

# Framing Surface Transportation Research for the Nation's Future

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**D**espite major progress in U.S. transportation systems and services since the 1950s and 1960s, improvements are needed to ensure competitiveness in the global marketplace and to enhance quality of life. Research plays a major role in addressing the challenges facing U.S. surface transportation.

The Transportation Research Board's (TRB's) Special Report 313, *Framing Surface Transportation Research for the Nation's Future*, explores opportunities for improving the productivity of U.S. expenditures on surface transportation research by building on lessons learned from transportation research in other countries and from research in nontransportation sectors in the United States. According to the committee that produced the report (see box, page 35), the timely development of a new national research framework that engages the public, private, academic, and nonprofit sectors and draws on the nation's research capacity in academia, industry, and elsewhere is needed.

## U.S. Research Enterprise

Research has informed many major improvements and policy innovations in surface transportation in the United States: safer and more fuel-efficient automobiles, more durable and economical pavement designs, real-time tracking of cargo shipments, and a resurgence of freight rail after the deregulation of the railroad industry, to cite a few examples. The U.S. surface transportation research enterprise is characterized by a diversity of participants, activities, and funding sources and is highly decentralized, with most research programs initiated from the bottom up. As a result, much of current research aims at specific problems identified by sponsors and is relatively short term, applied, and focused on individual modes such as highway or rail.

Leaders within the transportation community have questioned whether the U.S. approach to surface transportation research will yield the kinds of innovations in transportation services and policies needed to support national goals for economic devel-

The National Renewable Energy Laboratory debuts an energy-efficient parking garage, with charging stations for electric vehicles. Research in fuel efficiency for vehicles and infrastructure could benefit from a nationally coordinated framework, according to a TRB policy study.



PHOTO: DENNIS SCHROEDER, NREL



PHOTO: SOLEA, FLICKR

A goods train carries a variety of containers through the Rocky Mountains in the western United States. Research has assisted the boom in rail freight since industry deregulation in 1980; a cohesive national framework could strengthen links to societal goals.

opment, safety, mobility, competitiveness, and sustainability in the 21st century.

The current research enterprise frequently lacks clear links to national goals. The tendency is to focus on solving narrowly defined problems at the expense of basic and advanced research that could form the basis for exploring broader crosscutting issues and for developing innovative solutions to long-term challenges. Moreover, because research activities remain largely uncoordinated and fragmented, the integrative systems-level research needed to support national goals receives insufficient attention.

The policies of competitors in Europe and Asia emphasize transportation research as a vital means of achieving economic, societal, and environmental goals. Many European and Asian nations have established effective frameworks for prioritizing, funding, assembling, and coordinating research activities.

## Scope of the Study

In 2008, U.S. transportation research experts undertook a scanning tour of European and Asian countries. The experience highlighted the potential of alternative frameworks for improving the effectiveness of transportation research in the United States.

Subsequently, the state departments of transportation (DOTs) asked TRB, through the National Cooperative Highway Research Program, to convene an expert committee for a follow-on assignment: to describe and evaluate potential frameworks and institutional models for surface transportation research in the United States, drawing on experience in the transportation sector internationally and in nontransportation sectors domestically.

To keep the task within the allocated resources, the committee focused on highways, rail, and public transportation and excluded pipelines, inland waterways, and coastal shipping, although these modes conventionally are included within surface transportation.

## Framework Advantages

Innovations in surface transportation are needed to support the economic growth of the United States, strengthen its global competitiveness, and enhance its inhabitants' quality of life. The United States, however, lacks a cohesive national framework to link surface transportation research activities to societal goals. Without a framework, U.S. surface transportation research tends to be organized by mode, funding source, federal government department, and other arbitrary groupings.



PHOTO: LAURIA SANDOZ, PEDESTRIAN AND BICYCLE INFORMATION CENTER

Pedestrian traffic in London, United Kingdom. Development of sustainable urban mobility plans is one of the topics explored in the European Commission's transportation research frameworks.



A cohesive national framework would strengthen U.S. surface transportation research by establishing a holistic approach to problem solving and by building greater connectivity between researchers and research activities. To help create a framework, the committee considered the desirable attributes, devised a concept, and recommended the necessary steps to develop the concept.

## Recommended Steps

No “silver bullet” solution could rapidly transform the current fragmented and ad hoc national research framework for surface transportation into a more cohesive alternative. Instead, a series of steps over a period of years will be needed, both to engage a broad spectrum of interested groups and to implement strategies for making more effective use of the nation’s extensive research capabilities.

