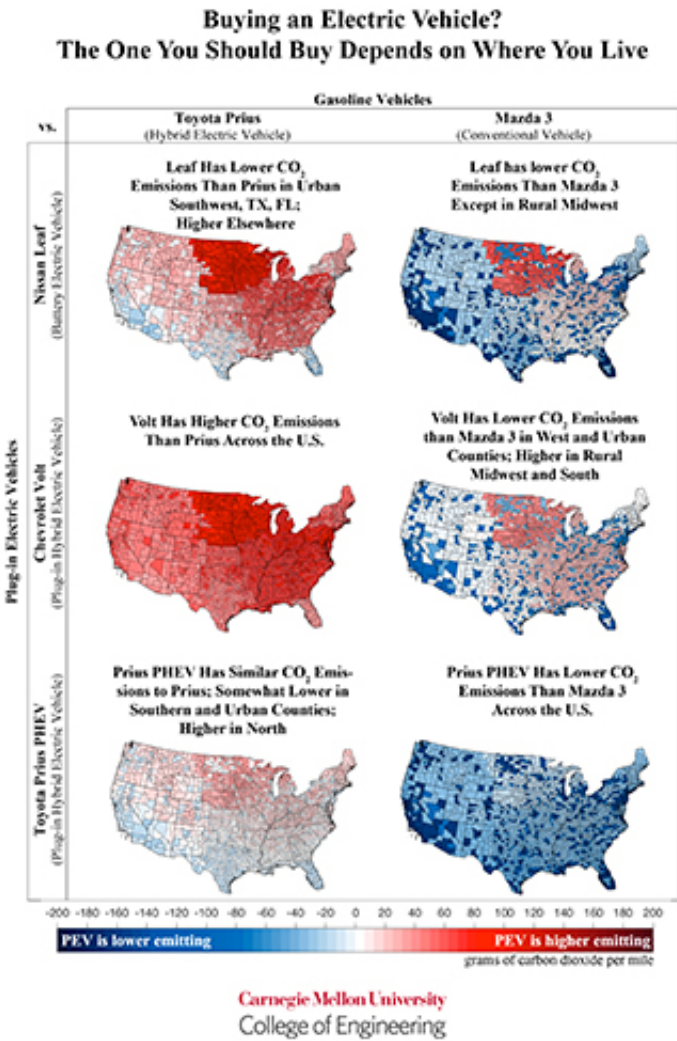


Want an electric vehicle? The one you should buy depends on where you live

May 12 2016, by Tara Moore



Credit: Carnegie Mellon University Mechanical Engineering

From the Tesla Model 3 to the Nissan Leaf, electric vehicles are all the rage these days—but before consumers head to the dealership, they should take a moment to consider a few factors. Their city's climates, how much highway driving they will be doing, and their regional electricity grids all contribute to their vehicles' carbon footprints. In other words, if they buy the wrong car for where they live, their good intentions may leave an even bigger carbon footprint than a conventional gasoline-fueled vehicle.

Researchers from Carnegie Mellon University have published the first study that accounts for the combined regional influence of electricity grid emissions; driving patterns, such as distance and highway vs. city driving; and temperature on the life cycle emissions of five different types of vehicles. The vehicles compared were the Nissan Leaf, the Chevrolet Volt, the Toyota Prius hybrid and plug-in hybrid models, and the Mazda 3.

"Most electric vehicle buyers assume that they're helping the environment by purchasing an electric or hybrid vehicle, but there's more to it than simply making the purchase," said study co-author Jeremy Michalek, a Carnegie Mellon University professor of mechanical engineering and of engineering and public policy. "Where a consumer lives plays a larger role than one might think in determining which vehicle will have the lowest [greenhouse gas emissions](#)."

When the vehicles' emissions are compared, it turns out that the entirely battery-run 2013 Nissan Leaf produces lower greenhouse gas emissions than the entirely gasoline-run 2013 Toyota Prius in urban areas of Texas, Florida, and much of the southwestern United States—but in the rest of the country, most notably in the Midwest and the South, the Leaf emits more greenhouse gases than the Prius.

Current federal policy for plug-in [electric vehicles](#) is fairly uniform

across the United States, although different states have different policies to encourage electric vehicle sales, including subsidies and mandates. The study identifies regions where electric vehicles offer the largest reductions of carbon dioxide emission to help inform future regional policy decisions.

"Electric vehicles offer the largest benefits for urban drivers in mild-climate regions with a clean electricity grid, such as San Francisco or Los Angeles," says Michalek. "In the rural regions of the colder, coal-heavy Midwest, electric vehicles are often higher emitting than comparable gasoline vehicles today."

So, if consumers are in the market for a new car, they should make sure to take their locations—and their good intentions—into account.

More comparisons between vehicle emissions can be found at *Environmental Research Letters* in the full article, titled "Effect of Regional Grid Mix, Driving Patterns and Climate on the Comparative Carbon Footprint of Gasoline and Plug-in Electric Vehicles in the United States."

The researchers involved in this study were Jeremy Michalek; Tugce Yuksel, a mechanical engineering Ph.D. student; Inês Azevedo, an associate professor of engineering and public policy; Chris Hendrickson, professor of engineering and public policy and of civil and environmental engineering; and Mili-Ann Tamayao, who began work on the project while an engineering and [public policy](#) Ph.D. student at Carnegie Mellon University. Tamayao continued contributing to the paper after she graduated and joined the University of the Philippines.

More information: Tugce Yuksel et al. Effect of regional grid mix, driving patterns and climate on the comparative carbon footprint of gasoline and plug-in electric vehicles in the United States, *Environmental*

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