TR NEWS

NUMBER 271 NOVEMBER–DECEMBER 2010

TRB 90TH Anniversary PERSPECTIVES

FEATURES

3

18

26

COVER: TRB is celebrating 90 years of growth and achievement in guiding, managing, and disseminating research and its applications in the service of transportation.

TR NEWS

features articles on innovative and timely research and development activities in all modes of transportation. Brief news items of interest to the transportation community are also included, along with profiles of transportation professionals, meeting announcements, summaries of new publications, and news of Transportation Research Board activities.

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The Transportation Research Board's 2010 Annual Report is included in this issue as a special insert between pages 24 and 25.

ALSO IN THIS ISSUE:

COMING NEXT ISSUE

The University Transportation Centers program, administered by the Research and Innovative Technology Administration, is a federal investment in transportation research, education, and workforce development; a feature article in the January–February 2011 *TR News* presents case studies of successful, problem-solving collaborations between the centers and state DOTs. In an annual mainstay feature, TRB Technical Activities program officers report on a range of state-related developments observed firsthand during field visits to state and regional transportation agencies and universities in 2010. A technical article reviews the safety and noise-reduction benefits of porous asphalt roadways in the Netherlands.

Researchers for Rijkswaterstaat, which manages the Netherlands' road network, make friction measurements of braking deceleration with blocked wheels on a new porous asphalt surface.

Trends and Fundamentals

Guiding TRB to Its 2020 Centennial—and Beyond

ROBERT E. SKINNER, Jr.

The author is Executive Director of the Transportation Research Board.

Anniversaries are important. They provide an opportunity to celebrate the achievements of the past and to contemplate the challenges and opportunities ahead. The Transportation Research Board (TRB) marked its 90th anniversary this year and convenes its 90th Annual Meeting in January 2011. This is not a gold or diamond anniversary, and TRB is still a decade shy of its centennial. But for any organization, reaching 90 years is a significant milestone, and a portion of this issue of *TR News* is devoted to reflections about TRB's past and future.

An essay by Thomas B. Deen, Executive Director from 1980 to 1994, reviews TRB's historical milestones and describes the unique role that the organization plays in our nation's transportation enterprise. Tom's reminiscences resonate with anyone who has struggled to explain TRB to friends and family who are not part of the transportation community. Included with his article are brief comments from a selection of TRB participants about what TRB has meant to transportation or to their own careers.

Their statements would gratify the farsighted founders of TRB. Farsighted though they were, when the founders gathered for the first Annual Meeting in January 1922, they could not have imagined how our transportation systems would evolve during the next 90 years or the role that TRB would play.

This major anniversary offers a good occasion to contemplate the future and to speculate about what lies ahead for TRB in the next decade. The older one becomes, the closer a 10-year horizon appears; to me, therefore, this is less speculation and more an acknowledgment of trends already under way, likely to continue, and—in some cases—certain to accelerate in the coming decade. It is also a recognition of fundamentals that have held true in the past and are likely to hold true in the future.

Although the technology employed by TRB committee members and Annual Meeting participants has changed between the 50th Annual Meeting in 1971 (*above*) and more recent Annual Meetings (*below*), the core mission of the Transportation Research Board remains the same.

TRB's core activities—the Annual Meeting, standing technical committees, publications, and databases—will be as vital to the U.S. transportation community as ever.

These activities support the exchange of information on transportation research and practice, date from TRB's beginnings, and are the foundation on which TRB's other programs have been built. Even in

Photo at left: Duke University Rare Book, Manuscript, and Special Collections Library

Accelerated construction innovations, such as self-propelled modular transporters used to build a bridge near Salt Lake City, Utah (*above*), are among the new technologies and techniques explored by TRB standing committees and adopted into practice. Since 1920, TRB has worked for the application of research results; (*left*) the Lincoln Highway near the Pennsylvania Tunnel, ca. 1921.

an electronic age, face-to-face interactions among researchers and practitioners in formal and informal settings are an essential component in the processes of innovation and career development.

In difficult economic times, attendance at the Annual Meeting has remained strong, as has the demand for standing committee membership. This is fortunate for TRB's research and policy study programs, which rely on these core activities to provide the technical talent for project committees and panels, connections to universities and other research institutions, and outlets for project findings and recommendations.

TRB's committees draw on the expertise and collegial synergy of transportation professionals from a variety of disciplines.

The current ways through which TRB interacts with its participants and delivers information will be supplemented and sometimes replaced by new information and communication technologies.

E-newsletters, webinars, and web-only publications have become a regular part of TRB dissemination activities. These vehicles make TRB products and information more accessible and—in the case of webinars—represent a meaningful step toward virtual conferences. The details and timing for this development are unclear, but the course is set—the onset of new information and communication technologies and the new capabilities they provide will continue for many years, and TRB must take advantage of them.

In some cases, TRB will adopt technologies at more or less the same pace as the technical and business communities, as with the use of e-mail and the Internet. I do not foresee TRB getting ahead of the communities it serves in moving to electronic-only

publication, although that day is coming. Social networking offers promising new opportunities, which TRB has not yet begun to exploit fully.

In other cases, we will be early adopters. For example, the growing size of the Annual Meeting and the short cycle for the peer review of papers created powerful incentives for TRB to move to a web-based review process as quickly as possible. Similarly, travel restrictions at many of our sponsors' organizations have created a strong incentive to find ways to provide for meaningful participation without travel. TRB quickly adopted webinars and can be expected to adopt other technologies that support active and effective participation by professionals from their own homes and offices.

In 2006, George Giannopoulos, Hellenic Institute of Transport, Greece (*left*), and TRB Executive Director Robert E. Skinner, Jr., signed a Memorandum of Understanding between the European Conference of Transportation Research Institutes and TRB. International collaboration is a growing focus of TRB.

The pressures to expand the scope and depth of TRB activities will continue.

By the late 1960s, it was apparent that the Highway Research Board could not effectively address highway research and practice without including the other transportation modes in its scope. Too many interests and issues were intertwined among the modes. This was recognized officially in 1974, when Highway was changed to Transportation in the organization's name.

Since then, these intertwined interests and issues have extended well beyond the boundaries of what was once considered transportation, to include a growing list of environmental, community, economic, logistics, security, and emergency response issues. The pressure to involve groups associated with these issues in TRB activities is continual and can be challenging, because many of the groups do not necessarily think of themselves as transportation organizations. Nonetheless, engaging these groups is important, and TRB standing committees and research programs have been effective in drawing them into TRB activities.

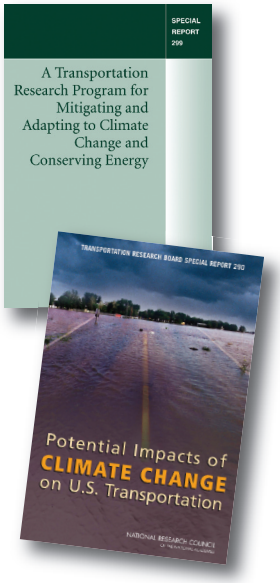
TRB's annual output of publications, both in print and on the web, exceeds 200 titles.

At the same time, TRB is pressured to adjust its standing committee structure and other programs to incorporate new technologies and new approaches. The constant evolution of TRB's committee and program portfolio, crucial to TRB's long-term success, will continue. In the decade ahead, I expect more in-depth treatment at TRB of topics such as nanomaterials, real-time systems to detect the condition of infrastructure components, accelerated construction, and a host of environmental and community design issues.

Energy, environmental, and climate change issues will be at the forefront of TRB's agenda for many years to come.

Some issues wax and wane in importance. They surface, stimulate research, are addressed though some combination of technical and institutional changes, and then fade into the background. This obviously is not the case with the interrelated issues of energy, environment, and climate change that confront our transportation system, our nation, and the world. The issues are too numerous, too complicated, and too far-reaching for simple solutions. Moreover, both our technical understanding of the issues and our societal beliefs about their importance are evolving.

In recent years, these issues have motivated major studies at TRB and the National Academies; have appeared increasingly on the research agendas of TRB's cooperative research programs; and have supplied spotlight themes for Annual Meetings. But developing and implementing transportation strategies for mitigation and adaptation are still in the early stages. Extensive research and intense policy debates will unfold in the years ahead.



The Transit Cooperative Research Program Oversight and Project Selection Committee guides one of TRB's research management programs.

TRB's international outreach will increase.

TRB always has had a presence internationally, in part because of the scale of its Annual Meeting and publications. In the past 10 years, however, a heightened awareness has developed that the United States has much to learn from other countries, that international coordination can leverage resources for research programs, and that issues are increasingly global in nature and require global solutions.

TRB activities have reflected this awareness. TRB is well positioned to facilitate individual collaborations among researchers from multiple countries and to introduce more collaboration at a programmatic level through the research programs it manages.

TRB will continue to provide an attractive institutional environment for research management and special studies.

TRB's institutional home within the National Academies, coupled with its foundational core programs, has led to significant growth in its cooperative research programs, management of the second Strategic Highway Research Program (SHRP 2), and important policy study assignments. The National Academies ensure independence, rigorous quality control, and credibility. TRB's core program provides standing and recognition within the transportation community, as well as connections with transportation professionals working in virtually every mode, discipline, and organizational affiliation involved in transportation.

These activities may not increase in the coming decade, and the scheduled phase-out of SHRP 2 will bring a decline in total TRB activity. Nevertheless, TRB will continue to be one of a select set of organizations that others turn to for conducting special studies and managing stakeholder-driven research programs.

Wild cards will alter strategies.

The past decade has taught us how quickly new concerns can emerge and shift our priorities. The September 11, 2001, terrorist attacks raised transportation security concerns to a new level dramatically and immediately. Hurricane Katrina reintroduced the nation to the importance of emergency response and evacuation preparations and demonstrated the vulnerabilities in the transportation infrastructure of our coastline. The worldwide economic crisis has added a new, complicating twist to transportation finance and has placed extraordinary strains on state and local transportation programs.

To imply that these concerns were not on the radar screen would be wrong, but these events gave the concerns a reality and an urgency that had not existed before. New demands and challenges arose for the transport system and introduced research needs to which TRB and other research organizations have responded. The events of the past decade are a reminder of how tricky the future can be. Further economic turmoil, new crises, or even changes in federal-aid programs that could significantly affect transportation and TRB are not difficult to imagine.

TRB has demonstrated remarkable resiliency and adaptability during its 90-year history. It has flourished in its efforts to remain relevant to the nation's transportation providers and users. The credit goes to our volunteer participants, for contributing their time and talents to promote transportation innovation, and to our sponsors, for investing in a unique organization with payoffs that are difficult to measure but are far-reaching, influencing transportation professionals and agencies around the world.

Photo: Jocelyn Augustino, Federal Emergency Management Agency

Transportation and infrastructure priorities can change dramatically in the face of catastrophic events such as Hurricane Katrina in 2005—transportation research must respond and adjust to these changes.

The Transportation Research Board at 90

Everyone Loves It, but No One Can Explain Why

THOMAS B. DEEN

The author served as eighth Executive Director of TRB, from 1980 to 1994; he continues to work as a transportation consultant in Stevensville, Maryland. His professional achievements are acknowledged through TRB's annual Thomas B. Deen Distinguished Lecture; in 2009, he received the Frank Turner Medal for Lifetime Achievement in Transportation.

It was 1980. TRB was 60 years old. I was 52 and president of a medium-sized transportation planning and engineering firm with offices in several cities in the United States and abroad. My position gave me the opportunity to work on some big projects in interesting places, I was paid well, and life was good. Yet I was considering quitting to become executive director of the Transportation Research Board (TRB)—although that would mean a pay cut.

The decision was difficult and took more than three months of pondering and consultation with family and close friends. Although difficult, the decision turned out to be one of the best I have ever made.

Understanding TRB

The consultations with family and friends, however, raised problems. I couldn't talk to many of my fellow transportation professionals because of the sensitivity of my position. If people in my company had an inkling that I was considering leaving, my leadership would have been impaired and morale would have been damaged.

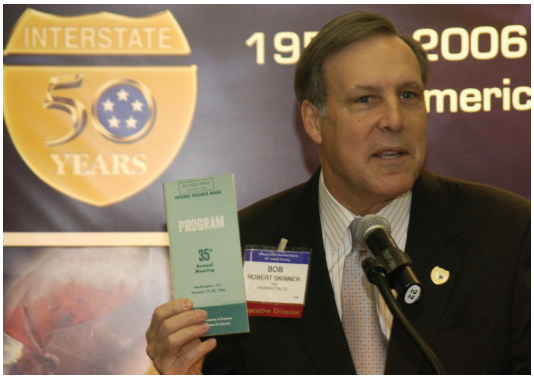
But when I turned to friends outside transportation and talked about TRB, I found it impossible to explain what TRB was. I was almost frantic for advice about a career-changing decision. But that advice was mostly unavailable, because the only people I could consult could not understand why I would accept reduced compensation to run an organization I could not explain.

The conversation would proceed as follows: I would explain that TRB was not a profit-making company or a government agency but a not-for-profit organization. "Was it a foundation, or a think tank, or a college, a church, or something like that?" "No." "Was it a hospital or something like the Boy Scouts or the Red Cross?" "No." "Did it lobby?" "No." TRB was not like anything else, and trying to draw analogies to something familiar did not work.

Essential Node

Part of the problem was that I did not understand TRB either. I was introduced to TRB in 1956, when my entire class at the Yale University Bureau of Highway Traffic came to the annual meeting in a bus. I

The author, in his role as Executive Director, conducts a meeting at the TRB office, circa 1990. In the 28 years before and in the 16 years after his term, he has contributed to the work of many technical and policy study committees.



At a commemoration of the Interstate Highway System's 50th anniversary in 2006, TRB Executive Director Robert E. Skinner, Jr., holds up a program for the 1956 TRB Annual Meeting—the first Annual Meeting that the author attended.

was dazzled by the transportation luminaries of the day addressing matters ranging from engineering to finance. That was the largest meeting I had attended—1,200 people in all—and I was impressed.

In the 24 years since that first meeting, I had participated in various TRB activities; had several of my papers published—one had received a best paper award; made many presentations; and chaired a committee or two. But I knew that TRB did other things that were less familiar to me—somehow it was part of the National Academy of Sciences (NAS); the National Academy of Engineering (NAE) also was a partner, but I had no idea what that meant—or what the National Research Council (NRC) was, and how it fit in.

All I knew was that TRB was a prestigious organization, that I was willing to serve on its committees without compensation, and that I felt good about it. TRB was good for networking; it provided opportunities to learn about aspects of transportation that were less familiar to me—for example, about other modes and how they were organized, financed, planned, and built. I got to know about competing firms, about the jobs they were winning, and about

TRB'S EVOLUTION

Selected Major Milestones

1916 Federal-Aid Road Act provides funding for highway construction by state highway departments on an equal-share, matching basis.

1920 National Advisory Board on Highway Research formed in New York City; Alfred D. Flinn is first Executive Director. The Bureau of Public Roads (BPR) provides initial funding and remains sole funder until 1945, when states assume a large share of the funding for the Board's core program.

1921 First Annual Meeting in New York City: 30 attendees; William K. Hatt appointed second Executive Director; first-year budget of $14,500 approved; six technical committees organized.

