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# Carbon Neutrality in California: Forecasted Expenditures on Fossil Fuel and Zero-Emission Vehicles from 2020 to 2045



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## Issue

California aims to be carbon neutral by 2045. Achieving carbon neutrality in California's transportation sector is projected to create more than 7.3 million full-time equivalent (FTE) job-years worth of work over the next 25 years, resulting in hundreds of thousands of permanent jobs and the creation of new billion- or multibillion-dollar industries. This influx of new jobs in zero-emission vehicle (ZEV)-related sectors will be accompanied by a decline in jobs in fossil fuel-burning internal combustion engine vehicle (ICEV)-related sectors. To assess how employment in these sectors will change between now and 2045, we must examine how consumer expenditures — a key driver of change in the labor market — will vary over time.

Currently, very little research exists on how expenditures may change over the next decades, and projections past 2030 simply do not exist. However, we anticipate that overall expenditures will decline as the vehicle fleet becomes greener since ZEVs are generally associated with lower maintenance and fuel costs. The rates at which ZEV-related industries expand and ICEV-related industries contract will depend largely on findings from three key expenditures: new vehicle purchases, fuel consumption, and maintenance and repairs. This research explains the fundamental relationship between how consumers spend their money and consequent changes in the workforce, characterizes Californians' current transportation-related spending, and forecasts changes in these spending patterns that will drive employment changes across transportation-related supply chains between now and 2045.

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## Research Findings

- California will spend \$23.3 billion less across the three key transportation expenditure categories in 2045 compared to 2020, with overall expenditures falling from \$175.4 billion to \$152.1 billion (Figure 1).
- All three key expenditure categories will be lower in 2045 than in 2020.
- New vehicle purchases will remain the largest expenditure category, with fuel costs second, and maintenance costs last.

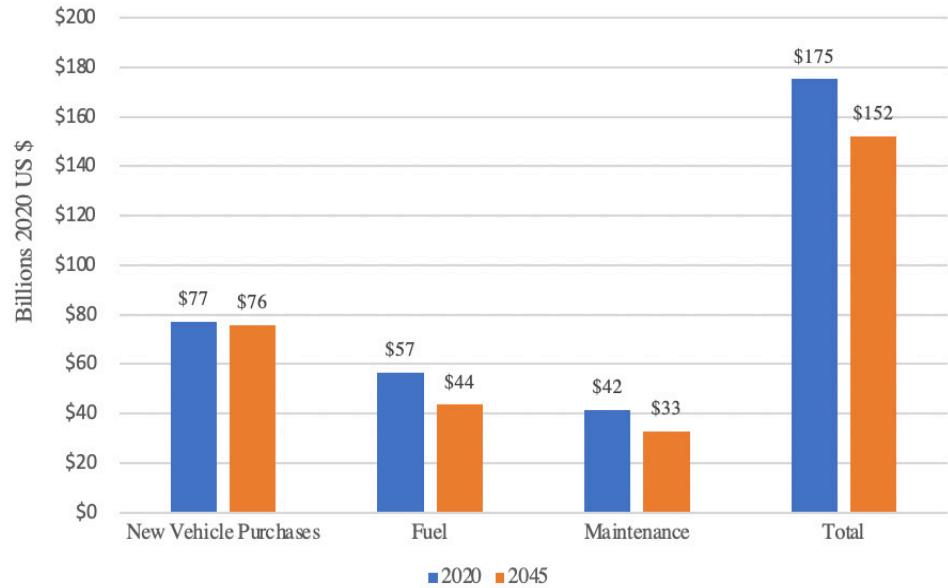
Vehicle purchase expenditures will see the smallest decrease of \$1.4 billion (1.8%), with fuel expenditures and maintenance expenditures witnessing much larger drops. Fuel expenditures will be lower by \$13.1 billion (23.2%), and maintenance expenditures will fall by \$19.2 billion (21.1%). Total overall expenditures will drop from \$175.4 billion to \$152.1 billion (13.3%).

Expenditures for ZEVs will increase over time while expenditures for fossil fuel vehicles will gradually decrease. By 2045, new vehicle purchase expenditures will solely be spent on ZEVs, and the majority of fuel and maintenance expenditures will go toward ZEV-related expenses.

## Study Approach

The researcher used data from a UC Davis Institute of Transportation Studies projection for California's 2045 carbon-

Figure 1. Comparison of 2020 and 2045 key expenditure estimates in California by fuel type in billions of 2020 US dollars.



neutrality goal, with supplemental data from external sources where required, and calculated each expenditure category as follows:

- New Vehicle Purchases, calculated by multiplying average vehicle purchase price with the number of vehicles purchased each year.
- Fuel Consumption for Transportation, calculated by multiplying the on-road fleet numbers by the annual fuel cost per vehicle.
- Maintenance and Repairs, calculated by multiplying vehicle miles traveled (VMT) by maintenance cost per mile by on-road fleet vehicle totals.

## Conclusions

The transition to a green vehicle fleet will lower California’s overall transportation expenditures due to the lower fuel and maintenance costs associated with ZEVs. As the vehicle fleet becomes cleaner, many jobs related to the procurement of fossil fuels and the production of fossil fuel vehicles will be eliminated and workers will need to be retrained in new clean-

energy industries. The following actions are recommended to more accurately gauge how expenditures may change in the coming years:

- Explore alternative timelines for California to reach carbon neutrality.
- Compare actual numbers with estimated numbers over time.
- Promote the widespread adoption of ZEVs.

The researcher recommends exploring other scenarios in which California reaches its carbon neutrality goal at a different time, using the same methodology, but with different inputs. As time passes, comparing actual ZEV adoption and expenditures with the forecasted figures will also give insight into how accurate these predictions may be. This will allow the numbers to be adjusted to better reflect real-world trends. Finally, California’s goal is ambitious, and in order to achieve it, the widespread adoption of ZEVs should be promoted. This could include providing incentives for ZEV owners, encouraging innovation, implementing more charging infrastructure, and spreading awareness of the benefits of owning a ZEV.



Yang, A. (2021). Towards Achieving Carbon Neutrality in California: Forecasted Transportation Expenditures for Fossil Fuel Vehicles and Zero Emission Vehicles from 2020 to 2045 (Master’s capstone, UCLA). Retrieved from: <https://escholarship.org/uc/item/16j6s61k>

Brown, A. L, Sperling, D., Austin, B., DeShazo, JR, Fulton, L., Lipman, T., et al. (2021). Driving California’s transportation emissions to zero. UC Office of the President: University of California Institute of Transportation Studies. <http://dx.doi.org/10.7922/G2MC8X9X>