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## **Behavior-influencing policies are critical for mass market success of low carbon vehicles**

**Policies to entice consumers away from fossil-fuel powered vehicles and normalize low carbon, alternative-fuel alternatives, such as electric vehicles, are vital if the world is to significantly reduce transport sector carbon emissions, according to new research.**

The new study, led by IIASA researcher David McCollum and IIASA and University of East Anglia, UK, researcher Charlie Wilson, is the first to take a global look at the non-financial reasons why consumers choose certain vehicles, and the long-term energy and carbon emissions implications those choices may have. It is not just the upfront costs and running costs that a consumer will look at; they will also consider attributes such as the available models and brands, comfort, acceleration, and interior space, and the availability of infrastructure such as refueling stations, which are still lacking for most types of alternative-fuel vehicles, particularly electric and hydrogen vehicles. Additionally, most consumers lack first-hand experience with these novel technologies.

Transport is responsible for 25% of energy-related CO<sub>2</sub> emissions globally, with half of that coming from private passenger vehicles. More than 90% of such vehicles are powered by internal combustion engines burning oil-derived fuels. Encouraging the use of low-carbon alternatives is an essential part of meeting climate change targets as well as improving local air quality and health.

The researchers found that focusing on the behavioral aspects of consumers in vehicle purchase decisions is key to encouraging the rapid uptake of plug-in hybrid vehicles, battery-electric vehicles, and hydrogen fuel cell vehicles. Making conventional gasoline and diesel vehicles more expensive to run – through increased fuel or carbon taxes – is not enough to incentivize the majority of consumers to change. However, carbon taxes can be critical in pushing electricity providers to decarbonize their operations.

“Alternative-fuel vehicles will play a critical role in the effort to avoid dangerous climate change, but only if measures to stimulate their adoption in cities – with positive climate, air quality, and health outcomes – are combined with policies to drive fossil fuels out of the electricity mix in favor of renewables and other low-carbon resources,” says McCollum.

The researchers employed six global energy-economy models in the study, upgrading the tools so that they could more adequately represent consumers and their behavior and preferences. They modeled

two different future scenarios for alternative-fuel vehicle policy worldwide to 2050. ‘AFV Push’ imagines a future where policy and social nudges lead consumers to be less risk averse, allowing low carbon vehicles and their requisite refueling and recharging infrastructure become the norm. In contrast, ‘No AFV’ imagines current views of these vehicles persisting, due to minimal policy support, low levels of consumer awareness, and limited infrastructure.

The models show that a mix of robust transport policies and strategies could increase the market share of alternative-fuel vehicles to more than 25% of all passenger cars and trucks by 2050, perhaps even higher. This would amount to some 500 million of these vehicles worldwide by mid-century. Without any such policies, the market for alternative-fuel vehicles will remain very niche, with a market share hovering around 1% for the foreseeable future – in other words hardly greater than today.

Behavior-influencing policies to encourage the use of alternative-fuel vehicles include a suite of options: fuel taxes, vehicle subsidies, technology mandates and efficiency standards, investment in refueling infrastructure and dedicated parking spaces, as well as social media campaigns and car-sharing networks to demonstrate the technology. The difference these policies can make, if applied in a multi-pronged strategy, can already be seen in countries that strongly support the use of alternative-fuel vehicles, such as China, Iceland, Norway, and Sweden. In Norway for example, 40% of passenger cars sold in 2017 were either battery-electrics or plug-in hybrids.

“Our research indicates that, when considering the wide range of non-financial attributes over which vehicle purchasers express preferences, alternative-fuel vehicles will be a hard sell to many for some time to come. The good news is that this is where dedicated transport policies and measures can help – and in fact are already helping,” says Wilson.

Stimulating the market for alternative-fuel vehicles will also likely lead to cost reductions and improvements in critical technologies, such as batteries and rapid charging infrastructure. McCollum and the team argue that policies over the next few years can leverage the power of social influences, for example early adopters of novel technologies communicating recognized benefits to individuals in the wider mainstream market, thereby eventually reducing the present-day negative perceptions surrounding alternative-fuel vehicles and ultimately normalizing their purchase and use.

The researchers add that their results are relevant for multiple stakeholders, including governments, vehicle manufacturers, and companies involved in wider transport activities, such as installing refueling and recharging infrastructure.

#### **Reference**

McCollum DL, Wilson C, Bevione M, Carrara S, Edelenbosch OY, Emmerling J, Guivarch C, Karkatsoulis P, et al. (2018) Interaction of consumer preferences and climate policies in the global transition to low-carbon vehicles. *Nature Energy* DOI: 10.1038/s41560-018-0195-z [[pure.iiasa.ac.at/15365](http://pure.iiasa.ac.at/15365)]



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**Press Release**

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This study was conducted within the context of the EU FP7 'ADVANCE' project, set up in 2013. ADVANCE developed a new generation of advanced integrated assessment models and applied the improved models to explore different climate mitigation policy options in the post-Paris framework. The project ended in December 2016. <http://www.fp7-advance.eu/>

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