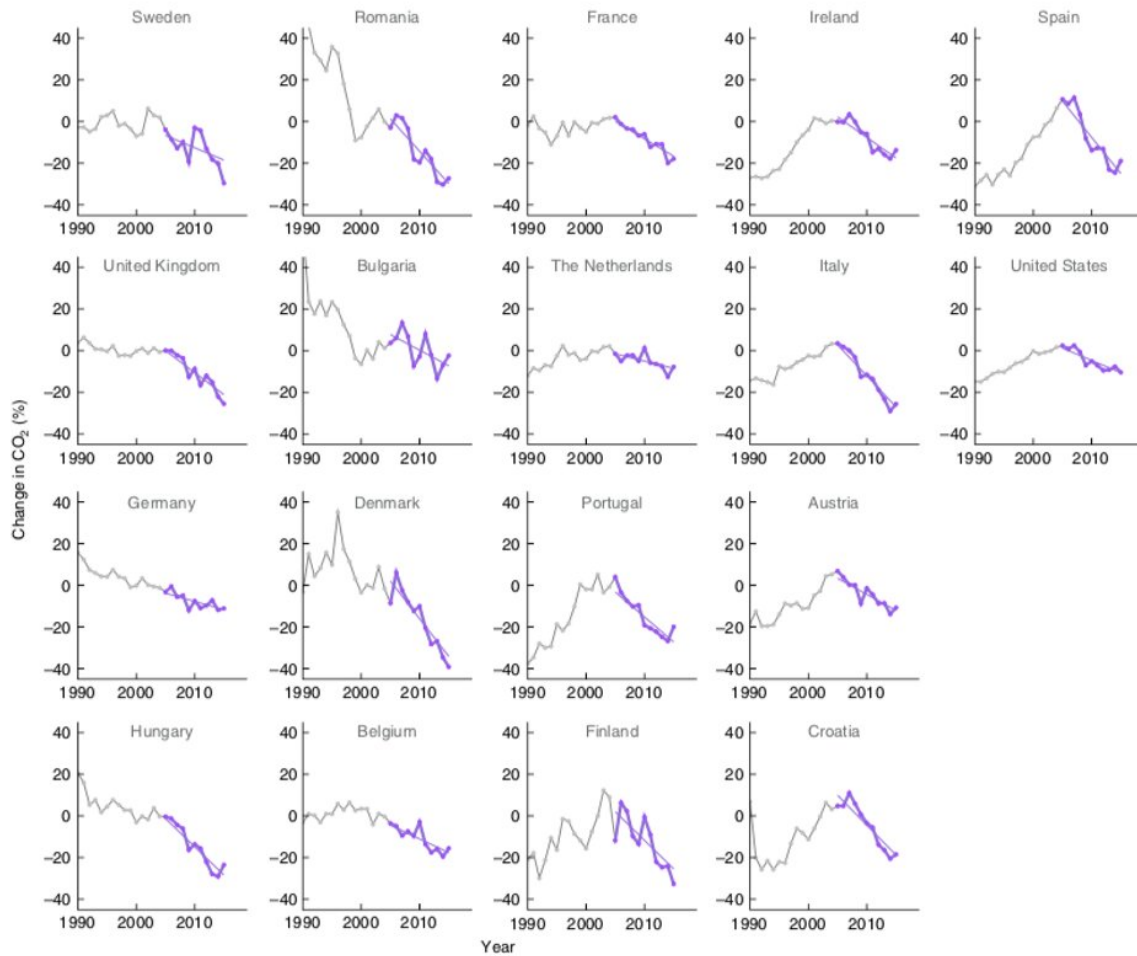
A sliver of hope against a backdrop of gloom: 18 countries showed a sustained decline in their carbon emissions from fossil fuel use over the past decade. This trend, averaging 2.2 percent a year over the period 2005-2015, is evident in less than 10 percent of the world's countries,

mostly in the EU, but accounts for 28 percent of global emissions.

Our [new research](#) published in *Nature Climate Change* explains why these 18 countries have downward emission trends. This work involved an international team of researchers led by Corinne Le Quéré from the Global Carbon Project and the Tyndall Centre at the University of East Anglia.

We found that part of the answer was country specific. For instance, in the US, a fracking boom meant coal was replaced by gas, while Eastern European states joined the EU and cleaned up their inefficient infrastructure. However, there are three common elements shared across these distinct national histories: the declining relevance of fossil fuels, a fall in [energy demand](#), and strong national [policy](#) frameworks.

We began by unpicking the drivers of falling CO₂ emissions in the sample of 18 "peak-and-decline" countries. We looked at four factors: lower [energy](#) use, such as more efficient vehicles, appliances or homes; lower share of fossil fuels in [energy generation](#), thanks to new renewable or [nuclear power](#); improved fossil fuel utilisation rate, for instance through leaking less electricity from cables or overhead lines; and lower carbon-intensity of fossil fuels, typically caused by switching from coal to gas.