1924 Charles M. Upham becomes third Executive Director; establishes contact representatives in each state and many universities. TRB moves into new National Academy of Sciences building on Constitution Avenue, NW, Washington, D.C.

1925 Board is renamed Highway Research Board (HRB).

1928 Roy W. Crum appointed fourth Executive Director; initiates the first Highway Research Information Service; organizes all activities into six major divisions.

1931 HRB publishes first in series of *Highway Research Abstracts*.

1942 HRB issues Wartime Bulletins to provide information on dealing with wartime road problems.

1945 Scope of Board activities expands to include Research Correlation Service (much of today's core program); 41 states subscribe funds for the initial year of operation.

1946 HRB establishes Research Reference Library.

1950 HRB and BPR jointly publish the first *Highway Capacity Manual*; the Board develops and publishes all subsequent editions.

Researchers collect bridge data in the 1955 American Association of State Highway Officials Road Test.

1951 HRB conducts Maryland Road Test to measure the effect of axle loads on pavement stress. Fred Burggraf appointed fifth Executive Director.

1955 American Association of State Highway Officials (AASHO) Road Test, directed by HRB, results in first pavement design guide published by AASHO in 1961; guide is employed in road design nationwide.

1962 National Cooperative Highway Research Program (NCHRP) organized within HRB with funding by state DOTs on a voluntary basis.

1963 First *Highway Research Record,* the Board's peer-reviewed journal, is published.

1964 HRB organizes Department of Legal Studies from Special Committee on Highway Laws. D. Grant Mickle is appointed sixth Executive Director.

1966 HRB launches computer-based bibliographic research information service for highways, forerunner of today's Transportation Research Information Services (TRIS). William N. Carey, Jr., is appointed seventh Executive Director.

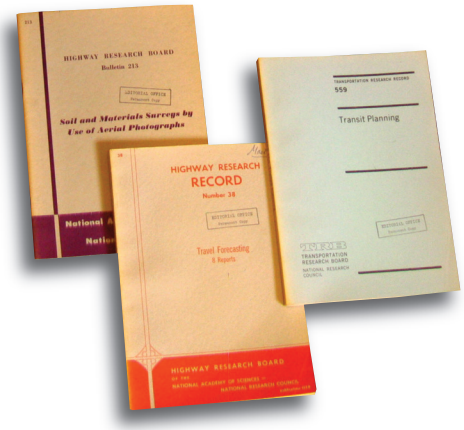
their people—some of whom I might need to hire or team with on a future project.

TRB was a place to find out about new opportunities for our firm. It was an essential node for business networking. But beyond that, I did not understand TRB at all.

Institutional Mystery

When I decided to make the move to TRB, this problem did not end. I had to explain my decision. My parents—both college graduates—never could figure it out. I overheard my mother telling one of her friends that "Tom had taken a new job in Washington, directing traffic." She is still healthy today at 104—and still has no idea what TRB is, despite my 14 years as Executive Director.

Even TRB's name appears designed to obfuscate, not elucidate. A "board" conjures images of 20 peo-



A few of the early Highway Research Bulletins and Highway Research Records—the precursors to the *Transportation Research Record: Journal of the Transportation Research Board*—that included papers by the author.

W. N. Carey, Jr. (center), was TRB Executive Director from 1966 to 1980.

1974 HRB is renamed Transportation Research Board (TRB) in recognition of increasing multimodal interests of the states and federal government.

1980 Reorganization of National Research Council elevates TRB to a major unit. Thomas B. Deen is appointed eighth Executive Director.

1982 Congress requests first in series of studies that make specific policy recommendations.

1984 TRB recommends the first Strategic Highway Research Program (SHRP), which is authorized by Congress and funded by the Federal Highway Administration (FHWA); SHRP produces Superpave®, a revolutionary set of flexible pavement specifications, as well as other highway innovations.

1990 First Innovations Deserving Exploratory Analysis (IDEA) program organized to provide seed money for potentially useful innovations.

1992 Transit Cooperative Research Program is organized within TRB; authorized by Congress with funding from the Federal Transit Administration.

1994 Robert E. Skinner, Jr., is appointed ninth Executive Director. TRB establishes first Internet outreach; by 2010, TRB website is visited more than 3 million times annually.

1999 NRC transfers the Marine Board, which focuses on maritime and inland waterway transportation and related issues, to TRB.

2002 Annual Meeting program adds 35 sessions to address transportation security issues stemming from the September 11, 2001, terrorist attacks. TRB launches Transportation Research E-Newsletter; by 2010, circulation of the free newsletter approaches 40,000.

The Marine Board (above, in a 2008 meeting) became part of TRB in 1999.

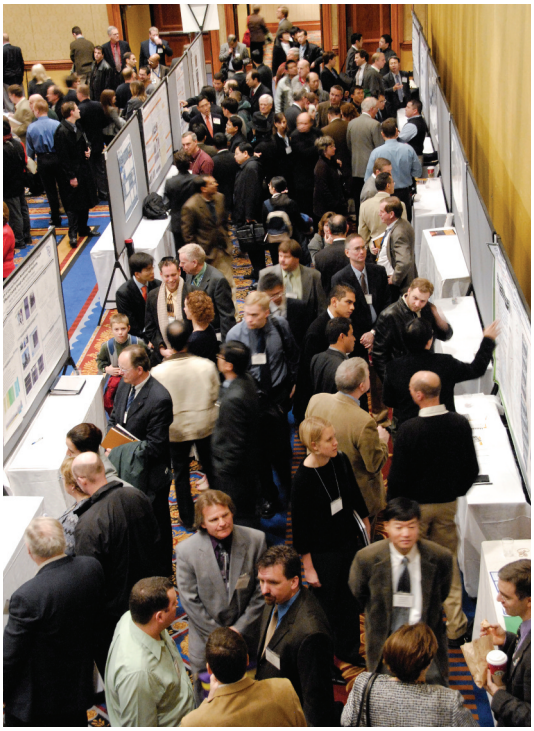
2005 Airport Cooperative Research Program organized within TRB; authorized by Congress and funded by the Federal Aviation Administration.

2006 Second SHRP is established; authorized by Congress and funded by FHWA. Hazardous Materials Cooperative Research Program and National Cooperative Freight Research Program are organized within TRB; the two programs are authorized by Congress and funded by the Pipeline and Hazardous Materials Safety Administration and the Research and Innovative Technology Administration, respectively.

2008 Exhibits from commercial firms debut at Annual Meeting.

2010 National Cooperative Rail Research Program organized within TRB; authorized by Congress and funded by the Federal Railroad Administration.

Through the better part of the 20th century and into the 21st, participation in TRB continues to grow and make essential contributions to advance transportation research and its applications.



ple sitting at a polished table making institutional policies, appointing executives, and establishing budgets—but that does not describe TRB. TRB is an institutional mystery. It is a small jewel in the midst of huge private companies, government agencies, and universities. TRB exerts an influence disproportionate to its size and authority—although it has no authority.

In writing about TRB at earlier anniversaries—the 25th, the 50th, and 75th—my predecessors struggled with the mind-numbing and eye-glazing exercise of explaining what TRB does and how it is organized. The effort necessarily involves a word salad of unfamiliar acronyms—for example: TRB manages several CRPs, the IDEA program, and SHRP 2, and is a division of NRC, which is overseen by NAS, NAE, and IOM.[1] To duck that task, I have assembled a time line (see pages 8–9), so that I can address instead what it is that distinguishes TRB from other organizations and what makes TRB so useful.

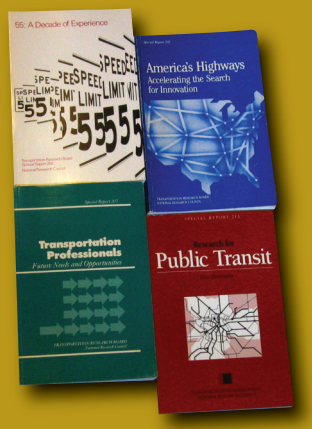
[1] CRPs: Cooperative Research Programs; IDEA: Innovations Deserving Exploratory Analysis; SHRP 2: second Strategic Highway Research Program; IOM: Institute of Medicine.

Significant Policy Studies
Informing Decision Makers

1984 *America's Highways: Accelerating the Search for Innovation* (Special Report 202)

1987 *Zero Alcohol and Other Options: Limits for Truck and Bus Drivers* (Special Report 216)

1989 *Improving School Bus Safety* (Special Report 222)



1991 *In Pursuit of Speed: New Options for Intercity Passenger Transport* (Special Report 233)

1991 *Data for Decisions: Requirements for National Transportation Policy Making* (Special Report 234)

1994 *Curbing Gridlock: Peak Period Fees to Relieve Traffic Congestion* (Special Report 242)

1997 *Toward a Sustainable Future: Addressing the Long-Term Effects of Motor Vehicle Transportation on Climate and Ecology* (Special Report 251)

1999 *Entry and Competition in the U.S. Airline Industry: Issues and Opportunities* (Special Report 255)

2001 *Making Transit Work: Insight from Europe, Canada, and the United States* (Special Report 257)

2002 *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards* (National Research Council)

2004 *The Marine Transportation System and the Federal Role: Measuring Performance, Targeting Improvement* (Special Report 279)

2006 *Going the Distance? The Safe Transport of Spent Nuclear Fuel and High-Level Radioactive Waste in the United States* (National Research Council)

2006 *The Fuel Tax and Alternatives for Transportation Funding* (Special Report 285)

2008 *Potential Impacts of Climate Change on U.S. Transportation* (Special Report 290)

2009 *Driving and the Built Environment: Effects of Compact Development on Motorized Travel, Energy Use, and CO_2 Emissions* (Special Report 298)

2010 *Achieving Traffic Safety Goals in the United States: Lessons from Other Nations* (Special Report 300)

Surviving the Cycles

As TRB celebrates its 90th anniversary, many U.S. institutions are suffering from real or perceived shortcomings. Our nation and the world are undergoing the most severe economic contraction since the Great Depression. We are trying to find our way out of two wars on the other side of the globe.

Most citizens still believe in our system of free-market capitalism, but its recent, unbridled excesses seem to cause great suffering as it lurches from boom to bust in never-ending cycles. Government seems unable to stem these swings and sometimes appears to be the captive of corporations and special interests, while increasing public debt to record and probably unsustainable levels.

The lobbying industry flourishes even as the economy struggles, and Congress often seems paralyzed by the tidal waves of money from K Street to Capitol Hill. Our schools are unable to educate our young, and our health care system costs more and does less than the systems in other countries. Polls show that confidence in our institutions is at an all-time low, with no clear path to reform.

Despite the public's skepticism about institutions, TRB seems to grow and to maintain the confidence of its sponsors and of its larger constituency, and the transportation industry continues to find new issues and problems for TRB to address. I often have marveled how in 1920 a few leaders organized a tiny unit, complex in its setting, that has survived the Great Depression, World War II, the Cold War, several smaller wars, and many cycles of boom and bust, and has grown through it all.

Yet TRB manufactures no products, cannot levy taxes, and depends on the voluntary participation and contributions of organizations and individuals. Despite its name, TRB performs little or no research on its own. Its methods are often slow and ponderous, and it sometimes seems bound by arcane rules and strictures imposed by its overseers, who seem more interested in its processes than in the substance of its work.

Origin and Mission

TRB's uniqueness reflects its origin and mission. Organized in response to a need identified by state and federal highway agencies, the Board provided a mechanism for the exchange of information and research results about highway technology when the states were setting out on the unprecedented task of designing and constructing a national highway system.

TRB has relied on and benefited from a special partnership with the states and the federal government. The organization fulfilled its original mission beyond anything its founders could have imagined, and it has added services over the years, including research management and policy studies.

I often have wondered why other economic sectors or other countries have not formed TRB-like organizations. For example, education and health care, like transportation, are large in scope, highly decentralized, depend on the effective collaboration of federal, state, and local government, and are vital to the national welfare. They also are composed of public and private interests.

A delegation of Iraqi transportation professionals attended the TRB Annual Meeting in 2008, and were greeted by former U.S. Secretary of Transportation Norman Y. Mineta (*fourth from left*) and 2008 Executive Committee Chair Debra Miller (*fifth from right*). Annual Meeting attendance from overseas continues to increase.

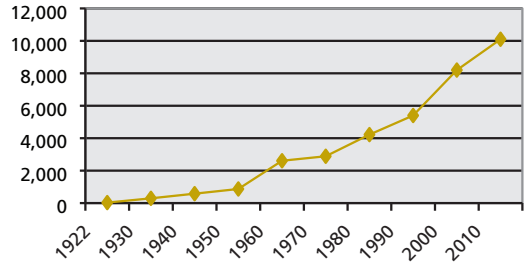


FIGURE 1 TRB Annual Meeting attendance, 1922–2010.

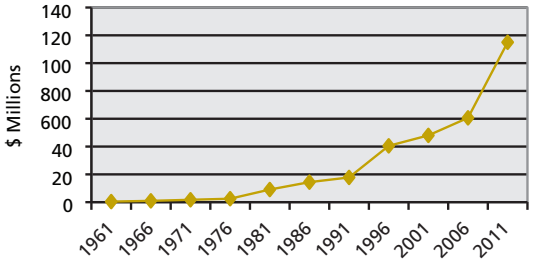


FIGURE 2 TRB budgeted expenditures, 1961–2011.

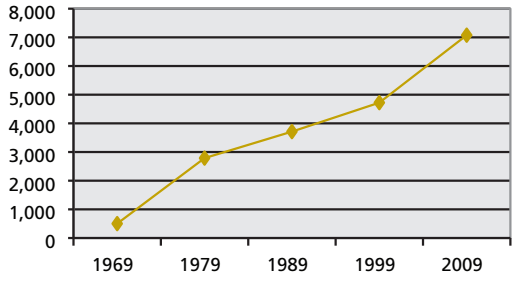


FIGURE 3 Number of TRB committee members, 1969–2009.

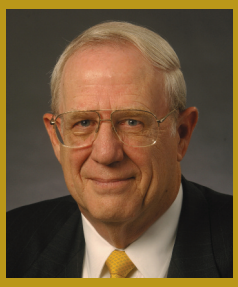
A meeting of the first Strategic Highway Research Program (SHRP) task force in 1986 (*above*). The success of SHRP led to the establishment of a second program, SHRP 2, in 2006 (*right*), a partnership with the federal government and states.

More than once, representatives from both of these sectors visited with me at TRB—they had heard of TRB's vital work for transportation and sought to organize an Education Research Board or a Health Care Research Board modeled after TRB. The attempts have not been successful. Perhaps the appearance of a newcomer would threaten too many organizations in health and in education; or perhaps creating and funding a complicated organization of any kind today is too difficult.

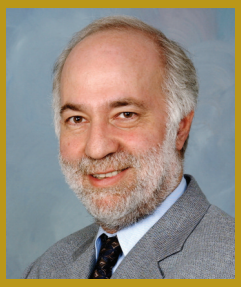
Foreign countries also have attempted to emulate and organize TRB-like entities for their transportation sectors. Foreign experts increasingly attend TRB's annual meeting and participate in sessions and projects, as the global economy and the issues of energy, climate change, and transportation cross over national borders.

