

New models yield clearer picture of emissions' true costs

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When its environmental and human health toll is factored in, a gallon of gasoline costs us about \$3.80 more than the pump price, a new Duke University study finds.

The social cost of a gallon of diesel is about \$4.80 more than the pump price; the price of [natural gas](#) more than doubles; and coal-fired electricity more than quadruples. Solar and wind power, on the other hand, become cheaper than they initially seem.

"We think we know what the prices of [fossil fuels](#) are, but their impacts on climate and human health are much larger than previously realized," said Drew T. Shindell, professor of climate sciences at Duke's Nicholas School of the Environment. "We're making decisions based on misleading [costs](#)."

Shindell said his study, published on Feb. 26 in the peer-reviewed journal *Climatic Change*, provides policymakers with a more accurate framework for estimating the costs of a broad range of health, climate and environmental [damages](#) linked to emissions from fossil fuels, industry, biomass burning and agriculture.

Current markets don't place a price on most [atmospheric emissions](#), so polluters typically pay none of these costs, he noted. Instead, society picks up the tab through increased risks of premature death or illness caused by air pollution, higher healthcare costs, lower crop yields, missed work and school days, increased insurance damages from floods and other extreme weather events linked to climate change, and other [social costs](#).

"Putting values on many of these social costs can be challenging because there are so many factors in play," Shindell said.

The comparative framework devised by Shindell to calculate these costs is built upon a widely used methodology introduced in 2010 to help the U.S. government determine the social costs of carbon.

Shindell's models extend the scope of those calculations to cover a much

wider array of pollutants and impacts, including damages from potent but short-lived climate pollutants (SLCPs) such as methane and aerosols, as well as longer-lived greenhouse gases such as nitrous oxides. The new models incorporate the most current data available to give policymakers accurate estimates of monetized damages.

"Looking at electricity, for example, the U.S. Energy Information Administration estimates generation costs per kilowatt hour of power to be about 10 cents for coal, 7 cents for natural gas, 13 cents for solar and 8 for wind," Shindell said.

"Not surprisingly, the U.S. has seen a surge in the use of natural gas, the apparent cheapest option. However, when you add in environmental and health damages, costs rise to 17 cents per kilowatt hour for natural gas and a whopping 42 cents for coal."

The true cost of gasoline is another example. If social costs of around \$3.80 a gallon are added in, damages from a typical mid-range gasoline-powered vehicle total nearly \$2,000 a year. In comparison, annual damages associated with an electric vehicle are around \$1,000 if the power comes exclusively from coal, about \$300 if the power is generated using natural gas, and minimal if the electricity is from renewable sources.

Because of the inherent complexity of establishing universal values for health and environment damages, Shindell doesn't view his newly published estimates as the last word in determining emissions' social costs.

"There is room for ongoing discussion about what the value of atmospheric emissions should be," he said. "But one thing there should be no debate over is that the current assigned price of zero is not the right value."

More information: "The Social Cost of Atmospheric Release," Drew T. Shindell. *Climatic Change*, Feb. 26, 2015. [DOI: 10.1007/s10584-015-1343-0](https://doi.org/10.1007/s10584-015-1343-0)

Provided by Duke University

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