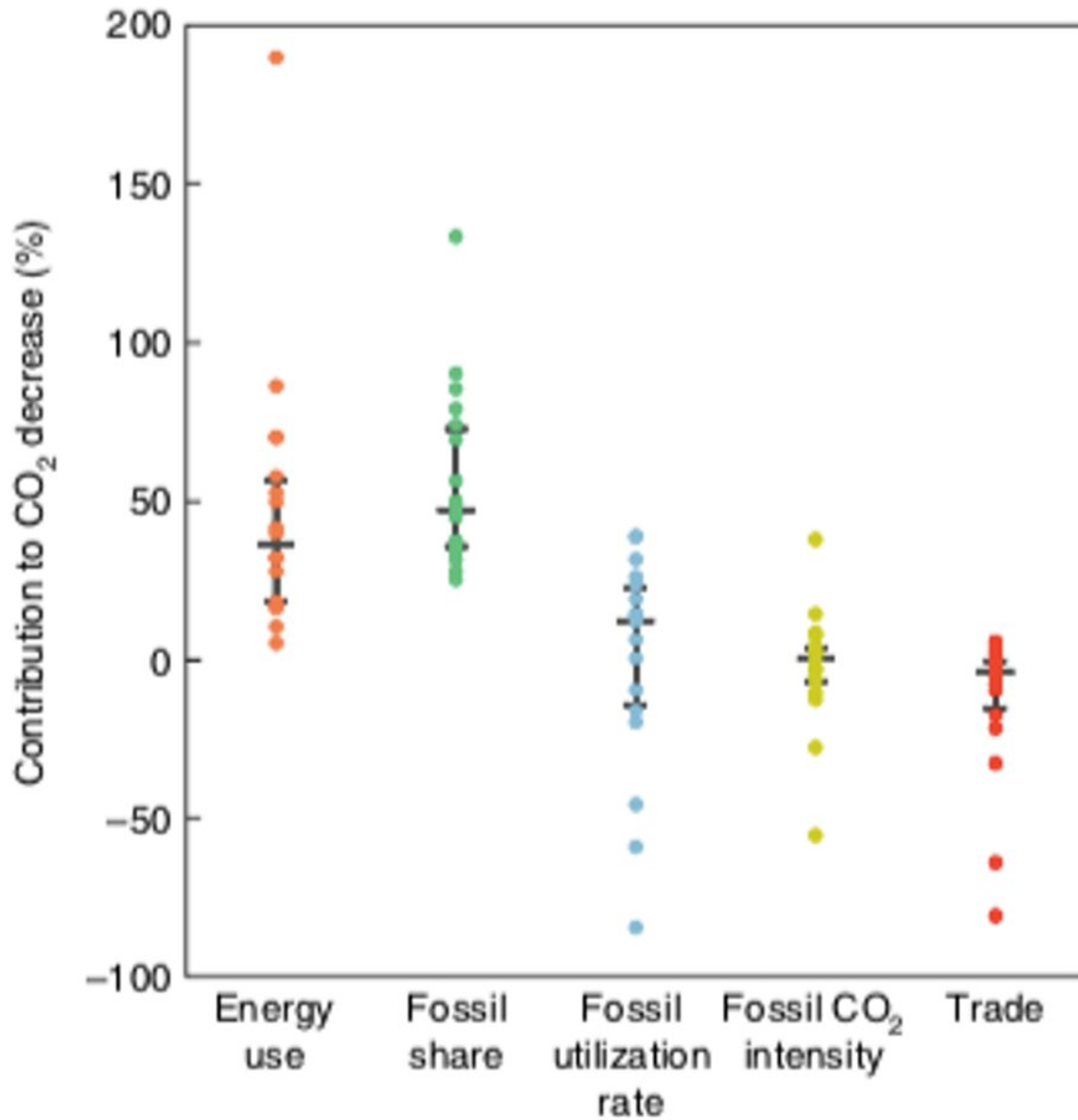


Declining carbon emissions from fossil fuels in 18 ‘peak-and-decline’ countries.
 Credit: [Le Quéré et al/Nature Climate Change, CC BY-SA](#)

We found that a declining share of fossil fuels was responsible for about half of the fall in emissions, with a further third attributable to a decrease in energy use. The relative emphasis of these two factors varied across countries. Whereas Austria, Finland and Sweden relied more heavily on decarbonising their energy mix, Ireland, the Netherlands and the UK saw a stronger effect from reducing energy consumption. In general, though, both factors were important across the board.

To check our claims were robust, we examined two other factors that may have influenced the results. The first was the global financial crisis, which we found did cause a slowdown in [economic growth](#) in the peak-and-decline countries, enough to partly explain some of the decline in energy use. Next was the well-documented effect of consumption in developed economies driving up emissions in industrialising economies – are Europeans who buy clothes or TVs made in China simply "outsourcing" their emissions? In our 18 peak-and-decline countries we found this process had slowed and largely ended prior to 2005, so had no significant effect on our results.