Milestones and Statistics

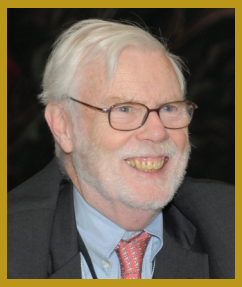
The time line illustrates TRB's trajectory over the



Wilding



Sperling



Downey

Kassoff

Scott

TRB strikes a remarkable balance, supporting sound, imaginative, collaborative research through a structure that keeps the process moving forward, free of extraneous influences. TRB makes me aware of how much about our fields—in my case, aviation—we have yet to discover, while providing a rewarding opportunity to learn and to contribute.

—James A. Wilding
Former President, Metropolitan Washington Airports Authority; Chair, Airport Cooperative Research Program Oversight Committee; former member, TRB Executive Committee

TRB is a national treasure. It is the focal point for the entire transportation research community in the United States and increasingly for international initiatives. I have attended every Annual Meeting for 27 years, served on many committees and chaired two, and I look forward to many more years of benefiting from the many activities TRB sponsors.

—Daniel Sperling
Director, Institute of Transportation Studies, University of California, Davis; member, TRB Executive Committee

Congratulations to TRB on its 90 years of service to the transportation community. From my first participation in sessions at the Highway Research Board until now, I always have taken away more useful knowledge from a TRB event than I brought in. The work of the TRB staff and the thousands of volunteers is at the heart of the innovation we need to solve America's transportation issues. Where would we be without TRB?

—Mortimer L. Downey
Former Deputy Secretary, U.S. Department of Transportation; former member, TRB Executive Committee; 2001 Recipient, Frank Turner Medal for Lifetime Achievement in Transportation

The annual TRB gathering has become the world's premier event for transportation professionals. I don't know of a close second. It has evolved into the ultimate experience for hatching new ideas, networking among professionals, and debating what is on the leading edge or the next big thing. TRB is the ultimate outreach organization, providing countless opportunities for career enrichment and growth. For a 90-year-old institution, it has amazing powers to attract budding generations of transportation professionals. If there is one model of sustainability in our industry, it is TRB.

—Hal Kassoff
Senior Vice President and Highway Market Leader, Parsons Brinckerhoff; former Administrator, Maryland Department of Transportation's State Highway Administration

On a personal and professional level, my TRB participation helps

past 90 years, with emphasis on the 15 years since the 75th anniversary. Selected milestones include the 1920 creation of the National Advisory Board on Highway Research, which later morphed into TRB. Space precludes listing many other significant events, but the organization repeatedly responded as needs arose and technology provided innovative ways to serve transportation.

New committees, new modes, new programs, new publications, computers, and the Internet make their appearances. These changes have accelerated, as transit, railroads, aviation, highway freight, and marine transportation, along with crosscutting concerns—such as the environment, energy conservation, safety, electronics, and a range of economic issues—have increased in importance for TRB, without diminishing its traditional service to highway infrastructure.

Annual Meeting attendance, budgeted expenditures, and numbers of committee members show these trends in statistical terms (Figures 1–3, page 11). TRB's annual meeting is one of the largest in Washington, D.C., with attendance exceeding 10,000 in recent years, after steady growth through good times and bad. Similar growth can be seen in TRB's budget and in the numbers of people serving on committees.

For the first time in 2008, commercial businesses sponsored exhibit booths at the Annual Meeting. This exhibit from Cardinal Systems, LLC, featured an interactive demonstration.

Spending more money in troubled times is not necessarily a virtue but indicates that agencies large and small, public and private, are relying on TRB to accomplish necessary work. Annual Meeting sessions and workshops have increased by 100 percent in the past 15 years, the numbers of presentations have increased by 114 percent, and the numbers of papers overseen in peer review have increased by

Borrone

Butler

Sussman

Martinovich

Mendez

to stretch and round me out. I enjoy interacting with the young professionals who are coming into our industry—I appreciate TRB's efforts in this area. I always seek the best available data—whether on current best practices or on strategic thinking about new ideas, future directions, and trends. Quality information is the key to effective decision making. Participating in TRB and the work it produces helps me to keep current.

—Beverly A. Scott
General Manager and Chief Executive Officer, Metropolitan Atlanta Rapid Transit Authority; member, TRB Executive Committee

Like many others in the transportation industry community in the United States and internationally, I have benefited professionally and personally from TRB's products and from active involvement with committees and at conferences, workshops, and Annual Meetings. Starting as a highway-oriented research organization, TRB has evolved into one of the few key international institutions for cross-modal national and international research, idea development, skill development, and policy networking for transportation practitioners and educators. By encouraging and embracing diversity, TRB is truly a center for lifelong learning, as well as a place through which we can contribute to the common good at every stage of our careers.

—Lillian C. Borrone
Chairman, Board of Directors, Eno Transportation Foundation; former Assistant Executive Director, Port Authority of New York and New Jersey; former Chair, TRB Executive Committee

As a private-sector practitioner in the freight rail industry, I was honored by the invitation to join the TRB Executive Committee. At the same time, however, I was somewhat skeptical about the value of my participation in a research organization that appeared to be filled with academics and public-sector officials with a strong bias to highway issues. My first review of TRB's *Critical Issues in Transportation* relieved me of that misconception; congestion, infrastructure, and institutions—among other critical issues—are as relevant to the rail industry as to other modes. Many important transportation issues face our nation today; no other forum gives voice to all of the stakeholders as effectively as TRB.

—Deborah H. Butler
Executive Vice President, Planning, and Chief Information Officer, Norfolk Southern Corporation; member, TRB Executive Committee

I have benefited extraordinarily from my involvement with TRB—through service as Chair of the Executive Committee and through other activities—but I prefer to highlight the impact that

(continued on next page)

All of the past four U.S. Transportation Secretaries have participated in one or more TRB Annual Meetings—(*top row from left*) Rodney E. Slater (1997–2001), Norman Y. Mineta (2001–2006), (*bottom row from left*) Mary E. Peters (2006–2009), and Ray LaHood (2009–present).

154 percent—yet TRB has never made growth an explicit goal. The Board has responded to sponsor needs for comprehensive coverage of transportation issues, which have expanded over the years.

Launches and Mainstays

These growth statistics are the result of expansion into the full range of transportation modes, as well as an expansion of the services and programs provided by TRB. Two decades ago, TRB launched its series of policy studies, which draw conclusions and make recommendations on timely and sometimes contentious issues.

Many of the studies are conducted at the request of Congress or the federal government. One recommended the establishment of the first Strategic Highway Research Program (SHRP), now completed. SHRP was highly regarded as a successful approach to highway innovation, and Congress followed it up with SHRP 2, currently in progress. The Innovations Deserving Exploratory Analysis or IDEA program started under SHRP and has expanded beyond roads to include bridges, rail, transit, and motor carrier transportation.

New cooperative research programs similarly have expanded beyond roads to conduct practical research for transit, airports, hazardous materials, freight transportation, and most recently, rail transportation. These contract research programs have accounted for much of TRB's budget growth.

After the September 11, 2001, terrorist attacks, transportation security gained new emphasis. The Internet has provided new modes of outreach, including an expanded website, the Transportation Research E-Newsletter, a webinar series, a Twitter page, and the online Transportation Research Information Services.

In 2008, commercial firms were invited to present exhibits at the Annual Meeting; with sponsor exhibits, the number of booths reached 200 in 2010. Meanwhile, the more traditional publications programs also have grown—published titles have increased by 124 percent in the past 13 years.

Information and Trust

What is it about TRB that has allowed it to flourish for an extended period, regardless of the external circumstances, when few fully understand it, and

(continued from page 13)

TRB has had on transportation students at the Massachusetts Institute of Technology. The TRB Annual Meeting often is their first professional exposure to the field outside of academia and has become a rite of passage for our program. These are the new transportation professionals, and TRB's role in their early professional life cannot be overstated.
—Joseph M. Sussman
JR East Professor of Civil and Environmental Engineering and Engineering Systems, Massachusetts Institute of Technology; former Chair, TRB Executive Committee

TRB provides the foundation for collaborative work among all areas of transportation research. The findings of transportation research programs are fundamental for helping states prioritize and maximize limited resources. TRB is a great partnership and a great asset.
—Susan Martinovich
Director, Nevada Department of Transportation; Member, TRB Executive Committee

Millar

Turnbull

Neumann

TRB has become what other organizations can only aspire to be—the go-to forum for the latest body of knowledge and research on all facets of transportation. No other entity brings to bear such an organized and systematic approach to transportation research or such a vibrant forum for exchanging ideas. Without a doubt, TRB is helping set the course for our industry in the 21st century.
—Victor M. Mendez
Administrator, Federal Highway Administration; member, TRB Executive Committee

TRB has been essential to my professional growth and development. Serving on committees, task forces, and as Executive Committee Chair has allowed me to meet people I would not have met and to learn about transportation issues outside my field of expertise. As a reliable source of transportation information and ideas, TRB continues unmatched in the world.
—William W. Millar
President, American Public Transportation Association; member and former Chair, TRB Executive Committee

TRB is truly a community of individuals interested in transportation. Participating in TRB committees, meetings, conferences, and other activities has greatly enriched my professional and personal development. I have met new people, gained long-lasting friendships, and been challenged to take on new responsibilities and to think about innovative approaches to addressing critical issues. Making sure the next generation of transportation professionals has these same opportunities is a priority for me and others.
—Katherine F. Turnbull
Executive Associate Director, Texas Transportation Institute; member, Technical Activities Council

Without question, TRB has been the most rewarding and helpful professional organization I've been involved with throughout my career. The opportunity to address the key policy and research issues facing the transportation industry, coupled with the opportunity to establish personal and professional friendships, has been wonderful. I would urge any young professional to get involved and to stay involved with TRB—the rewards will follow.
—Lance A. Neumann
President, Cambridge Systematics, Inc.

many other institutions are suffering? In an information age, professional success depends on knowing the latest about technology, about which methods work and which do not, and about current trends in funding, regulation, and legislation; success also depends on meeting other professionals who are working on the same problems.

TRB's Annual Meeting has become essential for keeping up in a fast-changing world. Until recently, most DOT modal administrators and the Secretary of Transportation rarely appeared at TRB Annual Meetings, but now it is rare that they don't. Also participating are many state transportation directors and a rising array of private executives. Any entity that wants to display a technology, a new program, a regulation, or other initiative finds the Annual Meeting the only place to gain exposure to nearly everyone in the field.

But the Annual Meeting is more a symptom of TRB's success than a cause. The one quality that most explains TRB's success is trust. TRB treats the issues—large or small, complicated or simple, controversial or benign—with balance, fairness, and competence.

Competing Interests

Transportation is full of competing financial and policy interests. Truck companies compete with railroads and with each other and contend with the states about load limits and taxes. Airlines compete with each other and challenge airport authorities over landing fees and taxes. River traffic competes with railroads and pipelines and struggles with government over user charges for dredging and navigation. Asphalt competes with concrete for pavements, and steel competes with concrete for bridges. The federal government often pressures the states over the distribution and uses of federal gas tax revenues and the imposition of standards. The public interest in safety often seems at odds with the profit interests of transportation providers.

These competing interests are unending and must be resolved in the marketplace, by regulation, or through legislation. Policy makers need unbiased information, and practitioners need to know the results of tests, research, or others' experience to make informed decisions about technical issues.

Ensuring Objectivity

Such an environment needs a clearinghouse to accumulate research and studies; to distinguish facts from opinion; and to distill, discuss, and share knowledge from investigations, under the peer review of unbiased experts. Objective, fact-based analysis is needed to inform the debate over complex issues of transportation policy. TRB provides this—nearly everything TRB does is guided by a committee of the best experts on the particular subject at hand.

Francis B. Francois, former Executive Director of the American Association of State Highway and Transportation Officials, has noted, "If TRB didn't exist, then we would have to invent it." But could TRB be invented today, given the current institutional environment and prevailing attitudes? Many transportation organizations would feel threatened. But TRB was blessed with founders who had vision and insight, who organized it before many of the trade associations and professional societies arose, and who established a place for TRB, independent of all.

To ensure that TRB's selection of experts for committees does not favor financial sponsors or staff bias, it was embedded in an organization that has nothing to do with transportation—NRC, which serves NAS, NAE, and the Institute of Medicine. The elected members of these three honorific organizations include many of the nation's most distinguished scientists, engineers, and health care experts.

Under the charter granted by Congress to NAS in 1863, the institution provides advice on scientific and technical matters to the federal government and other institutions. TRB has benefited enormously from the independence, reputation, and standards of its parent institution, an unusual nonprofit, nongovernmental organization. NRC must approve—directly or indirectly—every TRB committee to ensure that it is competent and fair.

This alphabet soup, however, reflects a complex organizational structure that is difficult to explain and sometimes cumbersome to operate. But without this structure, TRB would lose its way, and its reduced credibility would soon have a negative impact on its effectiveness and support.

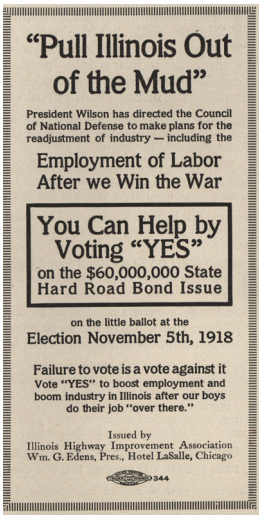


IMAGE: SPECIAL COLLECTIONS DEPARTMENT, UNIVERSITY OF IOWA LIBRARIES

A 1918 poster from the Illinois Highway Improvement Association exhorts residents to vote for a bond to improve state highways. The Federal-Aid Road Act of 1916 apportioned federal road funds to states based on a formula of size, population, and number of mail delivery routes.

Approaching Milestones

The Innovations Deserving Exploratory Analysis program observed its 20th anniversary in 2010. Upcoming TRB milestones include the following:

- 5th anniversaries of the second Strategic Highway Research Program, the National Cooperative Freight Research Program, and the Hazardous Materials Cooperative Research Program (2011)
- 150th article in the Research Pays Off series (2011)
- 20th anniversary of the Transit Cooperative Research Program (2012)
- National Cooperative Highway Research Program 50th anniversary (2012)
- Transportation Research Information Services 45th anniversary (2012)
- *Transportation Research Record* 50th anniversary (2013)
- TR News 50th anniversary (2013)
- 30th anniversary of TRB policy studies (2013)

Photo: Library of Congress Prints and Photographs Division

A Good Roads Convention in Grand Rapids, Michigan, in 1915. Similar conventions were held across the country in the early years of federal transportation activities under the Office of Road Inquiry, started in 1893.

Although few fully understand this complex little jewel, and even fewer can explain it, the thousands of people who participate in some facet of TRB sense that it has credibility, deals with complex issues that affect our society, and is therefore worthwhile. This sense grows during times when the credibility of many other institutions is suffering in the public esteem.

No Cause for Complacency

Yet for all this, TRB must guard against complacency. The robust image depicted in the foregoing paragraphs may suggest a metaphorical roaring lion, but a delicate flower is a more accurate likeness. A flower can bloom and flourish, yet remain fragile. TRB's future could be fragile.

