Model developed to measure China's share of global warming

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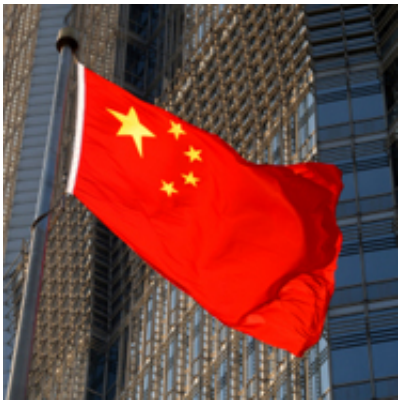

(Phys.org)—A large team of researchers from China and France has developed a model meant to show the degree to which China has contributed to global warming over the past two and a half centuries. In their paper published in the journal *Nature*, the group describes all the factors that went into the model, what it showed and offer their estimate of China's overall impact on global warming. Dominick Spracklen with the University of Leeds in the U.K. offers a News & Views piece on the work done by the team in the same journal issue and further explains the difficulty in not just pinning down the overall impact of a single country but also the problems inherent in trying to mitigate them.

China has a different environmental history regarding global warming

than most western countries due to its population history. Centuries ago, before the industrial revolution began, China had a very large number of people heating homes and buildings with coal, and because of the huge numbers of people involved, actually began contributing to our current greenhouse gas problem before countries in the west began burning coal and gasoline in large enough amounts to start their own large scale emission problems. China also currently has serious problems with other types of pollutants such as aerosols that lead to smog and contribute to widespread lung disease—but that also tend to cool the planet. In this new effort, the researchers gathered and used both relatively current data and data going back to approximately 1750 to attempt to assess China's contribution to global warming.

The model, as expected, offered mixed messages. The first was a rough estimate that China is responsible for approximately ten percent of global warming, due to its emissions of carbon dioxide and other gases from burning fossil fuels—and that its carbon footprint has remained "remarkably" stable over the time period studied, due mainly to the large amount of burning that occurred centuries ago and the deforestation that took place to make room for farmland. The model also showed another problem, that China's current program to reduce air pollution could wind up leading to an increase in global warming, because it involves removing aerosols that are currently causing cooling.

The model also highlights the difficulty in quantifying individual components involved in greenhouse gas emissions and overall for global warming—as Spracklen notes, even commendable acts sometimes do not work out as planned, noting that tree reforestation efforts in Europe, for example, have not produced the predicted results because the fast growing trees used do not store as much carbon as natural trees and they also absorb more sunlight.

More information: The contribution of China's emissions to global

climate forcing, *Nature* 531, 357–361 (17 March 2016) DOI: 10.1038/nature17165

Abstract

Knowledge of the contribution that individual countries have made to global radiative forcing is important to the implementation of the agreement on "common but differentiated responsibilities" reached by the United Nations Framework Convention on Climate Change. Over the past three decades, China has experienced rapid economic development, accompanied by increased emission of greenhouse gases, ozone precursors and aerosols, but the magnitude of the associated radiative forcing has remained unclear. Here we use a global coupled biogeochemistry–climate model and a chemistry and transport model6 to quantify China's present-day contribution to global radiative forcing due to well-mixed greenhouse gases, short-lived atmospheric climate forcers and land-use-induced regional surface albedo changes. We find that China contributes 10% ± 4% of the current global radiative forcing. China's relative contribution to the positive (warming) component of global radiative forcing, mainly induced by well-mixed greenhouse gases and black carbon aerosols, is 12% ± 2%. Its relative contribution to the negative (cooling) component is 15% ± 6%, dominated by the effect of sulfate and nitrate aerosols. China's strongest contributions are 0.16 ± 0.02 watts per square metre for CO2 from fossil fuel burning, 0.13 ± 0.05 watts per square metre for CH4, –0.11 ± 0.05 watts per square metre for sulfate aerosols, and 0.09 ± 0.06 watts per square metre for black carbon aerosols. China's eventual goal of improving air quality will result in changes in radiative forcing in the coming years: a reduction of sulfur dioxide emissions would drive a faster future warming, unless offset by larger reductions of radiative forcing from well-mixed greenhouse gases and black carbon.