AGRICULTURAL SCIENCES

Does renewable energy reduce fossil fuel production in the US?

The researcher found no association between the production of renewable energy and fossil fuels, which suggests that creating renewable energy did not lower or replace the production of fossil fuels. **Credit: Zbynek Burival on Unsplash. All Rights**

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UNIVERSITY PARK, Pa. — Increasing renewable energy may not reduce the use of fossil fuels in the United States, according to a study by Ryan Thombs, assistant professor of rural sociology in Penn State's College of Agricultural Sciences.

In the study, published in the **Journal of Environmental Studies and Sciences**, Thombs analyzed fuel production data spanning 1997 to 2020 from the 33 states that produce fossil fuels in the U.S., which is the second largest greenhouse gas emitter and second largest energy producer in the world.

He found no association between the production of renewable energy and fossil fuels, which suggests that creating renewable energy did not lower or replace the production of fossil fuels. However, Thombs did find that more than 96% of the variation in fossil fuel production across the states was explained by fixed factors in each state, such as fossil fuel endowments — the amount of fossil fuel deposits available in each state.

Thombs said the findings suggest that additional policies may be needed to help reduce the use of fossil fuels, since current renewable energy investment approaches often assume that more renewable energy naturally leads to less fossil fuel production.

"Policies could include ones that directly limit fossil fuel production through carbon taxes, setting production caps on fossil fuels and keeping fossil fuel reserves in the ground," he said. "Future research could consider other geographical contexts to see if the findings from this study are generalizable elsewhere and should also consider the effectiveness of specific policies that have been implemented."

Fossil fuels are a significant contributor to climate change, accounting for more than 75% of greenhouse gas emissions and almost 90% of carbon dioxide emissions, according to the **United Nations**.

Transitioning from fossil fuels to renewable energy can help mitigate climate change, and investments in these alternative, renewable forms of energy have been growing quickly — now making up the largest percentage of new energy generation, Thombs said.

“However, many policies to this point assume that growth in renewable energy corresponds with a proportional decrease in fossil fuels,” he said. “If it doesn’t, then we may need to implement additional policies to reduce fossil fuel production directly rather than hope that deploying renewables will crowd out fossil fuels.”

For the current study, Thombs used state-level data on per capita production of fossil fuels — including coal, natural gas and crude oil — as well as per capita renewable energy production, including energy produced from geothermal, conventional hydroelectric, solar thermal and photovoltaic, wind, wood and waste, and biofuels. He analyzed the data using three modeling approaches to ensure robust estimates.

One limitation of the study, Thombs said, was that the findings only apply to the U.S. and may not be true in other settings. The study also was limited to the time period in which the data was collected.

“It's possible that renewables will substitute fossil fuels as the broader political economy transforms, especially if state regulations are implemented,” he said. “However, the findings do demonstrate that any such transition will be hindered by the close proximity of renewable and fossil fuel resources in many fossil-fuel-dependent states.”

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