Throughout TRB's 90 years, the federal–state partnership in our nation's transportation has been important and robust. The states, the federal government, and TRB have maintained a three-way partnership. The states and the federal government view TRB as a tool for facilitating research and disseminating technical information in a decentralized environment.

The founding of TRB only 5 years after the first Federal-Aid Road Act—which required the establishment of highway departments in each state—was no coincidence. Over the years, federal legislation initiated the Interstate Highway System, aid to transit, airport assistance, research programs, Amtrak, environmental legislation, safety initiatives, and countless other regulations and requirements.

The Airport Cooperative Research Program

Celebrating Five Years of Serving Airports

MICHAEL R. SALAMONE

A well-functioning airport system is essential to U.S. participation in the global economy. The Airport Cooperative Research Program (ACRP), administered by the Transportation Research Board (TRB), is celebrating its fifth anniversary of producing research that offers technical and functional solutions for improving airport efficiency and effectiveness and that provides in-depth insight into the issues airports face.

Airport facilities and infrastructure accommodate a variety of services for the national and international air transportation system, operating in a complex environment with a range of challenges. The 3,400 airports in the national integrated airport system are diverse—located in urban and rural areas and operated by a variety of entities, including airport commissions, state and municipal governments, and airport authorities. These entities are responsible for commercial and general aviation operations, but often communication and organizational interconnections are informal.

Despite the diversity, most airports share many issues and challenges. All airports are subject to federal, state, and local regulations, which pose significant challenges for compliance, and all seek cost-effective solutions to improve efficiency, effectiveness, and services to customers. Research to find practical solutions to these issues can be too expensive for one airport to fund by itself, particularly if faced with several other challenges simultaneously.

Members of the independent ACRP Oversight Committee are chosen by the U.S. Secretary of Transportation from various airport-related industries and academic fields.

ACRP works to resolve these challenges, addressing problems important to the airport industry and airport operators by managing applied research and distributing the results. ACRP is sponsored by the Federal Aviation Administration. The U.S. Congress appropriated approximately $75 million for ACRP for fiscal years 2006 through 2011.

State interests in transportation also have expanded and often have required cooperative federal–state actions. Highway and rail vehicle manufacturers, universities, aviation interests, railroads, environmental organizations, trade associations, and consultants found TRB the place to network. TRB established its niche in the information age.

Today, many question the federal role in transportation, and the long-running cooperative transportation consensus appears to be unraveling. Congress has struggled to agree on reauthorizing surface transportation and aviation funding. Failure to enact the legislation would not doom TRB to extinction but may threaten its long-term viability.

The decentralized nature of transportation and transportation organizations creates a tendency to underfund research. Yet research and technical innovation have remained the most consistent and long-running federal transportation activities since the establishment of the Office of Road Inquiry in 1893. A reduction of the federal role in transportation could change the institutional environment and would cloud TRB's future.

Sustaining the Partnership

Even without a change in the federal role, TRB has no guarantee of continuing success. The expansion into multiple modes and interdisciplinary activities could reduce its viability if its responsiveness to individual modes and the interests of particular constituencies diminishes. TRB cannot be everything to everybody; its vitality stems from its strong bonds to the states and the federal government. TRB's leadership must maintain its reputation for independence, service, and responsiveness to the real problems that its constituency is experiencing.

Transportation problems that require research solutions will not disappear. Transportation will need to resolve the issues between ever-improving technology, environmental issues, financial interests, and safety concerns. TRB's niche is at the intersection of these forces. If future transportation legislation sustains the collaborative relationship between federal, state, and private interests, then TRB can continue to serve and thrive for another 90 years.

The program began publishing the results of research projects in 2007 to airports across the country. As of December 2010, ACRP has published nearly 100 titles in several series and has distributed and disseminated the documents to airports. Research topics have ranged from administrative practice to technical modeling and design and have addressed the needs of airport operators on issues involving administration, environment, legal matters, policy, planning, safety, security, human resources, design, construction, maintenance, and operations. (For a list of ACRP publications in six series, see www.trb.org/Publications/Public/PubsTRBPublicationsbySeries.aspx.)

An independent governing board provides program oversight. The U.S. Secretary of Transportation appoints the primary members of the ACRP Oversight Committee (AOC), choosing individuals from airport operating agencies, academic institutions, and airport consulting firms. Several industry organizations—such as the American Association of Airport Executives, the Airport Consultants Council, the Airports Council International–North America, the National Association of State Aviation Officials, and the Air Transport Association of America— also participate on the AOC, providing vital links to the airport community.

The ACRP research process begins with an annual call for problem statements from the industry. The AOC identifies the problem statements of highest priority and allocates available research funds.

A panel of volunteers approved by the National Research Council provides technical guidance throughout each ACRP project. During its first 5 years, ACRP has engaged more than 700 airport industry practitioners on panels overseeing more than 200 research projects. Panel members include experienced airport professionals, airport planning and engineering consultants, vendors, suppliers, airport tenants, airline representatives, academicians, and research specialists.

A recent highlight that typifies ACRP's accomplishments is the publication of research into the complex task of charting an airport's strategic plans and measuring airport performance; the publications together present the most complete guidance available on improving the effectiveness and efficiency of airport operations:

- ACRP Report 20, *Strategic Planning in the Airport Industry*, provides practical guidance and includes a comprehensive interactive workbook of tools and step-by-step procedures.
- ACRP Report 19 presents guidance on *Developing an Airport Performance-Measurement System* and includes an electronic workbook with tools to help users implement and complete the process.
- Now in preparation, ACRP Report 19A, *Resource Guide to Airport Performance Indicators*, assembles a comprehensive list of more than 700 performance indicators; airports can select appropriate indicators for use in benchmarking, which is a key to a successful performance measurement system.

For information about projects under way, see the ACRP website at www.trb.org/ACRP/Public/ACRP.aspx.

The author is Manager of TRB's Airport Cooperative Research Program.

Web 2.0 Tools for Customer Communication

Strategies and Practice at the Washington State Department of Transportation

LLOYD D. BROWN

The author is Director of Communications, American Association of State Highway and Transportation Officials, Washington, D.C., and former Director of Communications, Washington State Department of Transportation.

A storm locked down most of western Washington state in November 2006. To make it easier for the public to vent its frustration about the frozen highways and stranded vehicles, the Communications Office of the Washington State Department of Transportation (DOT) recommended launching a simple web log, or blog, which could be built in a few minutes at Blogspot.com. The first post was an apology and explanation from the state's then-Secretary of Transportation Douglas B. MacDonald, who encouraged the public to share its thoughts on the agency's performance.

The response was amazing. Nearly 80 comments were posted to the site in 48 hours. Although the initial comments were critical of Washington State DOT's performance during the storm, a surprisingly large number of posts defended the agency.

The blog's early success prompted the communications staff to consider new ways for the agency to embrace openness and accountability by cultivating the social aspects of Internet communication. With the support of upper management, the team began developing a suite of social media tools focused on getting "government" out of the way, to give the public a sense of the human side of bureaucracy.

Looking east from Washington Pass on the North Cascades Highway in Washington state. This image was posted on the Washington State Department of Transportation's (DOT) Flickr page in December 2008 and helped inform travelers of pass conditions and closure.

PHOTO: WASHINGTON STATE DOT

Reinventing Government

Washington State DOT was not the first government agency to explore a redefined relationship between government and citizens through the Internet, changing the way that citizens interact with and participate in their government. Since the 1990s, hundreds of state and local government agencies, responding to the basic ideals of the Clinton Administration's Reinventing Government initiative, have developed tools and techniques to provide government services electronically, in most cases via the Internet. In 1998, the Clinton Administration listed "Create an electronic government" as one of its five sets of actions that would change government forever.[1]

Although the goal of reinventing government has focused primarily on improving the efficiency of service delivery, governments more recently have tried blogs, wikis, Twitter feeds, Facebook, discussion boards, and Second Life and MySpace sites to connect with the public online and gain feedback.[2] This effort to expand government's accessibility and increase its accountability online is called Gov 2.0, modeled after the ideals of Web 2.0, "web applica-

[1] http://govinfo.library.unt.edu/npr/whoweare/history2.html.

[2] A wiki is a collaborative website for creating and editing interlinked web pages. A Twitter feed is a text-based post, or tweet, of up to 140 characters sent out to other users. Facebook is a social network service that allows users to create a personal profile, add other users as friends, exchange messages, and join common interest groups. Discussion boards are online sites for conversing via posted messages. Second Life is a virtual computer world in which users interact through avatars. MySpace delivers personalized social entertainment content and connects users to others with similar interests.

PHOTO: NOEL BRADY, WASHINGTON STATE DOT

The Washington State DOT blog, launched in 2006, featured communication from then-Transportation Secretary Doug MacDonald (*above*). A robust response from the public encouraged the department to become involved in communication via social media.

tions that facilitate interactive information sharing, interoperability, user-centered design, and collaboration" (*1*–*3*).

The Gov 2.0 focus on social networking sites makes sense—a growing segment of the public actively uses these sites. According to the Pew Internet and American Life project, more than one-third (35 percent) of adult Internet users have a profile on a social networking site, an increase from 8 percent in 2005 (*4*). In 2000, half of all Americans were using the Internet. Today, eight in 10 Americans are online. Fewer than one in 10 Americans had high-speed Internet access in 2000; today, six in 10 do (*5*).

Creating a Conversation

Government web-based initiatives tend to focus on delivering services more efficiently, to save taxpayers money and citizens valuable time, or on increasing citizen engagement during policy deliberation, to promote accountability and openness (*6*). The first focus area reduces the physical face-to-face interaction with the state by changing the way that citizens access services. The second focus area emphasizes information delivery and relationship building.

Online services are generally convenient and save time for the citizen. Washington State DOT online services include filing applications for oversize or overweight vehicle permits or posting contractor bids online. So many online services are now offered that most people have few reasons to interact face-to-face with government officials in typical day-to-day activities—unless they get caught speeding or otherwise break the law. The relationship between citizen and bureaucrat nevertheless continues to be based on public service, which is associated with a physical space—that is, an administrative location

Planning for an Organization's Social Media Debut

JANET FRASER

Social media tools can bring organizations closer to the public and to partners. A preliminary investment of time is required to set goals, identify the target audience, and acquire the necessary resources to execute the plan with success. An organization seeking to apply social media tools for public outreach should first answer three questions:

1. Why use a social media tool?

Not all social media tools are created equal or for the same purpose. An organization may gain vastly different results from a Twitter account, which provides short, yet frequent information updates, than from a Facebook page, designed for people to make connections and to share information about themselves and their interests. Before selecting a social networking medium, an organization should determine and set goals for its social media presence.

2. Who is the intended audience?

Different groups of people use different social media for different reasons. Using its established goals, an organization should define its intended audience and evaluate how best to reach it. Established professionals tend to use social outlets like LinkedIn to connect with colleagues and membership organizations. In contrast, young professionals and graduate students are likely to rely on Facebook to keep in touch with friends, family, and organizations of interest. Other outlets, such as Twitter, have more appeal to people interested in receiving frequent updates or the latest information from individuals and organizations.

3. What is the plan for using a social media tool?

An organization should not proceed without a plan to renew or refresh the content on its social media outlets regularly. For example, Twitter requires at least two to four brief daily tweets, or posts, to keep an audience interested and engaged. Facebook, however, requires only two or three posts per week, but each should be sizeable. LinkedIn does not require as much support for posts, but tends to be more effective for organizations that establish an online, professionally connected community. An organization should plan its social media debut knowing that it is better not to start up at all than to start up poorly.

The author is a doctoral student in civil engineering at Pennsylvania State University; she was a Christine Mirzayan Science and Technology Policy Graduate Fellow at the National Academies in fall 2009.

PHOTO: PAT HOY, WASHINGTON STATE DOT

Buffeted by a series of snowstorms in late 2008, many Washington State residents turned to the web for information about travel conditions.

within which voting, taxation, and other functions of government occur (7).

Gov 2.0 aims to create a conversation outside of that physical space. Washington State DOT uses Gov 2.0 technology to reach a mass population about issues that are most important to the individual. Citizens, in turn, want the government available online. Washington State DOT's efforts to engage the public have been overwhelmingly well received.

Redefining the public relationship is not easy. Although citizens may want the convenience of online services and easy government access, research does not point to a yearning for a new relationship with government. According to marketing researcher Arthur Sweeney, "Citizens trust e-government technology and the associated service, but having a relationship with a government is not something they contemplate" (7).

Sweeney suggests that government organizations like Washington State DOT should model their outreach to citizens after that of online retailers. He suggests that governments may have to try harder to build a relationship with citizens because governments want the relationships more than the citizens do.

Cultivating Twitter

Washington State DOT opened its Twitter feed in March 2008, mostly out of curiosity. The communications team initially was unsure about the usefulness of the tool for a transportation agency. Similar efforts by leading-edge organizations had been monitored; the Los Angeles Fire Department, for example, communicated to reporters about ongoing incidents via a blog and a Twitter feed.[3] Washington State DOT therefore began to develop the computer coding to send highway incident alerts to the public via Twitter.

After spending more time observing the Twitter culture, however, the communications staff realized that successful Twitter users carried on conversations with their followers. The traffic alerts were moved to a secondary feed, and the primary account took over what already was on the blog, highlighting often-overlooked aspects of the agency and its business.

The goal of the main Twitter account changed to build a relationship with the public and to engage people in an ongoing conversation. During a series of snowstorms in late 2008, Washington State DOT was able to communicate online with the public, which was checking the Internet to decide whether to travel on slippery roads. The word-of-mouth about the Washington State DOT account was enthusiastic, increasing followers from a few hundred to a few thousand in a few days.

Here are some of the comments collected from the Twitter account, @wsdot:

- "You Twitter and blog? You just made me love Seattle again."
- "Awesome idea being on Twitter—this is the modern sort of government that I want."
- "Thanks for the great service you provide on Twitter. Really on the cutting edge, and I don't know how many people just say thanks!"
- "Enjoying @wsdot tweets immensely. I hereby declare that this is state money well spent."

With approximately 11,000 followers as of August 2010, Washington State DOT has developed its Twitter presence to include regional traffic feeds. The public can send direct messages with certain

The Los Angeles Fire Department shares news, ongoing incidents, safety tips, and upcoming events via its blog (http://lafd.blogspot.com), which served as an initial model for Washington State DOT's effort.

[3] lafd.org.

Washington State DOT's successful foray into video sharing began with a simulation of the SR-520 floating bridge in an earthquake; the video was posted to YouTube in 2007.

key terms to the Washington State DOT Twitter account and receive back automated traveler information, such as mountain pass conditions or current travel times on key urban routes.

YouTube Attractions

Washington State DOT posted its first video on YouTube in 2007. The video, a simulation of how the State Route 520 floating bridge would perform during an earthquake, was certain to attract viewers; the communications team posted the video on YouTube to avoid a heavy load on the DOT's Internet servers. The ease of access to the public and the ensuing word-of-mouth soon made the YouTube account a success.

Washington State DOT now has posted 119 videos at YouTube.com and gained more than 950,000 collective views. The agency's video production team consists of two full-time videographers; some of the public information officers also contribute occasional video clips.