Taking the initial steps without delay is essential, because of the growing and changing demands on the nation’s transportation, the ever-increasing pressure on research budgets, the need to use research funds wisely, and the emphasis that many U.S. competitors have placed on transportation research. Figure 1 (at right) schematically illustrates the proposed steps to a new national research framework.

### Convening a Summit

The committee recommends launching an initiative to establish a new framework for U.S. surface transportation research without delay. A group of influential organizations led by the American Association of State Highway and Transportation Officials’ (AASHTO’s) Standing Committee on Research and composed of representatives from the public, private, academic, and nonprofit sectors should launch the initiative.

The leadership group would market the potential advantages of a cohesive research framework to a broad spectrum of public, private, academic, and nonprofit organizations; raise funding for a national surface transportation summit; and appoint a convener for the summit, which would use the framework concept to explore effective strategies for addressing major challenges in surface transportation research.

The summit would engage a broad range of interested parties, including representatives from entities outside the traditional transportation research community, such as the information technology and communications industries. The committee recommends that the summit convener issue a report to the leadership group on the outcomes of the summit. This report would address two important questions:



◆ Which group or organization should take the lead in furthering the framework initiative after the summit?

◆ How will the initiative be funded?

**FIGURE 1** Steps leading to a new national research framework.

### The Federal Role

The committee also recommends that the federal government take actions to support the transition to a new national research framework for surface transportation. These actions would help build a more productive federal research enterprise.

## Committee on National Research Frameworks: Application to Transportation

**Sue McNeil**, University of Delaware, Newark, *Chair*

**William L. Ball**, Merriweather Advisors, LLC, Grosse Pointe Farms, Michigan

**Irwin Feller**, Pennsylvania State University (emeritus), State College

**Robert E. Gallamore**, Gallamore Group, LLC, Rehoboth Beach, Delaware

**Genevieve Giuliano**, University of Southern California, Los Angeles

**David L. Huft**, South Dakota Department of Transportation, Pierre

**Dennis C. Judycki**, Federal Highway Administration (retired), Annandale, Virginia, and Red River, New Mexico

**Tschangho John Kim**, University of Illinois at Urbana–Champaign (emeritus), Fairfax, Virginia

**Laurie G. McGinnis**, University of Minnesota, Minneapolis

**Herbert H. Richardson**, Texas A&M Transportation Institute (emeritus), College Station

**Peter F. Sweatman**, University of Michigan, Ann Arbor

**Nigel H. M. Wilson**, Massachusetts Institute of Technology, Cambridge



Study committee member Genevieve Giuliano presents findings from Special Report 313 to the TRB Executive Committee, January 2014.

U.S. DOT has primary responsibility for the health of the nation's transportation system, but other federal departments, such as the Departments of Energy and Defense, also devote considerable resources to research related to surface transportation in support of their missions. To make better use of federal resources, the White House Office of Science and Technology Policy should create a task force to explore potential synergies and gains from greater coordination between the agencies.

To play a key role in the new national research framework, as appropriate to its mission, U.S. DOT will need to strengthen its research culture and capacity. In addition, the department should engage more fully with the research community; this would help it leverage the investments in technical and policy areas by other federal departments, as well as by the states, industry, and academia.

One option for the Secretary of Transportation to consider in furthering progress toward these objectives is to establish the position of chief scientist within the Office of the Secretary. This individual could serve as a science and technology adviser to the secretary and as U.S. DOT's champion for research.

Finally, federally funded research should more explicitly and intensively explore high-risk, high-payoff opportunities for quantum leaps in transportation performance. The committee recommends



TRB Special Report 313, *Framing Surface Transportation Research for the Nation's Future*, is available from the TRB online bookstore, [www.trb.org/bookstore](http://www.trb.org/bookstore); to view the book online, go to [www.trb.org/Publications/Blurbs/169932.aspx](http://www.trb.org/Publications/Blurbs/169932.aspx).

establishing a broad and robust program of basic and advanced research encompassing the many disciplines relevant to surface transportation.

## Supporting National Goals

Replacing the current fragmented assemblage of activities and funding with a more cohesive research framework is not without challenges. For example, no current organization or research group could effectively fill the multimodal leadership, stewardship, and funding roles for the framework.

By working together, however, surface transportation leaders and the research community have an opportunity to build a more productive research enterprise in support of national goals. The result will be a more cohesive and coordinated national research framework.



PHOTO: U.S. DEPARTMENT OF ENERGY

Participants in the 2013 Argonne Sustainability Teachers Workshop view research on energy efficiency at the U.S. Department of Energy's Argonne National Laboratory. The Department of Energy devotes considerable resources to research related to surface transportation.