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What Would it Take for Drivers to Adopt Eco-Driving Behaviors?

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Issue

Climate change in California could greatly impact the state's economy, nature, and public health. One strategy to reduce fuel consumption and greenhouse gas emissions from the transportation sector is eco-driving. Eco-driving is a set of behaviors or driving styles that encourage fuel-efficient driving that could help minimize energy consumption anywhere from five to 30 percent. With the advance of connected-vehicle technologies, the dynamic eco-driving concept uses real-time vehicle-specific information to optimize vehicle speed and reduce fuel consumption and emissions.

The effectiveness of eco-driving depends on overcoming two key issues: drivers' lack of acceptance of the technology and failure to comply with the real-time guidance. For the eco-driving applications to be widely adopted and optimally utilized, such challenges must be properly addressed. To understand factors affecting drivers' intention to accept eco-driving practices and their willingness to employ eco-driving systems, we surveyed owners of both internal combustion engine vehicles (ICEVs) and electric vehicles (EVs). We also conducted a simulated driving experiment to determine whether an eco-driving application could detect if drivers were overly distracted using the system.

Key Research Findings

Driver motivations for adopting eco-driving behaviors varies. For instance, drivers reported being motivated to adopt eco-driving behaviors by concerns for others' welfare (an altruistic goal framework) or for conserving energy or protecting the environment (a biospheric or environmental goal framework) while others were motivated by benefits to themselves (an egoistic goal framework) like extending their vehicle's driving range or saving money. Altruism was a particularly strong motivation for the ICEV drivers to engage in eco-driving, while the other goal frameworks were more important to EV drivers, perhaps because the EV drivers had more eco-driving knowledge than the ICEV drivers. In order to encourage drivers to adopt an eco-driving style and actually use eco-driving systems, interface designers should consider tailoring the content of information provided to emphasize the various benefits to different types of drivers.

Perceived ease of use was a key factor influencing a driver's intention to use an eco-driving system. It has a significant effect to drive the intention to use directly, with the standardized path coefficient of 0.303. (System designers should consider potential barriers when drivers use the system, such as the possibility of drivers becoming distracted while using the eco-driving interface. Some

drivers may have already developed eco-friendly driving habits even without using an eco-driving system, while other drivers could benefit from eco-driving training. Better design of eco-driving systems will enhance drivers' intention to use them.

Based on the result of the driving simulator experiment, drivers may become distracted while trying to follow the information provided by the eco-driving interface. In such circumstances, one solution could be to temporarily discontinue the information feed until the driver is no longer distracted. Previous studies conducted by our team showed that monitors for eye movement did a better job of predicting when the driver was distracted than monitors for detecting driving behavior like weaving, acceleration, and speed limit compliance, though a combination of both improved the overall accuracy during both vehicle acceleration and deceleration tests.

More Information

This policy brief is drawn from the research report “Drivers’ Responses to Eco-driving Applications: Effects on Fuel Consumption and Driving Safety” available at ucits.org/research-project/2021-23. For more information about findings presented in this brief, please contact Peggy Wang at peggywang@berkeley.edu.

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