The YouTube collection includes highly polished design visualizations, as well as clips taken by maintenance crews with handheld video cameras. One dramatic video, 1 minute and 10 seconds long, shows Stevens Pass during a severe wind and snow storm, recorded by a snowplow operator with a cellular phone video camera.[4] Viewed more than 7,400 times, the video is one of the best depictions of the dangers and challenges that Washington State DOT mountain road crews face in winter.

Viewers frequently post comments about the YouTube videos, providing another place for Washington State DOT to engage with the public.

Flickr Collections

Washington State DOT opened its Flickr account in April 2007 but did not realize how useful the tool could be until July. Flickr offered a way to manage all of the photos taken during the ribbon-cutting for the new Tacoma Narrows Bridge, a $735 million project. More than 65,000 people participated in the event, which allowed each person to have a photo taken cutting the ribbon. The photos were uploaded to Flickr instead of overburdening Washington State DOT's servers.

More than two years later, Washington State DOT has uploaded thousands of photos to Flickr, all tagged with keywords and sorted into collections and sets. Flickr serves as a virtual viewing platform, which allows the public to follow progress on highway construction projects and the building of new ferry vessels. The collection also serves as a photo library for agency staff.

A Few Fizzles

Not all of the Gov 2.0 tools that Washington State DOT has explored have proved successful. A weekly podcast, posted on iTunes, fizzled out after a year. The public was not interested in podcasts, despite the weekly production efforts of the communications team.

Although Facebook's registered members outnumber the citizens of the United States, the site has been a disappointment as a communication medium for Washington State DOT. The Twitter account followers number in the thousands, but the Washington State DOT Facebook page had earned only 332 fans through January 2010.

Originally conceived as a way to appeal to college students during recruitment trips, the Facebook page

Photo: Mark Bozanich, Washington State DOT

The opening of the Tacoma Narrows Bridge in 2007 attracted a large crowd. The many photos of the event were posted to the Washington State DOT Flickr account. In November 2010, the account's image and gallery views passed the 10 million mark.

[4] www.youtube.com/watch?v=4qYkylkgUqg.

The Washington State DOT Facebook page encourages two-way communication with members of the public.

has evolved into a Washington State DOT fan page, focusing on employee profiles and lifestyle features. Recent efforts to develop interest in the page through frequent updates and two-way engagement with the public has increased the agency's Facebook fans to nearly 1,500.

Incomes and Education

Although Washington State DOT has experienced tremendous success with Gov 2.0, none of these tools is a cure-all for bad public relations. A government agency must address several considerations in developing a Gov 2.0 strategy.

Governments cannot forget that not everyone is online and not everyone participates online equally. Maintaining this awareness is important, for example, during environmental permitting and National Environmental Protection Act environmental justice reviews.

According to a Pew Internet and American Life Project report, "Contrary to the hopes of some advocates, the Internet is not changing the socioeconomic character of civic engagement in America" (*8*). Those who earn a higher wage and who achieve a higher education are more likely to participate in online political activities such as e-mailing a congressman or signing a petition. Lower-income citizens and rural citizens may not have as much access to the Internet as those who make more money or live in an urban area.

A study of information available on legislative websites found that the educational background of legislators, as well as the educational and financial background of their constituents, seemed to determine how much information was available online and how much the focus was on building relationships with constituents.

Social Networking in the Test Mode at State Agencies

SUSAN C. SILLICK

A survey of state departments of transportation (DOTs), conducted this past spring, shows that access to social media or Web 2.0 sites is not universal. The survey responses from 34 state DOTs revealed that 20 block Facebook, 15 block Twitter and Ning[a], 10 block LinkedIn, and 7 block Google Groups.

State governments typically are slow to implement a new technology that may present a potential for abuse by employees. State government officials have concerns that social media may transfer and disperse agency communications to many employees, without controls. Questions arise about the responsibility for updating the sites and about which employees have the authority to communicate for the DOT.

The slow adoption of social media by state DOTs parallels that of the Internet. Many states restricted use of the Internet until officials realized its value in the workplace and created policies for its appropriate use. The Internet has transformed the workplace by placing the world of information at employees' fingertips.

Some state DOTs allow small groups of employees to use social media to communicate with their customers. In a culture of open debate and communication, social media allow government agencies to publish their message, gain responses from the public, and continue to engage the public—especially younger customers.

In addition to communicating with customers, social media provide networking tools that allow teams of DOT employees separated by distance to work together, coordinate, and collaborate more efficiently. As the survey findings indicate, however, social media remain in the testing mode at many state DOTs, awaiting proof of positive results for the workplace.

[a] Ning is an online platform for creating a customized social network.

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There is still a digital divide when considering the tools available on the legislative home pages that offer constituent relationship-building strategies as well as Internet tools. Constituents in some districts are able to utilize more Internet tools than those who live in others. (*9*)

Clearly the speed with which the Internet is changing could make these studies obsolete in a few years. The Pew study suggests, for instance, that the large number of young people who are active Internet users could be encouraged and engaged to change the dynamics of education and income in politics.

Privacy Alarms

As government expands its social media and online outreach, privacy advocates are sounding alarms. The White House has more than 330,000 fans on Facebook, and every comment posted at that site is being archived under the Presidential Records Act.

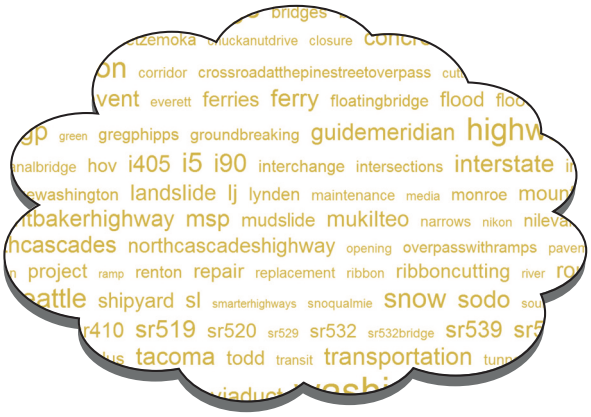
Mark Rotenberg, president of the Electronic Privacy Information Center, believes that archiving those comments runs counter to pledges by the government to protect the privacy of citizens who use social media sites. "The White House has not been adequately transparent, particularly on how it makes use of new social media techniques, such as this," Rotenberg contends (*10*).

Washington State DOT uses cookies to collect basic user information for website visitors but has been careful to post a link to the agency's privacy policy on every web page. That is not easy to do on many social networking sites, however.

The Electronic Frontier Foundation and the University of California, Berkeley, filed a lawsuit in U.S. District Court to determine how six federal agencies use social networking sites for data collection and citizen surveillance (*11*). The lawsuit was provoked by concerns about monitoring by the Department of Defense, the Department of Homeland Security, the Department of Justice, the Department of the Treasury, the Central Intelligence Agency, and the Office of the Director of National Intelligence.

The suit suggests that the government's intent to improve its relationship with citizens may require sacrifice of the freedom from monitoring. Even the highest-ranking U.S. official worries about this. When running for president, Barack Obama told interviewers, "The open information platforms of the 21st century can also tempt institutions to violate the privacy of citizens. We need sensible safeguards that protect privacy in this dynamic new world" (*12*).

Washington State DOT has no interest in obtaining personal information from the general public, but fears about government access to readily available usage information are worth noting and understanding before a state agency embarks on a social media program.



A collection of tags to images in the Washington State DOT Flickr account is visually represented in what is called a cloud—the letter size indicates the frequency of searches (graphic outline added for effect). Tags assist viewers in locating images, which are part of the public record.

Accommodating Special Needs

Advocates for special needs communities are concerned about the lack of access to online information. According to the U.S. Census Bureau, 18 percent of Americans have some kind of disability in sight, hearing, cognition, medical condition, or mobility, and 12 percent of the total population have a severe disability (*13*). On its social media sites, Washington State DOT has worked to provide information in ways that facilitate the use of accessibility tools such as text readers for the blind.

Federal rules have established some accessibility standards, but state and local governments are not required to comply. The Department of Justice, which monitors federal agency compliance with accessibility rules, has not issued a compliance report since 2001. According to Sharron Rush, Executive Director of Knowbility, a nonprofit accessibility solutions group in Austin, Texas, "In the rush to implement Web 2.0, accessibility tends to get pushed back on the priority list" (*13*).

Archiving and Public Records

Washington State DOT's use of social media tools is considered public record. The agency has developed an archiving process and a policy for guidance. Every tweet, Facebook update, video link, and photo is backed up and available for archiving. An independent internal committee that oversees the keeping of government records has reviewed Washington State DOT's social media archiving policy and procedures.

Each state's approach to public records and open government is different, so that each agency's archiving and retention programs are likely to be different also. An agency's plan for backing up and preserving social media activity should be in accord with state laws.

Photo: Washington State DOT

Effective use of social media requires effort from department staffers. In 2008, Washington State DOT hosted a virtual open house to discuss findings on the I-90 Snoqualmie Pass East Project. Members of the public joined an online webinar; from there they could view a PowerPoint Presentation and posters, ask questions, and receive responses from DOT employees.

Additional Considerations

Before starting a Gov 2.0 social media program, consider the communications needs and the goals. In developing the Washington State DOT blog, the goal was to engage the public with a person-to-person style of writing and presentation of information. To reinforce transparency, all blog posts allowed for comments. The arrangement has worked successfully. But Washington State DOT also posts a clearly labeled blog use policy to help the public understand what is acceptable commentary at the site.[5]

Washington State DOT also had specific reasons for turning to YouTube and Flickr as resources. The tools fit with the agency's program but may not be right for every situation.

Staff Commitments

Although most of these tools are free or low cost to start, they require maintenance and oversight by trained staff. Washington State DOT learned that the public would return to its website if fresh content is regularly posted—this makes sense. Stale content infrequently updated offers little incentive to visit a website. Visits build relationships. This rule applies to any online tool.

An agency should be willing to dedicate human capital for its social media strategy. Washington State DOT, for example, has one full-time employee assigned to managing and developing social media tools. But communications team members also increasingly contribute content, making this a shared responsibility.

[5] www.wsdot.wa.gov/Policy/blog.htm.

TRB's Web 2.0 Initiatives

LISA BERARDI MARFLAK

TRB is implementing several Web 2.0 initiatives to communicate with and engage people interested in transportation research:

This video of a SHRP 2 project demonstration is featured on the National Academies' YouTube channel.

◆ TRB is hosting three to four web briefings, or webinars, each month.[a] TRB webinars provide transportation professionals a conference-like atmosphere to share and receive information while in their own offices. TRB uses webinars to share information about upcoming reports, Annual Meeting sessions, and topics requested by TRB committees.

◆ TRB's Twitter page connects Twitter users directly to TRB.[b] Followers of TRBofNA receive daily updates about reports, programs, events, and general news related to transportation. Followers also use Twitter to provide feedback about TRB services and events.

◆ TRB's second Strategic Highway Research Program has posted one video to the National Academies' YouTube Channel and plans several additional posts.[c]

◆ TRB's website has incorporated Really Simple Syndication (RSS) feeds to provide timely updates about transportation topics.[d] Users can select from more than 40 transportation-related topics and receive notifications of related updates to the TRB website.

◆ TRB's Transportation Research Information Services database provides customized RSS feeds for search items.[e] A user can enter key words into the search box, save the search as an RSS feed, and receive updates as items become available online.

◆ As a complement to its Twitter feed, TRB shares information about reports, meetings, and events via its Facebook page.[f] Facebook users can follow TRB by signing in, searching for Transportation Research Board, and selecting the "like" button at the top of the page. Updates will appear in a follower's "News Feed."

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[a] http://trb.org/ElectronicSessions/Public/Webinars1.aspx.
[b] http://twitter.com/trbofna.
[c] http://www.youtube.com/user/nationalacademies.
[d] http://www.trb.org/Main/Public/RSSfeeds.aspx.
[e] http://tris.trb.org/.
[f] http://www.facebook.com/pages/Transportation-Research-Board/124739004253580.

Experiments and Readiness

Finally, experiment with the tools before a crisis arises. Washington State DOT's first blog started in response to a crisis, but the communications team already had spent months discussing the tool and what might be posted on a blog. A general idea had developed for what the blog might be, although a launch date and first topic had not been identified.

Working with the tools and learning their proper applications can be helpful in maintaining continuity of operations, as well. In January 2009, Washington State DOT's Internet servers began to shut down during a statewide snowstorm that had closed all of the state's east–west mountain passes and travel routes. A failure in the air conditioning unit that kept the servers from overheating had caused the problem. The agency directed web traffic to the blog and Twitter feed for several hours during the storm. The road closure updates and information outreach continued uninterrupted during the crisis, because the staff had gained a good understanding of how to deploy the social media tools.

Realizing the Vision

Despite drawbacks and concerns, Washington State DOT has become an active online participant. New social network tools are regularly sought out and tested, along with blogging and multimedia websites, to learn about new techniques for engaging the public in conversation and improving service delivery.

President Obama has made social media a federal government priority. On January 21, 2009, he signed a memo directing federal agencies to develop new tools within four months to enhance government accountability, openness, and collaboration. "We will work together to ensure the public trust and establish a system of transparency, public participation, and collaboration," he wrote. "Openness will strengthen our democracy and promote efficiency and effectiveness in government" (*14*). The President's memo clearly established a vision for how to deploy the technology:

> Executive departments and agencies should offer Americans increased opportunities to participate in policy making and to provide their government with the benefits of their collective expertise and information. Executive departments and agencies should also solicit public input on how we can increase and improve opportunities for public participation in government. Government should be collaborative.

Peter Orszag, Director of the federal Office of Management and Budget, followed up with an Open Government Directive, requiring that federal agencies post data online, improve the quality of government information, create a culture of open government, and write the policies to guide these practices. The December 8, 2009, memo noted that transparency, participation, and collaboration form the cornerstone of an open government.

Obama's vision for an open and accountable government is laudable. A government that is responsive to its people, open, and transparent is a worthy goal. Washington State DOT is working to see that vision become reality. The vision will not come about easily and will require preparation and planning.

PHOTO: WASHINGTON STATE DOT

During an emergency that shut down Washington State DOT's Internet servers, web traffic was directed to the blog and Twitter feed, keeping the public updated on snowstorm and pass conditions.

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Medieval English Bridges and Modern Transport Policy

A Distant Mirror?

ALAN COOPER AND
DAMIAN J. KULASH

PHOTO: WYRDLIGHT MCCALLUM PHOTOGRAPHY

Cooper is Associate Professor of History at Colgate University, Hamilton, New York, and author of Bridges, Law, and Power in Medieval England, 700–1400 *(Boydell Press, 2006). Kulash is retired President and CEO of the Eno Transportation Foundation, Washington, D.C., and was Executive Director of the first Strategic Highway Research Program.*

This article is the result of conversations between the authors about parallels between contemporary transportation issues and those described in Cooper's book.

U.S. policy makers are struggling to find a clear, broadly accepted vision for highways to meet the demands of the post-Interstate era. They may take solace from a distant age: medieval people also wrestled with a fundamental shift in how to deal with bridges, the most expensive and complex part of their road system. A new history of bridges in medieval England reveals interesting parallels, without claiming to offer novel solutions.

