

To reduce pollution, policymakers should broaden focus beyond smokestacks

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Emissions from air pollutants are associated with premature mortality. Between 2008 and 2014, air pollution health damage from fine particulate matter exposure fell by 20 percent in the United States. There are four sectors in the U.S. economy that together are responsible for over 75 percent of air pollution damage but contribute less than 20 percent to national GDP: agriculture, utilities, manufacturing and transportation.

In the paper, "Fine Particulate Matter Damages and Value Added in the United States Economy," Nicholas Z. Muller, the Lester and Judith Lave Associate Professor of Economics, Engineering, and Public Policy, Peter Tschofen, a doctoral candidate in Engineering and Public Policy at Carnegie Mellon University, and Ines Azevedo, Associate Professor of Energy Resources Engineering at Stanford, used integrated assessment models to compute marginal damages from fine particulate matter-related emissions to measure economy-wide gross external damage due to premature mortality and other health outcomes.

"Canonically, we tend to think about air pollution as coming from smokestacks," says Muller. "But what we're finding is a transition from the utilities sector to the agriculture sector in terms of the most significant sources of damages from particulate matter."

Though the utilities and manufacturing industries might be expected to be the main producers of air pollution, Muller explains that their air pollution output is actually shrinking due to government regulations and [market forces](#), while the less regulated agriculture and transportation industries have remained roughly constant, thus capturing a larger percentage of total impacts.

"The air pollution policies that have been levied on the utilities sector have done a very good job in reducing emissions and damages, so policy can be effective at protecting public health in this regard," says Muller. "It's also evidence that we need a more comprehensive, targeted and thoughtful way to regulate pollution from agricultural systems."

Muller suggests regulations could involve changing the composition of fertilizer, using different means to treat waste from animals, and limiting dust emissions from livestock and tilling. "All of these things need to be looked at in terms of their costs because what we're seeing is that emissions in the agricultural sector are very damaging."

Though regulations inducing firms to change their behavior and implement technological controls that limit emissions are costly, Muller and co-author's research suggests that the long-term benefits of these actions are quite large.

"When you consider the net value of the agriculture and transportation sectors' contributions to total economic output, it would be a lot more if they were to clean up because they're imposing all these external costs that measurements like GDP just don't capture," he says.

GDP, Muller explained, focuses on the production of goods and services. By definition, GDP cannot measure the impact of air pollution externalities because these costs accrue outside the market. An example is the production of electricity using coal. There is a market transaction for power that is recorded, if you will, in GDP. However, emissions released from the smokestack have impacts downwind on communities not privy to the market transaction. These ancillary impacts are not tracked by GDP, and, crucially, the downwind costs are not reflected in market prices for power, absent [public policy](#). The goal of the paper by Muller, Tschofen, and Azevedo is to tally up these external costs from air pollution.

The paper, "Fine Particulate Matter Damages and Value Added in the United States Economy," was published in *PNAS*. Muller, Tschofen, and Azevedo are currently working on a follow-up paper to further explore how to address [pollution](#) from the [agriculture sector](#).

More information: Peter Tschofen et al., "Fine particulate matter damages and value added in the US economy," *PNAS* (2019).
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