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Transportation Futures: Policy Scenarios for Achieving Greenhouse Gas Reduction Targets

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Many states have established targets to reduce greenhouse gas emissions by 50-80% by 2050. The federal government has also established a 2020 target of reducing carbon emissions by 17% (based on a 2005 base). These targets are based on limiting global temperature increases to 2°C. Reductions will be needed in the transportation sector to meet these ambitious targets. This study evaluates various policy measures to determine their contribution to reducing greenhouse gas emissions out to 2040. Three key travel-demand policies were assessed. These are, road pricing; directing new population growth to more compact areas; and, increasing transit service.

Study Methods

The unique contribution of this analysis was the use of an activity-based travel demand model to analyze the impact of the three policy scenarios. The California state-wide activity based model was used to calculate the sensitivity of vehicle travel to changes in policy. This model is based on a disaggregate framework that enables a more complete and consistent representation of micro-economic theory throughout the model system. The probability of an individual traveler selecting a given alternative is a function of his or her socioeconomic characteristics and the relative attractiveness of the alternative travel options. Elasticity values are derived which provide a measure of travel sensitivity. These are then applied to current estimates of growth in vehicle travel for the nation calculated from the VISION model.

The VISION model provides nationwide estimates of transportation lifecycle greenhouse gas emissions out to 2040. This model includes the same assumptions used in the Annual Energy Outlook published by the Energy Information Administration. Embedded within the model are various assumptions on future economic growth, vehicle technology, and alternative fuel usage for cars, light trucks (LTs) and heavy-duty vehicles (HDVs). This model incorporates existing regulations on carbon emissions that are already contributing to decreases in emissions. New heavy-duty fuel economy standards will also soon take effect and these are also included.

VMT Elasticities for Policy Scenarios

Scenario	Arc Elasticity (With Respect to VMT)		
	Cars and Light-Trucks	Medium-Duty Trucks	Heavy-Duty Trucks
Land Use (weighted population and employment density)	-0.31	-0.46	-0.01
Transit (revenue miles of service)	-0.02	0.00	0.00
Pricing (dollars per mile)	-0.30	-0.03	-0.05

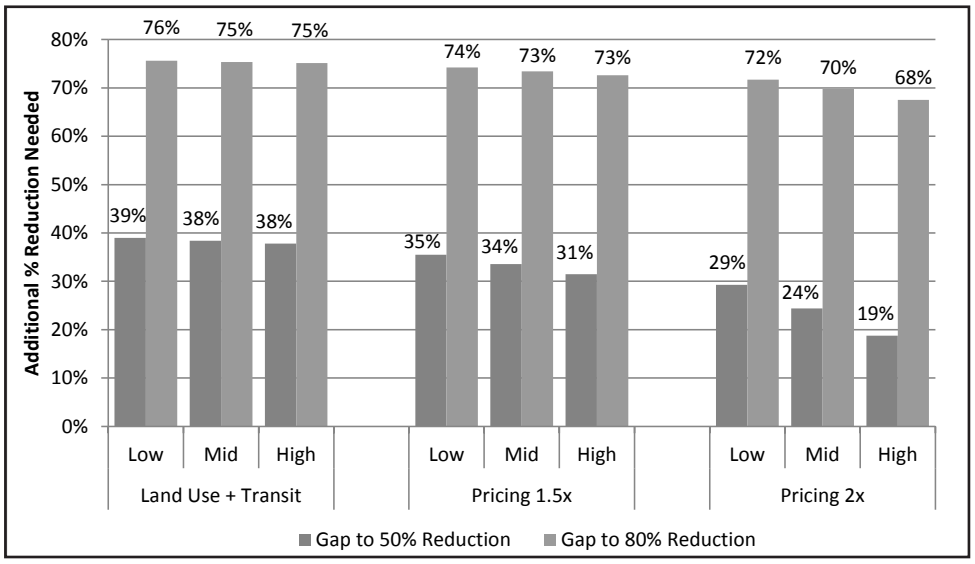
It is assumed that the activity-based model results are generalizable to the United States as a whole. No equivalent national model exists for detailed travel demand forecasting. In addition, California is a large state whose population is spread throughout a diversity of development patterns and regional forms which are not unrepresentative of the range of settlement patterns in the United States. Furthermore, the elasticities generated from the model are similar to other elasticities reported in the literature.

Findings

Of the three travel demand management policies analyzed, only the pricing policy comes close to achieving a 50% emission reduction in emissions over the period from 2000 to 2040, and this assumes both a doubling of the price of driving and the highest range of elasticity estimates from the model. Transit and land-use policies provide only minor reductions in emissions. Overall, this analysis suggests that additional reductions of about 20% to 40%—in addition to those provided through demand management strategies—are necessary to meet these reduction goals.

Medium- and heavy-duty vehicles achieve only small reductions in emissions even with the pricing scenarios. This suggests that further technology improvements will be required to reduce emissions from these vehicles.

These results are not inconsistent with other "gap" analyses that have been conducted. Most studies conclude that both aggressive technology policies and reductions in travel demand are needed to achieve large reductions in transportation greenhouse gas emissions.



Additional Emissions Reductions Necessary to Meet 50% and 80% Reduction Target (Relative to 2000)

Policy Recommendations

Two main recommendations are derived from this research. First, there is a substantial gap in the emissions reduction that can be achieved for medium and heavy-duty vehicles with existing regulations. The policies analyzed are not sufficient to reduce the emissions from these vehicles; more aggressive technology approaches are needed. The EPA is currently beginning a rule-making process to further tighten the greenhouse gas emissions from medium and heavy-duty vehicles.

Our second recommendation is that policy makers cannot rely on technology alone to achieve greenhouse gas reduction targets. The price of travel will need to increase, whether through carbon taxes or fees on vehicle-miles of travel. At a minimum a doubling of travel costs is likely necessary.

About the Authors

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To Learn More

For more details about the study, download the full report at ***transweb.sjsu.edu/project/1149.html***

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