The Middle Ages may appear primitive and impossibly distant, but some of the issues that people dealt with reflect those of today. Consider the modern issues of climate change and the environment. For centuries until the Middle Ages, fords had been a practical way to cross most rivers in England. But this changed when large amounts of woodland were cleared for cultivation between 800 and 1200, leading to a more pronounced spring runoff and more frequent flooding. Stronger, heavier flows of water in major rivers scoured the beds, making fords difficult. In agricultural lands, drainage ditches accelerated the cycle, as did the embankment of rivers and reclamation of fens.

Broad, shallow rivers that once had been easily fordable became narrower, stronger, and more dangerous. Although William the Conqueror could cross the Thames by a ford on the prehistoric Icknield Way in Wallingford in 1066, by the 12th century the ford was impractical, and a bridge had to be built.

Photo above: The medieval double bridge at Eashing was built by the monks of Waverly Abbey in the 13th century.

Evolution of Bridge Work

Medieval bridge work evolved in four stages. Until the late 9th century, bridges were not a necessity—the undeveloped environment of England included many rivers that were fordable; traffic was rudimentary; and expectations of speed were small. The obligation to repair bridges appears in charters—the records of land donations—as one of the three common burdens from which no landholder might be excused: army service, fortress repair, and bridge maintenance. But bridges were few—that obligation appears more symbolic than practical.

In the second period, from the late 9th century until 1000, bridge work gained a clearer practical purpose and a higher priority. King Alfred the Great drew on the three common burdens in reconquering England from the Vikings. The Vikings' success hinged on rapid movement; the construction of bridges and fortresses next to rivers was of vital strategic value.

As the English population grew and its economy developed, England added many bridges by the 10th century. In the period of peace that followed Alfred's rule, his descendants drew on the three common burdens to strengthen public order. The obligations were universal and inescapable, binding even the king and his family.

During the third period, from the 11th to 12th centuries, exceptions emerged to the obligation for bridge work. Initially, the exceptions were sporadic, but they proliferated after the Norman Conquest in 1066. The Norman kings used bridge work as a tool of power, sometimes exacting strict compliance and

other times granting exceptions in exchange for favors. What had been the common interest now became the king's interest, and he could demand bridge work or grant exemptions as he saw fit. The 10th century assumption that every landholder should be responsible for the upkeep of bridges was eroded, even as the number of bridges increased in the 12th century.

In the fourth period, from the end of the 12th century to the 15th, new approaches were required for bridge repair. These show the limits of national power in managing road and bridge systems, even as the people of England were relying on bridges for the new horse-drawn carts that transformed commercial agriculture after 1200.

Where possible, kings enforced ancient obligations on landowners and sought to assert new obligations if a landholder built a bridge. Kings asserted the illegality of private tolls on the royal highway but then granted the right to collect temporary tolls for the repair of roads and bridges. The kings encouraged the formation of charities to repair bridges—travelers were vulnerable and therefore the proper object of charity; pious donations might result in relief of souls in Purgatory.

The U.S. Federal-Aid Highway program, almost 100 years old, also has evolved in stages. It focused initially on access to cities from surrounding rural areas, or on "getting the farmer out of the mud." The program went on to become a tool for building an interconnected system of national routes between cities. This thrust reached its peak with the construction of the Interstate Highway System. After the completion of that system, the focus of U.S. highway policy has diffused among diverse national goals and varied state priorities.

Photo: Wikimedia Commons

Large swaths of woodlands are not a feature of the English landscape. The widespread clearing of England's natural forests in the Middle Ages led to larger runoffs after spring rains and faster river flows—making bridges a necessity for crossing rivers.

Image: Den Haag, Konnklijke Bibliotheek, 72 A 24

An illustration in an early 15th century manuscript shows William the Conqueror crossing the Thames at Wallingford in 1066. By the 12th century, the ford used after the Battle of Hastings was no longer viable and had to be replaced by a bridge.

Shared Challenges

Despite the technological and cultural differences, medieval and modern people share three challenges in providing adequate bridges:

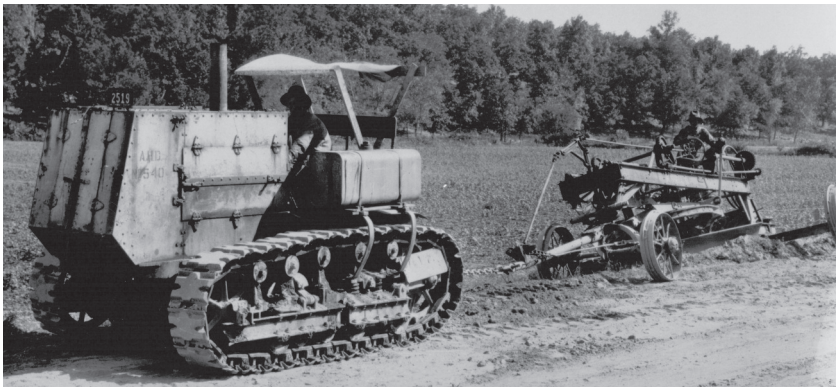
1. Maintenance, a continuing burden that requires planning;
2. Striking a balance between competing local and national needs; and
3. Establishing core principles for expeditious decision making about specific projects.

Burden of Maintenance

Throughout medieval times, funds were urgently needed for maintaining English bridges, but no one wanted to pay unless compelled by the direst of threats. Responsibility for the few older bridges was clear—the obligations for the maintenance of a bridge that was in place before Alfred were shared by the local people. The old obligations transferred to a replacement bridge built on exactly the same site. An entirely new bridge, however, offered no historic obligations, and a variety of solutions applied.

Medieval obligations for bridge work could be multiple and overlapping. The abbot of Abington, for example, was responsible for the upkeep of 18 bridges, mostly in combination with others; for two of the bridges, however, the responsibility was shared with seven other men.

The most complex arrangements were probably for Rochester Bridge—landowners scattered across Kent were separately responsible for each of the



The U.S. Federal-Aid Highway Program originally focused on "getting the farmer out of the mud." Here, an early Caterpillar tractor assists a stuck farm vehicle.

bridge's nine piers. The origins of those obligations may have predated the Anglo-Saxon invasions and originated in Roman times.

When the people of England rose against the notorious King John in 1215, one issue that aroused anger was the king's requirement to repair bridges—often to facilitate his hunting expeditions—even when no obligations were in place. Magna Carta, which has become a model statement for universal human rights—includes a clause that the king may not require unwonted bridge work.

Illustration from a 15th century edition of Julius Caesar's *Commentarii*. Landowners automatically were responsible for the upkeep of bridges on their property—some were unwilling and sought ways to avoid the duty, including the reinvention of a bridge's history.

When land changed hands, so did bridge obligations. For example, the prior of Hatfield was charged for failure to maintain a bridge near Hatfield Broadoak in Essex. He denied responsibility, but the jurors pointed out that the obligation formerly had been borne by the owner of lands that were now part of the prior's holdings. The prior may have received the land in a bequest without realizing the attached obligation.

Creative ways arose to escape these obligations. Stories were concocted that passing saints or merchants who cared about the welfare of the local people had built certain bridges, given them to the people, and then moved on, leaving a bridge but no one responsible for its upkeep.

In modern times, bridges and roads require large outlays up front, but the costs cannot be known with certainty until after completion of the work. Expensive maintenance also is required, but we are not as guarded as our medieval forbears—many bridges built by local and state governments are now on the federal welfare rolls.

Local and National Needs

Local and national priorities for roads and bridges always have caused tension. Before motorized transport, most road use was by people living on or near the road, and the abutting landowners or their communities were responsible for keeping the road passable. During the Middle Ages, responsibility for the road itself was generally passive—clearing obstacles like fallen trees or not placing buildings or crops in the right-of-way. Local residents performed most of the road maintenance work.

Local maintenance of roads appeared fair and appropriate when traffic was mostly local, the benefits of road use fell mostly to locals, and the maintenance involved low-technology, low-cost measures. But these conditions did not apply when through traffic and bridges were involved. Bridges are the most expensive parts of the road network and require more active stewardship than roads. Often several routes converge to exploit a single bridge structure, so that bridges usually carry a higher proportion of through traffic than roads.

The medieval bridge at Huntingdon on the major road towards the north from London was the subject of a dispute that reflects these tensions. Because of the national significance of this bridge, the whole county of Huntingdon was required to pay for its upkeep; the taxpayers were aggrieved, however, that the people of the town of Huntingdon, adjacent to the bridge, were making disproportionate use of the bridge without paying a fair share of the cost. The judges who heard the case agreed and placed a

PHOTO: WIKIMEDIA COMMONS

In the Middle Ages, the bridge across the River Great Ouse in Huntingdon, Cambridgeshire, was on a route to London. Residents of the town used the bridge more than county residents and those passing through, however, and were ordered to pay a greater share of the bridge's upkeep.

greater burden on citizens of the town.

The Middle Ages also applied tolls, which escaped the need for predetermining local and national shares and let actual road use determine the split. Pavage tolls for cross-country highways appear in the second half of the 14th century, presaging the 18th-century turnpikes.

Today, U.S. highway policy recognizes the conflicting demands and costs of different classes of traffic and reconciles them by combining tiered administration and toll facilities. The balance entails a mix of federal and state funds, as well as "donorism," by which user fees from one state end up supporting highway work in another state. This principle was generally accepted during the building of the Interstate Highway System, but acceptance has waned as the needs of states and regions have become more discrepant.

Core Principles

In managing assets as ubiquitous as roads and bridges, both medieval and modern governments have applied across-the-board core policies to deal with specific issues. In medieval England, the inescapable obligation was for bridge work. In the United States, two core policy elements are user fees and the formula-based distribution of highway revenues.

Medieval Obligations

The medieval obligations for bridge work had advantages in assigning maintenance responsibility, but the obligations discouraged expansion of the system. The builder of a bridge assumed perpetual responsibility for its maintenance. This served as a disincentive for building new bridges, although addressing the repair of the old. Even when a new bridge made of stone on a better site would make more sense than a futile effort to repair a dilapidated bridge, considerable effort of will was required to make the decision.

The bridge across the River Medway at Rochester in Kent was in disrepair for most of the 14th century, despite—or perhaps because of—land-based obligations for its upkeep. When a new bridge was built on a new site, local knights had to take responsibility for transforming the obligations into a charitable endowment. Without such creative leadership, the core policy could not keep up with emerging needs.

Modern Formulas

The core principles that guide highway matters in modern times did not appear quickly or easily. Throughout the 19th century and earlier, U.S. states and localities handled road and bridge matters. The federal government was involved in a few multistate improvements like the National Road. Turnpikes had

IMAGE BY PERMISSION OF THE WARDENS AND ASSISTANTS OF ROCHESTER BRIDGE

Financed by wealthy knights Sir John de Cobham and Sir Robert Knolles, the medieval bridge in Rochester, Kent, was commissioned in 1382 and finished by 1391. It was situated 100 yards upstream of an ancient Roman bridge.

a fitful start in the early 19th century but quickly fell victim to the railways.

By the end of the 19th century, the government role in highways was mostly a state matter, often involving statute labor to keep the roads repaired. State maintenance, like that in Europe for centuries before, depended on in-kind contributions of labor, materials, animal power, and tools from the citizens. Public road surveyors oversaw the process, but the process was notoriously ineffective.

The modern era of federal involvement in U.S. highway matters began in 1893, with the creation of the Office of Road Inquiry, which promoted good road practices. The federal government began direct financial assistance to the states for road building in 1916, with a program of grants to assist in building post roads. The legislation included a formula for distributing the grants and set out the terms of matching funds that states had to provide.

Starting with Oregon in 1919, states increasingly turned to motor fuel taxes to support road expenditures. The user-pays principle has been central to U.S. highway policy throughout most of the automobile age. A federal excise tax on motor fuels was introduced in 1932. The Hayden-Cartwright Act of 1934 stated that diversion of highway taxes to other uses was unfair and would be subject to sanctions. This principle continued in the Highway Trust Fund, created in 1956 to support construction of the Interstate Highway System. The fund has produced the necessary support, and the public has understood and accepted it as a fair way to pay for the roads they use.

Both the medieval and modern systems functioned well for a period by holding closely to their core principles, but both systems became increasingly ad hoc as conditions changed.

Exceptions and Earmarks

The obligation of landholders to repair bridges was one of the three common burdens, from which no one could be excused. How could a system fundamental to governance and ingrained in the national consciousness ever fall apart? Those in power asserted self-interest above principle, and once the principle was undermined, the system was broken.

Medieval Exemptions

The first documented instance of an exemption from bridge work was granted by the notorious Æthelred the Unready to his glamorous young wife Emma in 1012. Later, the Normans regarded bridge work as a right or possession of a lord, to be excused in return for favor at the whim of the king.

The Norman kings distributed this favor in two ways. William the Conqueror bestowed an exemption on his favorite monastery, Battle Abbey, established on the site of the Battle of Hastings, exactly where the English nobility had been slaughtered in 1066. Intended to atone for the shedding of Christian blood, the abbey was exempted from all secular burdens, including bridge work.

In the 12th century, monks began to record old property rights that had been preserved only in memory. As they produced the documents, the monks sometimes embellished their rights by claiming an exemption from bridge work. Claiming that an ancient king had given a monastery its land "as free as the king can grant" became commonplace in these 12th century forgeries. An Anglo-Saxon king would not have allowed such an exemption, but 12th century monks could claim that a Norman king had.

Politics also undermined the system. In 1100, William the Conqueror's son, Henry I, seized the throne. Because his position was precarious, he issued a coronation charter making promises to the people whose support he needed. One promise was that a knight's land would be free from the obligation for public works. As Henry established his position, he was able to renege on some of the promises, but he had set a dangerous precedent.

Modern Earmarks

Like the medieval principle of obligations, today's system of user fees and formula-based distribution has long been perceived as effective and fair. Yet like the medieval exemptions from obligations, modern earmarks have replaced a uniform system with case-by-case treatments.

The modern federal-aid program operated without earmarks for half a century. During those decades, bills identified a set of common state highway needs, authorized funds to pay a stipulated fraction of the cost,

and then distributed the funds by formula. Project-specific earmarks were unheard of until 1968, when Congress inserted support for the Three Sisters Bridge in Washington, D.C., into the highway bill.

As parts of the Interstate system were completed in some states and other priorities came to the fore, earmarks increased. The 1982 bill included 10 that together cost $386 million; the number increased to 152 in 1987 and to 539 in 1991. In 1998, the nearly 1,500 earmarks cost a total of $9 billion. The House version of the most recent multiyear highway reauthorization bill of 2005 contained 8,000 earmarks that cost $10 billion.

Earmarks are not necessarily abuses of discretion; they may cope with legitimate but unique needs, as shown by two extreme examples. The Gravina Island Bridge, famous as the "Bridge to Nowhere," between Ketchikan and Gravina Island, Alaska, would have cost $398 million to serve the island's 50 residents. The 2006 Appropriations Bill included an earmark to build this bridge.

