

A white electric car is parked at a charging station. The car is connected to a green charging station. The background shows trees and a building.

Research Brief

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Equitably Decarbonizing Electrified Transportation

Rapid decarbonization of the transportation system is needed to address global climate change, but consideration should be given to ensure that pathways to decarbonization are equitable.

Background

The transportation sector is the largest greenhouse gas (GHG) emitter in the United States, accounting for 28% of total emissions. This includes light-duty passenger vehicles, heavy-duty trucks, rail transport, and aviation, but the majority of the emissions from this sector come from on-road vehicles. When the electric grid is powered by low-carbon energy sources, electrification of on-road vehicles offers a promising approach to reducing GHG emissions from the transportation sector. As grid power continues to shift from coal to natural gas and additional zero-emission generation sources, further decarbonization is expected, allowing the U.S. to reach its goal of achieving 100% zero-carbon electricity by 2030.

Eliminating carbon emissions is essential to addressing global climate change. It also presents an opportunity to simultaneously identify injustices and reduce inequities present in both the current and future energy systems. As electrification increases and its effects on the transition to low carbon transportation and overall energy systems becomes clearer, there will be different ways to define what an ideal or just transition would look like. This transition also creates possibilities for policy and decision-makers to reduce regressive policy impacts of various transportation and decarbonization solutions by identifying aspects of equity to be considered during the evaluation process.

POINTS FOR POLICYMAKERS

Four critical issues must be addressed to achieve equitable transportation electrification:

- **Air Quality and Health Equity.** To maximize air quality and associated health benefits of electrification, a reduction in power sector emissions will be as important as vehicle electrification. Elimination of coal power plants and other highly polluting generators paired with significant electrification would result in the largest health benefits. The speed and geographical patterns of electric vehicle adoption, along with the evolution of the power grid in different regions, will have substantial implications for equitably electrifying transportation.
- **Equitable Access to Electric Vehicles and Clean Forms of Transportation.** Identifying barriers to EV acquisition and determining the best policy actions to encourage broader adoption is needed. Incentive programs such as tax breaks and rebates have proven to be inadequate tools to promote more equitable adoption. Increased availability of used electric vehicles may alleviate accessibility concerns for some households as will a greater access to charging infrastructure.
- **Equitable Infrastructure Siting.** Location and distribution of new charging stations will have important implications for equity. For example, those living in multi-family housing may lack parking options with charging access at their homes and will likely need to rely on public charging stations to meet their charging needs. As new power plants are planned to meet increased demand from EVs, siting should occur in locations that do not disproportionately burden vulnerable communities
- **A Just global supply chain.** Both electric vehicles and renewable energy technologies utilize critical minerals including lithium, copper, nickel and cobalt that are mined all over the world. Decisions about material sourcing and production should account for not only climate impacts, but global air quality and public health impacts as well. Future research could focus on the development of frameworks and metrics to assess tradeoffs between local and global injustices in climate solutions.

As electrification grows, the transportation and power sectors are becoming increasingly linked. Decisions and pathways forward in each individual sector will have significant impacts on the other. It is important that decision-makers take these multi-sectoral impacts into account as electrification pathways that fail to address each of these components may reduce GHG emissions but will fall short of their potential to build an equitable transition to sustainable transportation systems.

In undertaking an analysis of decarbonization in the transportation sector, Stanford researchers focused on key aspects of equity that decision- and policymakers might wish to consider as they are evaluating various solutions. The research team identified four critical issues that must be addressed to achieve equitable transportation electrification: air quality and health consequences from air pollutants; technology access; infrastructure siting; and global supply chain impacts.

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This brief is based on *Emerging environmental justice issues at the intersection of transportation and electricity systems* published in *Progress in Energy*.

FOR MORE INFORMATION

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