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Evaluation of Zero Emission Policies in Last-Mile Delivery



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Issue

Los Angeles is one of the most polluted regions in the United States. In 2020, the city saw an initial decrease in smog due to a reduction in transportation emissions caused by COVID-19-related stay-at-home orders. By year's end, however, smog levels rebounded to more than 185 parts per billion of ozone in the air. While total greenhouse gas (GHG) emissions decreased by 24% between 1990 and 2018, the city is still short of its stated goal of reaching roughly 17 million metric tons of emissions by 2025.

Transportation is a leading cause of GHG emissions, and within the sector nearly 30% of emissions are attributed to medium- and heavy-duty trucks for freight. Accordingly, numerous efforts have focused on increasing the use of electric vehicles (EV). In particular, the city of Santa Monica has implemented a Zero Emission Delivery Zone (ZEDZ) that provides preferential parking incentives for EVs within the zone. This study looks at new and existing policies to both encourage widespread EV uptake and discourage the use of diesel-based freight through purchase subsidies and ZEDZs.

Approach

The researchers first sought to include the perspectives of a multitude of stakeholders, policymakers, and experts in the field of transportation by conducting 10 interviews.

They then estimated the impacts of different combinations of transportation policies by using an optimization model. The four policies compared for this study were voluntary ZEDZ implemented by Santa Monica, mandatory ZEDZ that limit entry into the zone to EVs only, congestion pricing, and purchase subsidies for freight EVs.

Based on statistics, the research team first forecasted the demand for last-mile deliveries in Santa Monica and then calculated the minimized transportation routes. This was repeated for each policy to calculate the logistical impact. They also evaluated each policy in terms of its efficiency (value of pollution reduced per dollar spent), impacts on equity, and political feasibility.

Research Findings

- Zero Emission Delivery Zones generally enjoy widespread support from a variety of stakeholders including residents, businesses, and policymakers.
- The quantitative analysis revealed that the cost of EVs for cargo is higher than the reduction in negative externalities. Therefore, even though regulatory policies (such as mandatory ZEDZs and congestion pricing) can be effective in reducing GHGs and air pollutants, they alone impose a heavy burden on logistics companies.

		Policy 1		Policy 2		Policy 3		Policy 4	
		Congestion Pricing		Purchase Subsidies		Mandatory ZEDZ		Voluntary ZEDZ	
Criterion	Weight	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Political Feasibility	40%	1	4	2	8	3	12	4	16
Efficiency									
- Emissions reduced per year / cost per year	30%	3	9	2	6	4	12	1	3
Equity									
- Least burden on marginalized communities, or small businesses	30%	2	6	3	9	1	3	4	12
Total	100%		19		23		27		31

Figure 1. Equity Scores: A table shows the relative equity of various emissions reduction strategies.

- Incentive policies, such as voluntary ZEDZs and purchase subsidies for EVs, may be less effective than regulatory policies, but they are politically feasible and address equity issues. Therefore, combining regulatory and incentive policies can be a better overall solution.
- To better improve political feasibility scores, establish a phased process for ZEDZ. In the U.S., there are high political barriers when considering mandated ZEDZ as a policy. Instead, following Santa Monica’s model, a voluntary ZEDZ will provide an onboarding process introducing the features of a ZEDZ to businesses and communities, warming up stakeholders to the concept of a regulated EV zone. This is also a way to help cities gain political traction in passing state legislation to allow cities to create mandated ZEDZ.

Conclusions

- Since no one pollutant-reducing policy can meet all criteria effectively, the team recommends packaging various policies together. The model demonstrates that a combination of policies produce the highest results in decreasing costs and pollutant levels, particularly a combination of purchase subsidies and mandatory ZEDZ.
- To better improve equity scores, cities should consider adding purchase subsidies of freight EVs to a ZEDZ program to offset costs businesses would incur. Mandated ZEDZs would add additional burdens on small businesses since these companies don’t have the capital to transform fleets.



Abe, R., Forbes, M., Marshall, E., Navid, M., & Shepard, K. (2022). Zero Emission Delivery Zones - An Analysis on US Implementation (Master’s capstone, UCLA). Retrieved from <https://escholarship.org/uc/item/75j473v5>.