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Japan's electric vehicle transition by 2035 may be insufficient to combat the climate crisis, but there are solutions

Japan must simultaneously move to extend vehicle longevity, invest in a cleaner energy mix, and decarbonize the supply chain to reach their climate goals

Fukuoka, Japan—Researcher at Kyushu University have found that Japan's current policy of stopping the sale of gas vehicles by 2035 and transitioning only to hybrids and electrical vehicles may be insufficient to reduce the country's CO₂ emissions and prevent it from reaching its decarbonization target goals. In fact, emissions may temporarily increase.

The team's analysis showed that along with the policy, the Japanese government must simultaneously work to increase production of clean energy, decarbonize the manufacturing process, and extend vehicle lifetime.

In the effort to combat the climate crisis most countries in the world have implemented policies that reduce their production of greenhouse gases such as CO₂, and Japan is no different. One such policy is a ban on the new sale of fossil fuel powered vehicles. The country is working to ban the sale of new gas vehicles by 2035, and move to only sell EVs, HVs, and FCVs, electric vehicles, hybrid vehicles, and fuel cell vehicles respectively.

While this is a move in the right direction, [Professor Shigemi Kagawa](#) from Kyushu University's Faculty of Economics reports in his new paper, published in the [Journal of Cleaner Production](#), that banning new gas vehicles may not be enough to reach Japan's decarbonization goals.

"Our team focused on how much CO₂ is produced during a car's entire lifetime, from the first resource extracted from the earth to when it gets destroyed. Looking at the lifecycle CO₂, or LC-CO₂, of a car allow us to take a larger view on a car's emissions," explains Kagawa.

The team found a number of policy points that need to be addressed, including decarbonizing the supply chain, improving the country's energy mix, and extending vehicle lifetime.

"Just building a car is energy intensive. All the building materials need to be mined, processed, shipped, and constructed. Every part of that process produces CO₂," Kagawa continues. "Construction of an EV can produce 1.5 to 2 times more emissions compared to a gas car. If car manufacturers increase their production of EVs without decarbonizing the supply chain, then emissions reduction will stagnate."

Moving Japan's energy mix to more renewable sources is also a vital step in this process. A country's energy mix is the ratio of fuel sources the country's electricity supply. In 2020, Japan's energy mix was 76% fossil fuels and 20% renewables. So, even if everybody switched to EVs the energy required to charge such vehicles still results in fossil fuel emissions.

"Japan's planned 2030 energy mix is 50% fossil fuels and 28% renewable energy. That will not adequately reduce LC-CO₂. The EV policy starting in 2035 aims to contribute to a 10% reduction or 2.9 Mt (million tons) of CO₂ in vehicle emissions in 2050. This reduction level falls far short of achieving a carbon-neutral vehicle society," explains Kagawa. "Japan needs to aim toward the International Energy Agency (IEA) mix of 10% fossil fuels and 88% renewables by 2050. Our models show a reduction of an additional 10%, a potential of 3.4 Mt of CO₂, in vehicle emissions in 2050 if Japan follows the IEA policy mix."

Finally, extending a car's lifetime, for both EVs or gas vehicles, can go a long way to reduce LC-CO₂. The average lifespan of a car in Japan is 13 years. The research team's models found that if a car registered between 1993 and 2050 has its average lifetime extended by even one year it could reduce up to 90 Mt of overall CO₂ emissions for the country. Conversely, if a vehicle's lifespan is reduced by one year, within the same time frame, CO₂ emissions increase by roughly the same amount.

"When we expanded our model to extending the lifespan of a vehicle by 10 years, the potential reduction in CO₂ emissions can be more than 600 Mt," Kagawa states.

The team hopes that their analysis will encourage Japan to implement these policies so it can continue to effectively combat the climate crisis and make their goal of carbon neutrality by 2050 a reality.

"We can make efforts ourselves by trying to drive our cars less and for a few years longer, and even consider buying used vehicles instead of new ones," concludes Kagawa. "But the government needs to provide attractive subsidies for those programs, and manufacturers should work to encourage vehicle repair and parts replacement. The climate crisis is a complex issue, and the right policies can go a long way in providing us a better future."

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For more information about this research, see "Environmental consequences of Japan's ban on sale of new fossil fuel-powered passenger vehicles from 2035," Minami Kito, Yuya Nakamoto, Shigemi Kagawa, Shunichi Hienuki, Klaus Hubacek, *Journal of Cleaner Production*, <https://doi.org/10.1016/j.jclepro.2024.140658>

About Kyushu University

Kyushu University is one of Japan's leading research-oriented institutes of higher education since its founding in 1911. Home to around 19,000 students and 8,000 faculty and staff, Kyushu U's world-class research centers cover a wide range of study areas and research fields, from the humanities and arts to engineering and medical sciences. Its multiple campuses—including one of the largest in Japan—are located around Fukuoka City, a coastal metropolis on the southwestern Japanese island of Kyushu that is frequently ranked among the world's most livable cities and historically known as Japan's gateway to Asia. Through its Vision 2030, Kyushu U will 'Drive Social Change with Integrative Knowledge.' Its synergistic application of knowledge will encompass all of academia and solve issues in society while innovating new systems for a better future.



Fig. 1. A future household with old and new cars. For Japan to effectively reach its carbon emission reduction goals they must work to implement policies that establish more renewable energy, decarbonize the manufacturing process, and extend vehicle lifetime.



Fig. 2. A line of used Toyota Priuses available for purchase. One key policy Japan must implement to effectively reach its decarbonization goals is extending the lifespan of cars. The average lifespan of a car in Japan is 13 years whether or not it is driven for any amount of time. Providing incentives to purchase used cars instead of new ones can be a viable policy that can help the country reach its climate goals.

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