Next, we tested whether falling [carbon emissions](#) in our 18 countries were associated with policies. We collected data on the numbers of energy efficiency, renewable energy, and climate policies (including frameworks and targets) adopted in law per country during the 2005-2015 study period. In each case, we found that these policy count statistics were strongly and significantly correlated with corresponding energy or emission trends.



How much various factors contributed to the decrease in CO₂ emissions. Each dot represents one of the 18 countries. Credit: [Le Quere et al / Nature CC](#), Author provided

To understand whether these findings were unique to the peak-and-decline countries rather than part of a more general phenomena, we

repeated our analysis for two "controls": a group of 31 countries with rising emissions and slow economic growth (such as Japan, Brazil and South Africa), and a group of 30 countries with rising emissions and fast economic growth (such as Turkey, India, and China).

As expected, we found that none of the policy variables in the control group countries were significantly correlated with energy and emissions trends.

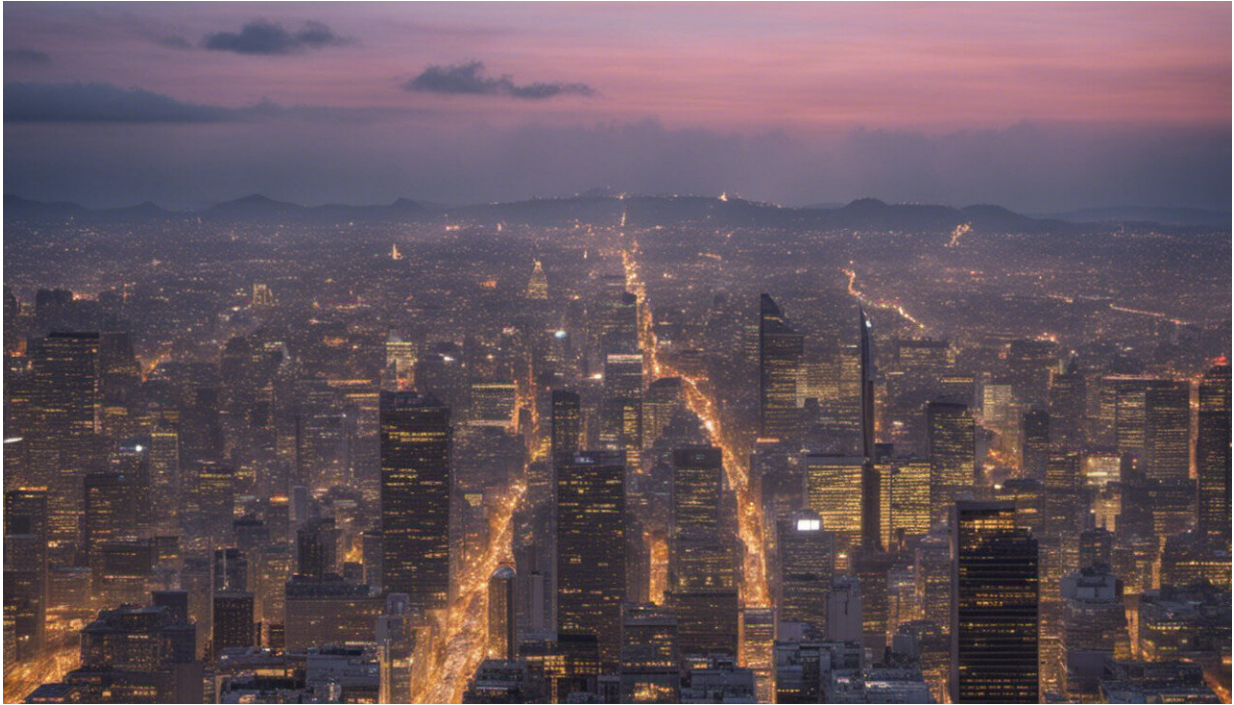
Correlation is not causation. We cannot claim that national climate policies are directly responsible for falling emissions. And counting policies does not account for their stringency, enforcement, and credibility, all of which are important.



Credit: Marcin Jozwiak from Pexels

However, there is some precedent in the literature for using count statistics to assess the effect of policy on [emission](#) reductions both in [Europe](#) and the [US](#). Our findings are also consistent with [political science](#), [innovation studies](#), and [energy assessments](#), which repeatedly emphasise the importance of stable policy environments for low-carbon innovation and clean energy deployment.

Another important takeaway from our research is the importance of energy use. Renewables, nuclear, fracking, coal, and carbon capture and storage tend to hog the headlines as well as the [attention of policymakers](#). But our analysis found that even double digit growth rates for renewables did not make a dent in rising emissions in those countries with rapidly expanding energy systems dominated by fossil fuels as new solar panels or wind turbines were simply being added at the margins. In contrast, [downsizing the entire energy system](#) by reducing demand makes the whole process of decarbonisation much more manageable.



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