

# Clean energy grids and electric vehicles key to beating climate change and air pollution

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Any uptake in electric vehicle use must be mirrored by the development of clean energy grids to mitigate both climate change and air pollution.

That is the key finding of a new study by researchers at the Lawrence Berkeley National Laboratory, California, and Stanford University, California.

Published today in the IOP Publishing journal *Environmental Research Letters*, the study examined the most beneficial vehicle fuel technology for transportation in the US, and the trade-off between decarbonization (climate) and air pollution (health) mitigation.

Co-author Professor Inês M.L. Azevedo, from Stanford University, said: "The transportation sector is the largest contributor to CO<sub>2</sub> emissions in the United States. Its impact on health and the environment is also significant. Greenhouse gases and criteria air pollutants affect different places in different ways. Greenhouse gases disperse globally, stay in the atmosphere for decades to centuries, and their effects differ globally, but such an effect does not depend on where the emissions originate. Criteria pollutants have much shorter lifespans, and their effects depend on where the emissions occur."

The study estimated the life cycle monetized damages from greenhouse gas emissions and criteria air pollutant emissions for passenger cars, SUVs, and transit buses in the US. It looked at vehicles powered by four different fuel types—gasoline, diesel, CNG, and grid electricity—paired with three vehicle technologies: internal combustion engine vehicles (ICEVs), hybrid [electric vehicles](#) (HEVs), and battery electric vehicles (BEVs).

It used a marginal damage approach to estimate [climate change](#) monetized damages associated with [greenhouse gases](#) (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O) and health and environmental monetized damages caused by criteria air pollutants (SO<sub>2</sub>, NO<sub>x</sub>, CO, PM<sub>2.5</sub>, and VOCs).

Co-author Dr. Fan Tong, from the Lawrence Berkley National

Laboratory, said: "We found vehicle electrification has substantial potential to reduce climate change damages and air pollution damages. With the 2014 electricity grid, vehicle electrification can already reduce climate change damages compared to conventional petroleum vehicles on the west coast and New England."

"However, in some locations, battery-electric vehicles can lead to much higher air pollution damages than conventional gasoline/diesel vehicles. This occurs in regions where coal is still prevalent (such as Midwest and Southeast)."

"Even in US regions with relatively clean electricity grids (such as the [west coast](#) and New England), battery electric vehicles can only partially reduce [air pollution](#) damages. Our results highlight the importance of continually cleaning and decarbonizing electricity grids, such as with increased amounts of renewable energy technologies and nuclear power, as well as improving [vehicle](#) efficiency. A clean [electricity grid](#) with near-zero emissions not only benefits the electricity sector and traditional electricity consumers such as buildings but also becomes increasingly crucial for a sustainable transportation future."

**More information:** What are the best combinations of fuel-vehicle technologies to mitigate climate change and air pollution effects across the United States? *Environmental Research Letters* (2020). [DOI: 10.1088/1748-9326/ab8a85](#)

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