



A Transportation Research Program for Mitigating and Adapting to Climate Change and Conserving Energy

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Buildings and roads in Harris County, Texas, were destroyed by the flooding that followed Hurricane Ike in 2008. The transportation system still needs to adapt to changes in storm surges, precipitation, wind loadings, and flooding.

The risks posed by climate change and the dependence on imported petroleum are among the most challenging problems facing the United States. Many state and national policy makers are embracing proposals to reduce total greenhouse gas (GHG) emissions by 50 to 80 percent below current levels by 2050 and to reduce energy consumption by the transportation sector.

Transportation depends on petroleum for 97 percent of its fuel and is a major contributor to climate change and to energy dependence. Transportation accounts for 28 percent of U.S. GHG emissions and consumes twice as much petroleum as the nation produces annually. Passenger and freight vehicles using surface transportation modes account for approximately 88 percent of carbon dioxide emissions from transportation and for a comparable share of energy consumption.

Seeking Additional Reductions

Projections of the impact of policies already in place to improve fuel economy and introduce alternative fuels suggest that by 2030 total transportation GHG emissions would be about the same as today. Sub-



PHOTO: OREGON DOT

Mileage charging is an option—but a controversial one—to increase transportation revenue. A mileage counting computer underwent trials in Oregon.

stantial improvements in vehicle fuel economy, along with other improvements, will offset the demands of expected growth in population and economic activities. For this reason, proposed legislation has targeted additional reductions from the transportation sector through policies that would reduce demand for the most fuel-intensive modes.

Transportation contributes significantly to total GHG emissions and to energy dependence, but it also contributes to economic and social well-being. Careful selection of policies to reduce or shift demand will help to avoid or minimize losses to the economy and society. Yet the effectiveness, costs, feasibility, and acceptability of various policies to mitigate transportation's GHG emissions and energy consumption are not well understood.

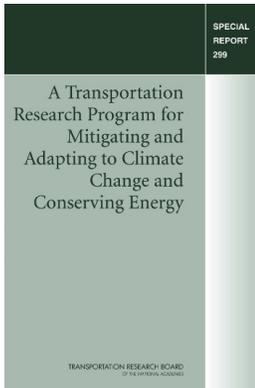
Also not well understood are policies and practices that should be considered for adapting the transportation system to changes in precipitation, flooding, storm surges, and wind loadings that are likely to occur with climate change. The cost of adapting infrastructure is high, as is the uncertainty about the timing, magnitude, and location of the risks.

Developing Guidance

Federal, state, and local policy makers need informed



PHOTO: FEDERAL EMERGENCY MANAGEMENT AGENCY



Special Report 299, *A Transportation Research Program for Mitigating and Adapting to Climate Change and Conserving Energy*, is available from the TRB online bookstore, www.trb.org/bookstore; to view the book online, go to <http://onlinepubs.trb.org/onlinepubs/sr/sr299.pdf>.

guidance about the effectiveness, costs, feasibility, and acceptability of transportation mitigation and adaptation strategies. The committee that prepared Special Report 299, *A Transportation Research Program for Mitigating and Adapting to Climate Change and Conserving Energy*, recommends making a modest investment of \$40 million to \$45 million annually to develop the best guidance quickly, working from available information, and then to improve the guidance as new research is completed (Table 1, right).

The investment represents approximately 9 percent of current U.S. Department of Transportation research spending on surface modes. Yet because of the importance of making policy choices that produce the most benefit for the least harm, the investment could pay substantial long-term dividends.

The committee's research cost estimate is an approximation, to give the U.S. Congress a sense of the level of investment needed. The topics suggested for research in the report are preliminary and should be refined by convening expert and practitioner stakeholders early on to develop more detailed plans and more refined estimates of investment needs.

To be most effective, the research should be guided by the following principles:

- ◆ The topics should relate directly to the needs of federal, state, and local transportation policy makers;
- ◆ Funding should be awarded through open competition, with a merit review of the proposals by peers; and
- ◆ Results should be evaluated by expert and practitioner stakeholders.

Program managers should have the flexibility to shift areas of investment as knowledge is developed. An independent group reporting directly to Congress should evaluate the program regularly.

Effective Strategies

One of the most effective mitigation strategies would

TABLE 1 Estimated Cost of Mitigation and Adaptation Research Programs (\$ millions)

Program	6-Year Total	Annual Average
Mitigation^a		
Guidance and outreach	60.0	10
Fundamental research	130.0	21.7
Subtotal	190.0	31.7
Adaptation		
Research	60.0	10
Total	250.0	41.7

^a The mitigation research cost estimate does not include the cost of collecting travel data for research and improved modeling or the cost of a mileage-charging demonstration program.

be to tax or charge for use of the system in ways that more closely reflect economic, social, and environmental costs. Charging for mileage traveled on all roads could make this possible and could supplement or replace taxes on fuels that currently generate revenues for highway and transit infrastructure.

