

quora.com Aaron Brown's answer

Is it true that there is not a single scientific paper that has proven that carbon dioxide emissions are causing climate change?

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I don't care much for the answers so far, as most of them focus narrowly on the word "proven," or launch into general essays about climate change. My advice to anyone with questions about climate is to read the [Intergovernmental Panel on Climate Change](#) report. I don't claim it's a perfect document, but it's far better than the filtered versions you get in other sources and you can generally tell when an editor leans a bit to overcaution or speculation. Any intelligent person can read and understand it. It's nowhere near as certain as some partisans believe, in fact significant sections would be labeled "denialism."

The IPCC report is the closest thing we have to a "single scientific paper" that covers the entire issue. It's single (well, there are five of them and they're working on the sixth, but the most recent one is single), scientific (everyone involved is a scientist), just a report that summarizes thousands of papers, not a paper.

My other advice is to use your brain. You don't need to be a professional climate scientist to figure out what people can reasonably know.

- Carbon dioxide emissions have increased significantly. No one could possibly identify and measure all sources of carbon dioxide. The evidence for increase is based on assumptions and cobbling together of data of differing type and reliability. Nevertheless, the amount of increase from 1960 to 2010 is so large that the fact of very significant increase is clear. Since 2010 the amount of increase is small enough to allow reasonable doubt of continuing increase, although the weight of the evidence seems to be for slowing increase rather than plateau or decline.
- Atmospheric concentrations of carbon dioxide have increased significantly. No one can directly measure the total amount of CO₂ in the atmosphere, so this is based on sampling at various locations using different methods. Again there is large uncertainty in the data, but the increase since 1960 is much larger than the uncertainty. There are some suggestions that the increase is slowing, but the best guess is that it is continuing at roughly the same rate as the last few decades. Anyway, it's not declining.
- Carbon dioxide emissions have many effects on the environment, some known, some unknown; some measurable, some not. They affect atmosphere, oceans, plants, erosion and lots of other stuff, all of which interacts in complicated ways with other stuff. So there's no certainty that increased emissions are causing increased atmospheric concentrations. On the other hand (a) it's a reasonable first assumption, (b) the other plausible mechanisms have been investigated and discounted and (c) it doesn't matter for policy since we know CO₂ emissions can have large environmental effects, and we know atmospheric CO₂ concentrations can have large environmental effects so what would we do differently if they're one big issue or two big issues? Even if we knew CO₂ emissions were unrelated to atmospheric CO₂ concentrations, it would be safer to reduce emissions than to increase them.
- The simple "greenhouse" explanation for atmospheric CO₂ concentrations causing the observed warming has been known to be false since its original proposal in 1896. It's obvious if you think about it. It would argue that local temperatures should be higher in places with high CO₂ concentration, when in fact local CO₂ concentrations are uncorrelated with local temperatures. It would say the effect should be strongest where there is the most sunlight—at the equator versus the arctic regions, and during the day versus at night. The opposites are true. Atmospheric CO₂ concentrations have increased steadily, while temperature has oscillated up and down, just with more warming than cooling. There is no simple direct mechanism that relates the measured increase in atmospheric CO₂ to the measured increases in temperature. There are many complex effects, some measured, some modeled; but no convincing evidence that the overall effect of higher atmospheric CO₂ concentrations has caused the observed warming. On the other hand, (a) other plausible explanations for warming have been investigated and discounted, and (b) it doesn't matter for policy whether we have one problem or two.

So where does that leave us? We have no proof that CO₂ emissions caused global warming, but it is a simple and plausible guess. Some of the links are supported better than others, but none of the links have significant evidence against them, nor likely alternative explanations. And given all the other things that

CO2 emissions definitely do, there are good policy reasons to reduce them even if they're unrelated to atmospheric levels of CO2 or if atmospheric levels of CO2 are not responsible for warming.

The harder issues are policy ones. Legislation to reduce CO2 emissions to date has probably increased emissions due to moving activities to less regulated jurisdictions, lowering the price of fossil fuels, subsidizing "green" energy, provisions inserted to help cronies rather than improve the environment, and corruption in enforcement. The next problem is even if legislation did reduce CO2 emissions, it would send technology, the economy and society down a new path, with unknown impact on the total human environmental footprint. Even if we knew the footprint, we couldn't predict the effect on climate; and even if we knew the climate, we couldn't measure (or even define) the total impact on human welfare.

My personal conclusion is the best policy is a tax on total energy use. I think it's a much better proxy for total environmental footprint than CO2 emissions are. Single-minded focus on CO2 could lead to bigger emission problems. Moreover the actual proposals to tax or regulate CO2 are extremely complex and expensive to enforce; which I suspect means they will be ineffective and unfair. A straight energy tax can be relatively simple and cheap to administer. And while taxing energy use does slow economic growth, it makes a lot more sense to tax things we want less of—like environmental impact—rather than things we want more of—like income, wealth, jobs and economic activity.

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