Legislation also earmarked funds for the Woodrow Wilson Bridge, which crosses the Potomac River near Washington, D.C. Originally built in 1961, the bridge had been in increasing need of replacement since the 1990s, because of its age and the heavy traffic load from I-95, I-495, and the Capital Beltway. More than 1 percent of the nation's economic output crosses this bridge. Clearly the bridge has national interest.

An editorial in the *Washington Post* called for federal assistance to this essential national project, but days later, another editorial bemoaned the pork-barrel spending in the pending highway bill, unwittingly including the allocation for the Woodrow Wilson Bridge. Both the Woodrow Wilson Bridge and the Gravina Island Bridge were earmarked, but are both pork-barrel projects?

PHOTO: AARON HEADLY

Earmarks in federal transportation legislation would have replaced the ferry between Ketchikan and Gravina Island, Alaska, with a controversial $398 million bridge. The bridge was not built.

Tolls as a Last Resort

Pontage Grants

Formal royal grants for tolls emerged in England in the 13th century. Ferrybridge was granted the right to apply bridge tolls or pontage in 1228, and Beverley the right to apply road tolls or pavage in 1249. The practice spread quickly. By 1400, the kings of England had made 371 pontage grants and 395 pavage grants. A new financing concept had been rapidly adopted, but the real change was that the king was able to insist on the illegality of private tolls on the public highway.

Towns petitioned the king to allow pontage and pavage, and the king would grant the request as a favor. In general, the tolls applied only to carts with goods for sale, not to pedestrians or to people carting personal goods. Tolls can be a fair way to recoup maintenance costs, but the grants exempted favored traffic and penalized unfavored traffic. For example, the highly profitable and highly favored wool trade was exempt from charges for many years. Some towns charged special tolls for Jewish travelers, and Carlisle charged an extra toll for Scots. The toll rates could be extremely complicated, distinguishing between roofing nails and common nails, as well as between different kinds of fish, cloth, and spices.

Tolls were not general taxes, but payments that users made to keep facilities in good repair, much as modern user fees differ from general taxes. Merchants were vigilant that the toll revenues were used to maintain the bridges.

Most of the pontage grants focused on bridges for which no one was responsible. The collections may have facilitated innovation and system expansion by funding work that otherwise was unsupported, much as modern tolls do. Grants in Doncaster in

PHOTO: TREVOR WRAYTON, VIRGINIA DOT

Replacement of the Woodrow Wilson Bridge in the Washington, D.C., area also was an earmarked project. The bridge carries I-495 over the Potomac River between Alexandria, Virginia, and Oxon Hill, Maryland.

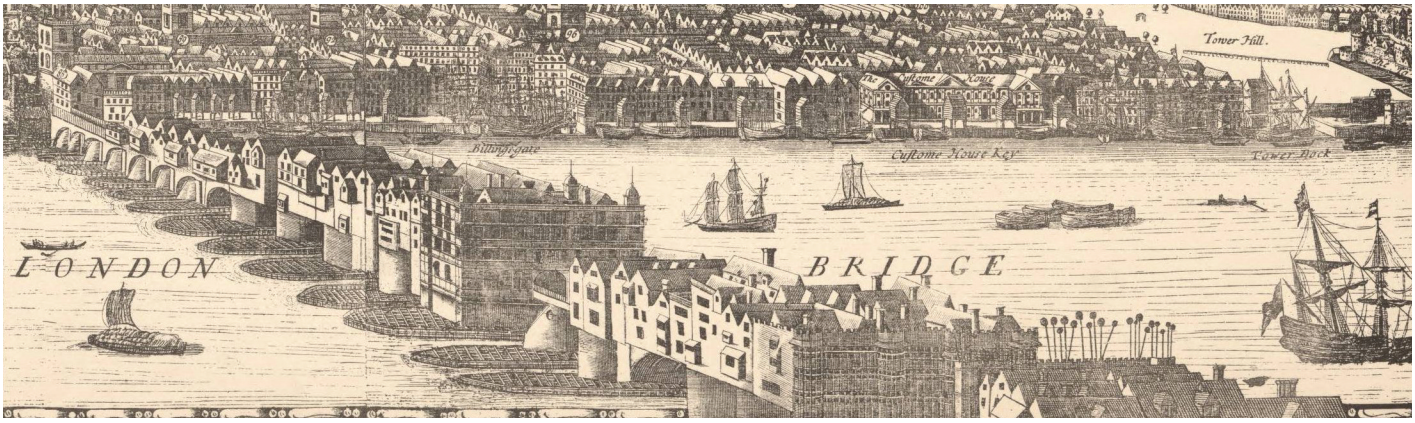


IMAGE: LONDON TOPOGRAPHICAL SOCIETY, 1904

Houses and other buildings on the London Bridge can be seen in this 1682 engraving. Income from tenants was part of the bridge's revenue stream, managed by a Bridge Trust.

1247 and Saltersford in 1331 were made to rebuild bridges in stone, a much more durable and much more expensive solution.

Tolls were one of the innovative financing methods that the English employed when widespread exceptions had eroded the system of obligations. Other methods included revenues from episcopal indulgences, royal gifts, bequests, profits from ferries that replaced bridges when necessary, and fund-raising by burgesses and bridge wardens.

London Bridge Trust

London Bridge received alms, bequests, and income from tolls, as well as rental income from houses on the bridge; the Bridge Trust managed these revenues. After the Barons' Revolt of 1258 to 1265, King Henry III seized ownership of the bridge and gave it to his queen, Eleanor of Provence. The queen siphoned off the revenues and let the bridge fall into disrepair. The bridge could be profitable, but only without maintenance.

The London Bridge Trust paid for the Millennium Bridge, a pedestrian bridge over the Thames that opened in 2000.

PHOTO: ADRIAN PINGSTONE

Londoners therefore were keen for the Bridge Trust to regain its independence and fulfill its proper function. The trust arrangement proved to be a permanent solution for London Bridge and a model for self-sustaining revenue-supported projects up to the present; the same Bridge Trust paid for the new Millennium footbridge over the Thames by St. Paul's Cathedral.

Today a state planning to build a new road normally would seek to include it as part of the system for which federal aid was available. If that does not work, the state might turn to tolls. Most road projects rely on tolls when other sources fall short, leading to the conventional wisdom that "A toll road is better than no road." In the Middle Ages, a royal grant of pontage or pavage, although a constructive act by the king, was also an acknowledgment that the normal methods of finance had failed.

Too Broken to Patch?

Collapse and Progress

Medieval people muddled along for centuries as the system of universal obligations gradually collapsed. Political energy was expended to gain exemptions. Fraudulent charters and claims complicated what had once been simple and clear. The era when bridge work was an absolute, inescapable obligation, fair and consistent, was past.

Yet when this apparent simplicity ended in the Norman era, progress in highway matters did not end. On the contrary, the 12th century—when bridge work ceased to be a universal assumption—witnessed a surge in the construction of new bridges. Is this a coincidence of chronology or a direct cause-and-effect? Did the loosening of royal control over the highways and the failure of universal bridge work free the entrepreneurial spirit, allowing people to build new bridges where necessary, either to attract merchants to their town or to charge private tolls?

The sources do not provide answers. Certainly, as

the system of obligations crumbled, other solutions were devised to patch the system. Not until the middle of the 16th century, when the upheavals of the Reformation transformed land ownership, was the government able to reform the system of bridge and road repair, turning the duty of maintenance back to local landowners, who paid officials in every parish.

Glory Days Past

Today's Highway Trust Fund has earned public support. Having the users pay appears fair and effective; having them pay as they go seems fiscally responsible; and assuring that the payments are not diverted to other uses maintains a clear sense of purpose. The Highway Trust Fund monies are made available to highway agencies through special multiyear arrangements that are necessary for large-scale construction projects, and they are placed off-budget to insulate them from cyclical and budgetary fluctuations. The Highway Trust Fund has proven its mettle during the rapid, uninterrupted construction of the Interstate Highway System. It is enshrined as a key element of U.S. transportation policy.

Yet anyone who works with U.S. highway finance knows that the glory days of the Highway Trust Fund were over long ago. The fund worked like magic when motor fuel tax receipts grew in rough proportion to system use, as reflected in vehicle miles of travel (VMT).

Between 1957 and 1972, inflation-adjusted receipts from motor fuel taxes going into the Highway Trust Fund grew by 97 percent, almost in lockstep with VMT, which grew by 95 percent. Then came the oil embargo of 1973 and Corporate Average Fuel Economy standards in 1975. The average fuel economy for all vehicles increased, as did inflation. The purchasing power of the Highway Trust Fund has grown only 6 percent since then, but VMT—and the wear and tear on the roads—rose by 227 percent. Highway interests are painfully aware of this erosion of purchasing power, yet support for the Highway Trust Fund continues to be nearly unanimous.

Emerging Solutions

The emergence of hybrid cars and cars powered by alternative fuels means that more road users will be exempt from road user fees. The National Surface Transportation Infrastructure Financing Commission recognized that these developments would continue to undermine the efficacy and fairness of motor fuel taxes and recommended shifting to a mileage-based user fee by 2020 (*1*).

These fees preserve the base of user fees, as vehicle fuel economy improves and as more and more vehicles are powered by alternative fuels not included in motor fuel taxes. But the mileage-based user fees do not correct for inflation. No President or Congress in the past 25 years has proposed increases to the gas tax; they probably would not adjust mileage-based fees either.

Photo: David Falconer, U.S. National Archives

In the fall of 1973, the gasoline shortage was causing stations along Interstate highways—such as this one on I-5 in Oregon—to run out of gas by the middle of the day.

Previous changes to the Highway Trust Fund reflect valid, competing concerns such as reducing environmental damage and supporting public transportation. Achieving its original purpose—having highway users pay for highways—has become less distinct. The eventual collapse of the fund may not be the end of organized transportation policy, but a moment when new solutions will emerge—as happened in the 12th century. As earmarks and legislative delays erode the traditional federal aid for highways, stronger state and local programs may form the new centerpiece.

Long-Range Perspectives

All citizens are directly affected by U.S. transportation policy. New legislative proposals are studied for their effect on states, modes, industries, or professional areas. Opportunities to rise above everyday concerns and to reflect on this from a detached, long-range perspective are few.

Looking back at medieval bridge maintenance provides such an opportunity. The view does not yield any magic solutions or precise parallels, but it engenders a surprising camaraderie with these distant people. Their failures mirror our failures; their successes show that progress comes slowly and clumsily.

Reference

1. National Surface Transportation Infrastructure Financing Commission. *Paying Our Way: A New Framework for Transportation Finance*. February 2009. http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Advance%20Copy_Feb09.pdf.

Implementing the *Mechanistic–Empirical Pavement Design Guide* for Cost Savings in Indiana

TOMMY E. NANTUNG

The author is Section Manager, Division of Research and Development, Indiana Department of Transportation, West Lafayette.

The *Mechanistic–Empirical Pavement Design Guide* (MEPDG) presents a new paradigm for pavement design and analysis. Developed under the National Cooperative Highway Research Program and adopted and published by the American Association of State Highway and Transportation Officials, the MEPDG approach considers the input parameters that influence pavement performance—including traffic, climate, and pavement layer thickness and properties—and applies the principles of engineering mechanics to predict critical pavement responses (*1*). The MEPDG changes not only the design process and inputs but the way that engineers develop and implement effective and efficient pavement design.

Problem

The MEPDG design and analysis process incorporates a hierarchical approach to design inputs for subgrade, materials, environment, traffic, and project information. The design team selects the inputs and determines the types and quantities of data needed for a reliable design case by case. This task requires a thorough evaluation of all of the design parameters and an analysis of how the values will affect the predicted performance.

Implementation of the MEPDG design process therefore demands that the designers must be knowledgeable about pavement design inputs and pavement performance. In addition, interaction is necessary among the highway agency engineers who work in traffic, materials, geotechnical areas, and pavement structures to identify the proper input parameters for the design. The design team must have sufficient knowledge in pavement engineering to ensure successful outcome of the analysis and design process.

Concrete pavement construction project in Indiana; the MEPDG design and analysis procedure has allowed a 2-in. reduction in pavement thickness and has optimized joint spacing.

Solution

In implementing the MEPDG, the Indiana Department of Transportation (DOT) first identified candidate projects and initiated research to quantify the input parameters for pavement design. The research included traffic, materials, pavement structure, and testing. One important activity was to ensure that the team of pavement design engineers—agency staff and outside consultants—had a knowledge and understanding of the design procedure.

Consultants often have strong backgrounds in structural design, but limited familiarity with pavement design. They may have to undergo intensive pavement training to reach the required level of knowledge.

Also important is coordination with other involved parties, such as the Federal Highway Administration (FHWA), state pavement associations, and contractor associations. FHWA must approve use of the MEPDG design procedure on projects supported with federal funds. Because contractor associations represent the groups that build the pavements—and sometimes warrant or design pavements as part of design–build projects—their familiarity with the MEPDG can help in providing long-lasting pavements.

Application

Indiana DOT began implementing the MEPDG on January 1, 2009. The early implementation was made possible by efforts that started in 2002.

The Indiana DOT Pavement Steering Committee coordinates all MEPDG implementation activities,

with participation from agency pavement design engineers, FHWA, pavement associations, and contractor associations. The committee meets monthly to discuss issues in implementation and to approve the next steps. Training sessions were conducted with the cooperation of all parties in November 2008, with another session initiated by the pavement associations in March 2009.

As training and implementation progressed, Indiana DOT needed to provide customer support to pavement design engineers and consultants, to facilitate use of the MEPDG software and ensure its proper application. Most of the pavement designers and consultants gained familiarity with the new pavement design procedure within six months. They applied this knowledge in the design of projects funded through the American Recovery and Reinvestment Act of 2009. Consultants also demonstrated their knowledge and readiness to implement the MEPDG in several projects for local public agencies.

Benefits

From January to December 2009, Indiana DOT staff and consultants designed more than 100 pavement sections using the MEPDG procedure. As required by the FHWA Indiana Division, Indiana DOT documented the pavement thickness design of all new pavements and provided comparisons between the thicknesses estimated according to the 1993 *AASHTO Guide for Design of Pavement Structures* (2) and those estimated according to the MEPDG procedures.

In addition, the Indiana DOT executive staff reviewed the cost savings attributed to the pavements designed with the MEPDG. Because the AASHTO 1993 Guide and its adaptations are in common use by state and provincial highway agencies, the cost comparison is valid. Table 1 (page 36) lists the estimated and actual cost savings for all new pavement projects let for contract from late 2008 to early 2010.

The savings shown in Table 1 result from optimized pavement structures achieved through MEPDG's more efficient design and analysis procedure and its enhanced characterization of traffic data and pavement material properties. Most of the savings came from the reduced thickness of the asphalt pavements and from a combination of the reduced thickness and the optimized joint spacing of concrete pavements.

The thickness of most of the concrete pavements on the Interstate and U.S. highway systems is reduced by 2 inches; a less prominent reduction applied to pavements on state routes. The cost savings were estimated as the difference from the average contract unit price of pavements in the Indiana DOT database. For the five completed projects, however, the total savings of $3,024,954 were calculated using the actual contract cost.

The table does not include cost savings for pavement rehabilitation projects—that is, for structural overlays. These savings are expected to be high—possibly more than $20 million for one construction season—because pavement rehabilitation projects outnumber new pavement projects.