Fuel taxes have become unreliable revenue generators, and this unreliability will grow as vehicle fuel economy improves. Although mileage charging shows promise, it is controversial because of concerns about privacy, equity, and administrative costs. The committee joins other groups—including two congressional commissions—that have called for investing in an aggressive demonstration program to test alternative concepts and address concerns. The total cost probably would be \$70 million to \$100 million for a multiyear project.

Researching and analyzing cost-effective strategies for reducing GHG emissions will depend on the quality of the data. The data available for national-level estimates of passenger and freight travel are useful but are too crude to guide the detailed analysis and planning to inform decisions about the best strategies at the state and local levels.

Much of the data also could be used for statewide and metropolitan area planning, could improve compliance with other environmental policy goals, and would be essential if the next surface transportation reauthorization includes performance standards. The committee recommends that Congress authorize funding to collect data adequate to meet the needs of federal, state, and local governments for analyzing options and planning for mitigation strategies.

Climate change and energy dependence will remain major problems for decades. Transportation's contributions to these problems must be addressed, but the wrong policies could impose significant costs without gaining the intended effects. The research programs identified in this report represent the topics of greatest importance for informing the best choices in coming years.

Committee for Study on Transportation Research Programs to Address Energy and Climate Change

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TRB Special Task Force Produces Climate Change Primer and Research Needs Statements

MARK R. NORMAN

The TRB Special Task Force (STF) on Climate Change and Energy has prepared two new reports, available online as e-circulars:

◆ The *Modal Primer on Greenhouse Gas and Energy Issues for Transportation*, written by volunteer teams from throughout the transportation industry and edited by Peter Bryn, Sea-River Maritime, Inc., contains brief but informative overviews of climate change and energy issues for the primary transportation modes.^a

◆ *Research Needs Statements for Climate Change and Transportation* assembles approximately 40 research needs statements to assist universities, students, research organizations, government agencies, and other interested parties in selecting, conducting, and funding projects.^b

The authoring teams for the chapters of the modal primer come from a variety of backgrounds. Each team produced an educational discussion of the status and future of a mode in relation to greenhouse gas emissions and energy use; the goal was to provide an inclusive, informed, and objective overview. The chapters are not position papers or advocacy documents—each presents a spectrum of viewpoints, from academics and researchers to practitioners and policy makers.

Several TRB groups were involved in assembling the e-circular of research needs statements:

- ◆ The STF, which took the lead;
- ◆ The Transportation Energy Committee, the Alternative Transportation Fuels and Technology Committee, and their Climate Change Joint Subcommittee; and
- ◆ The Transportation and Sustainability Committee.

Face-to-face meetings, conference calls, a workshop, and a collaborative website provided opportunities to propose, develop, critique, and revise the research needs statements. The participants drew from work that has identified research themes for the mitigation of transportation's impact on climate change and the adaptation of transportation to climate change.

The statements constitute a robust supplement to the

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PHOTO: CARLE RISSON, TRB

Members of the Special Task Force for Climate Change at the 2009 TRB Annual Meeting.

topics that already had been posted in the area of transportation and climate change in the TRB Research Needs Statements database.^c The new statements also provide more specifics for the themes identified in

Special Report 299, *A Transportation Research Program for Mitigating and Adapting to Climate Change and Conserving Energy*.^d A key area not discussed in either e-circular is climate change adaptation, to avoid redundancy with the adaptation-focused TRB Special Report 290, *The Potential Impacts of Climate Change on U.S. Transportation*.^e

Established in January 2008, the STF coordinates activities related to climate change and energy and facilitates communications among TRB standing committees. The STF augments the work of committees on climate change and energy and maintains a road map for ongoing and potential TRB initiatives. The STF reports directly to the TRB Technical Activities Council; Marcy Schwartz, CH2M Hill, was the initial chair during the first 2 years of the STF, succeeded in April by Cochairs Robert Noland, Rutgers University, and James M. Sime, Connecticut Department of Transportation. Membership is drawn from TRB committees with strong interest in climate change and energy issues, supplemented by members-at-large, including subject matter specialists from constituencies outside TRB.

^a Circular E-C 143, <http://onlinepubs.trb.org/onlinepubs/circulars/ec143.pdf>.

^b Circular E-C 144, <http://onlinepubs.trb.org/onlinepubs/circulars/ec144.pdf>.

^c <http://rns.trb.org/>.

^d <http://onlinepubs.trb.org/onlinepubs/sr/sr299.pdf>.

^e <http://onlinepubs.trb.org/onlinepubs/sr/sr290.pdf>.