The cost comparisons assumed that the initial construction costs for pavement structures would have a similar traffic level over a similar service life. The optimized pavement structures resulting from the MEPDG analysis procedure, however, may require different maintenance and rehabilitation actions from those determined with the earlier AASHTO design procedures; the life-cycle cost savings, therefore, would differ from the initial construction cost savings.

Developing the *Mechanistic–Empirical Pavement Design Guide*

AMIR N. HANNA

The *Mechanistic–Empirical Pavement Design Guide* (MEPDG) incorporates the design methodology developed under National Cooperative Highway Research Program (NCHRP) Project 1-37A, Guide for the Design of New and Rehabilitated Pavement Structures, by ERES Consultants, Inc. (later part of Applied Research Associates, Inc.), with Arizona State University as a subcontractor. The pavement design methodology is based on engineering mechanics and validated with extensive road test performance data.

The MEPDG approach presents a major change from the pavement design methods in the 1993 *AASHTO Guide for Design of Pavement Structures*, which are based on limited empirical performance equations developed from the AASHO Road Test in the late 1950s. The design methodology applies to all pavement types by considering the same inputs in terms of climate and traffic. Through a process of modeling and consideration of material properties, distress is predicted. The designer defines an acceptable level of distress and then determines the properties and layer thicknesses that would produce the level of distress at the desired time in the pavement's life.

The mechanistic–empirical pavement design procedure relates the pavement thickness and the material properties to performance. The more detailed characterization of traffic generates a more accurate estimate of its effect on performance. In addition, the effect of construction and material variability on performance can be estimated.

The pavement can be engineered to address particular distress types. Various NCHRP projects developed Version 1.0 of the MEPDG software; AASHTO is pursuing the development of Version 2.0, expected to be available in early 2011. In addition, research under several NCHRP projects aims to enhance the applicability of the MEPDG. For more information, visit the NCHRP website, www.trb.org/NCHRP/.

The author is Senior Program Officer, Cooperative Research Programs, TRB.

Indiana DOT asphalt pavement construction project; the agency has coordinated with contractor associations in implementing the new MEPDG procedures.

For example, the concrete pavements designed with the MEPDG procedure have a shorter joint spacing (16 ft versus 18 ft) and thus approximately 15 percent more joints that may require maintenance. Nevertheless, only a slight difference is expected, because the pavements are designed to provide similar performance and therefore should require similar maintenance.

In summary, Indiana DOT's experience has confirmed that implementation of the MEPDG results in efficient pavement designs that can be built at a lower cost, producing much-needed cost savings.

For more information, contact Tommy E. Nantung, Section Manager, Division of Research and Development, Indiana Department of Transportation, P.O. Box 2279, West Lafayette, IN 47906; telephone, 765-463-1521, ext. 248; tnantung@indot.in.gov.

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1. *Mechanistic–Empirical Pavement Design Guide: A Manual of Practice*. American Association of State Highway and Transportation Officials, Washington, D.C., July 2008.
2. *AASHTO Guide for Design of Pavement Structures*. American Association of State Highway and Transportation Officials, Washington, D.C., 1993.

EDITOR'S NOTE: Appreciation is expressed to Amir N. Hanna, Transportation Research Board, for his efforts in developing this article.

TABLE 1 Cost Savings Attributed to Implementation of the MEPDG

Road	Letting Date	AASHTO 1993 Thickness, Joint Spacing	MEPDG Thickness, Joint Spacing	Estimated Contract Savings	Actual Contract Savings
I-465	11/19/2008	16″, 18′ JPCP	14″, 18′ JPCP	$1,475,000	$1,000,000
I-465 ramps (10th St.)	11/19/2008	12.5″, 18′ JPCP	11″, 18′ JPCP	$112,000	
I-80 (mainline)	11/19/2008	16″, 18′ JPCP	14″, 18′ JPCP	$361,000	$775,170
I-80 (ramp)	11/19/2008	12″, 18′ JPCP	10.5″, 18′ JPCP	$520,000	
SR 14	3/8/2008	15″ HMA	13.5″ HMA	$333,000	$155,440
US 231	11/8/2008	15.5″ HMA	13″ HMA	$557,000	$673,796
SR 62	11/8/2008	16″ HMA	13″ HMA	$403,000	$420,548
US 24	3/11/2009	12.5″ JPCP	10.5″ JPCP	$720,000	
SR 32	2/11/2009	15.5″ HMA	13.5″ HMA	$283,000	
SR 66	2/11/2009	13.5″ HMA	13″ HMA	$90,000	
US 31	2/11/2009	15.5″ HMA	14″ HMA	$287,000	
SR 641	3/11/2009	15.5″ HMA	13″ HMA	$292,000	
SR 3	3/11/2009	14″ HMA	13.5″ HMA	$103,000	
SR 23	4/8/2009	18″ HMA	13.5″ HMA	$430,000	
I-465	9/10/2009	16″, 15′ JPCP	14″, 18′ JPCP	$432,000	
I-70 @ I-465 & ramps	9/10/2009	16″, 15′ JPCP	14″, 18′ JPCP	$665,000	
I-465	9/10/2009	16″, 15′ JPCP	14″, 18′ JPCP	$391,000	
AE @ I-465 & ramps	9/10/2009	18″ HMA	14.5″ HMA	$598,000	
I-465	1/13/2010	16″, 15′ JPCP	14″, 18′ JPCP	$494,000	
I-74 @ I-465 & ramps	1/13/2010	14.5″, 15′ JPCP	12.5″, 18′ JPCP	$234,000	
SR 37 @ I-465	3/3/2010	13.5″, 15′ JPCP	12″, 16′ JPCP	$90,000	
SR 25 Segment 3, Phase C	TBA	14″ HMA	12.5″ HMA	$484,000	
US 24 Phase 2	2/10/2010	15″ HMA	13″ HMA	$375,000	
Total cost savings				**$10,268,000**	

AASHTO 1993 = *AASHTO Guide for Design of Pavement Structures,* 1993; MEPDG = *Mechanistic–Empirical Pavement Design Guide*; JPCP = jointed plain concrete pavement; HMA = hot-mix asphalt pavement; I = Interstate; SR = state route; AE = airport expressway.

Suggestions for "Research Pays Off" topics are welcome. Contact G. P. Jayaprakash, Transportation Research Board, Keck 488, 500 Fifth Street, NW, Washington, DC 20001 (202-334-2952; gjayaprakash@nas.edu).

TRB Meetings 2011

January

22 International Symposium on Durable and Innovative Bridges
Washington, D.C.

23–27 TRB 90th Annual Meeting
Washington, D.C.
www.TRB.org/AnnualMeeting

February

7–11 2nd International Conference on Construction Management*
Orlando, Florida

March

13–16 Geo-Frontiers 2011*
Dallas, Texas

16–18 Joint Rail Conference: Shared Corridors, Shared Interests*
Pueblo, Colorado

30–April 1 5th University Network Summit: Catastrophes and Complex Systems*
Washington, D.C.
Joedy Cambridge

May

1–4 International Transportation Economic Development Conference: Economic Impact of Connecting People, Goods, Markets, Employment, Services, and Production*
Charleston, West Virginia

8–12 13th TRB National Transportation Planning Applications Conference
Reno, Nevada

10–11 Transportation Planning, Land Use, and Air Quality Conference
San Antonio, Texas

18–20 3rd International Conference on Roundabouts
Carmel, Indiana

18–20 4th International Transportation Systems Performance Measurement Conference
Irvine, California

June

2–3 5th International Conference on Bituminous Mixtures and Pavements*
Thessaloniki, Greece

6–7 Using National Household Travel Survey Data for Transportation Decision Making Workshop
Washington, D.C.

7–9 13th Annual Harbor Safety Committees and Area Maritime Security Committees Conference*
Houston, Texas

9–11 2nd GeoHunan International Conference: Emerging Technologies for Design, Construction, Rehabilitation, and Inspection of Transportation Infrastructure*
Hunan, China

14–17 1st International Conference on Access Management*
Athens, Greece

27–30 6th International Driving Symposium on Human Factors in Driver Assignment, Training, and Vehicle Design*
Lake Tahoe, California

28–July 1 6th International Symposium on Highway Capacity and Quality of Service
Stockholm, Sweden

July

10–13 TRB Joint Summer Meeting
Boston, Massachusetts

11–14 Southern African Transport Conference*
Pretoria, South Africa

24–27 10th International Conference on Low-Volume Roads
Orlando, Florida

August

30–Sept. 1 Emerging Issues in Safe and Sustainable Mobility for Older People
Washington, D.C., area

TBD 19th Biennial Symposium on Visibility and Traffic Control Devices
Minneapolis, Minnesota
Rich Cunard

September

13–16 Smart Rivers 2011: Systems Thinking*
New Orleans, Louisiana

14–16 3rd International Conference on Road Safety and Simulation
Indianapolis, Indiana

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*TRB is cosponsor of the meeting.

Jake Kononov

Colorado Department of Transportation

Jake Kononov brings more than 28 years of experience in planning, designing, constructing, and operating transportation facilities to his positions as director of research for the Colorado Department of Transportation (DOT) and associate professor, adjunct, at the University of Colorado at Boulder. He started his career at Colorado DOT as a junior engineer, became a project engineer in 1987, a resident engineer in 1991, and in 2001 was promoted to traffic and safety engineer, overseeing safety and mobility for the entire Denver metropolitan area. In 2006, Kononov began his current position at Colorado DOT and became Colorado state representative to TRB.

Kononov received bachelor's, master's, and doctoral degrees from the University of Colorado, Denver (UCD); his doctoral dissertation focused on accident prediction and diagnostics of accident causality. "Throughout my career, I have been fortunate to have an opportunity to combine engineering practice with state-of-the-art applied research and teaching," Kononov observes.

"Working in concert with gifted and dedicated Colorado Department of Transportation staff made it possible to improve safety in Colorado significantly and to establish a model for the rest of the country."

At a Safety Management Conference in Arizona in 1994, he attended a presentation by Ezra Hauer, University of Toronto—a pivotal moment in Kononov's career and one that provided him with the motivation to study and practice road safety. Hauer's argument that professional authority rests on substantive knowledge—and that only when such knowledge is obtained can the transportation engineer act with social responsibility—resonated strongly with Kononov and continues to influence his work as an engineer. "These ideas offered liberation from the uncertainty of intuition- and opinion-based decision making in safety, and offered an exciting promise of an emerging new science addressing safety explicitly and quantitatively," Kononov recalls.

In 1998, Kononov and fellow Colorado DOT employee Bryan Allery began what Kononov refers to as a "safety revolution" at the department, initiating a transition to science-based safety management with the goal of maximizing crash reduction within available budget constraints. Kononov and Allery applied Hauer's ideas to Colorado DOT projects—ideas that were, at that time, considered radical. That year, the team calibrated the first Safety Performance Functions (SPF) and began work on diagnostic methodology; since 2000, their predictive and diagnostic tools have been used for all Colorado DOT projects—including resurfacing, reconstruction, widening, realignment, safety improvements, environmental assessments, and behavioral programs.

Institutionalized use of this diagnostic methodology contributed significantly to the 40.4 percent reduction in the number of fatal crashes in Colorado between 2002 and 2010, according to Colorado DOT and the Fatality Analysis Reporting System. Kononov and Allery also provided guidance on accident analysis methodology to DOTs across the country. With Allery, he has coauthored many of the TRB papers incorporated into the American Association of State Highway and Transportation Officials' *Highway Safety Manual* (2010), translating state-of-the-art statistical techniques into applied practical methodology used by engineers. Introduced and implemented by Kononov, the concept of level of service of safety in the SPF framework quantitatively describes the relative safety of a roadway segment or intersection. The nature of the problem is identified using direct diagnostics and statistical pattern recognition techniques also pioneered by Kononov.

Nine years before the publication of the *Highway Safety Manual*, Kononov developed and taught a graduate class at UCD on the explicit consideration of safety in highway design—the first class of its kind in the United States—and devised a continuing education class on the same topic for practicing engineers.

"Throughout my career, I was fortunate to have an opportunity to work with a number of talented professionals—including Jerold Simpson, Ron Nelson, Rich Sarchet, Zane Znamenacek, Steve Hersey, and Scott McDaniel," Kononov comments. "Working in concert with gifted and dedicated Colorado DOT staff made it possible to improve safety in Colorado significantly and to establish a model for the rest of the country."

Kononov's research has been published by TRB, the Swedish National Road and Transport Institute, the German Road Research Institute, the Italian Society on Highway Infrastructure, and *Public Works Magazine*. At TRB, he cochairs the Safety Management Committee and is a member of the Safety Data Analysis and Evaluation Committee. He also has served on several National Cooperative Highway Research Program project panels and chaired a panel examining the relationship between design standards and truck characteristics.

Alexander Skabardonis

University of California, Berkeley

After receiving a bachelor's degree from National Technical University of Athens, Greece, and a master's degree and Ph.D. in transportation engineering from the University of Southampton, England, Alex Skabardonis had originally planned to return to Greece and become a transportation consultant. But in 1983, he came to the United States for a six-month postdoctoral research appointment at the University of California, Berkeley (UCB)—and stayed for 27 years. He now is a professor in UCB's Department of Civil and Environmental Engineering and a research engineer at the Institute of Transportation Studies.

In his doctoral dissertation, Skabardonis developed a microscopic simulation model for freeway merging areas—ever since then, his research has focused on modeling and simulation. He is an internationally recognized expert in traffic flow theory and models; traffic management and control systems; design, operation, and analysis of transportation facilities; intelligent transportation systems (ITS); and the impact of transportation on energy and the environment. His modeling research led to enhancement of existing models, and his work on performance measurement and developing of data test beds—such as the freeway performance measurement system (PeMS) and the Berkeley Highway Laboratory (BHL)—has proved useful in theory and model testing. He was a senior adviser to the Federal Highway Administration's (FHWA) Next-Generation Simulation project.

"The state of practice in traffic management and control systems has advanced little over the past 20 years, despite great advances in the state-of-the-art analysis tools and information technology."

"The state of practice in traffic management and control systems has advanced little over the past 20 years, despite great advances in the state-of-the-art analysis tools and information technology," Skabardonis notes. "There are tremendous opportunities to deploy these advances to improve mobility and safety."

Skabardonis served as principal investigator for a BHL prototype dataset of 4,700 vehicle trajectories extracted from video images. He developed improved microscopic car-following and lane-changing algorithms for oversaturated conditions on freeways; further work in this area produced—for the first time—a new microscopic traffic flow theory that can explain common traffic phenomena, verified with experimental data.

His recent research on traffic operations and performance analysis has included large-scale field experiments, laboratory test-beds with real-time data from multiple sensors, algorithms for data fusion, performance measures estimation, and freeway and arterial prediction. Besides PeMS, which processes real-time data from more than 30,000 sensors embedded in California freeways to produce freeway performance measures, Skabardonis' work includes a framework for analysis of freeway bottlenecks, tools to assess the effectiveness of freeway service patrols in several states, and an analytical model to estimate the travel times on signalized arterials based on data from system loop detectors and signal settings. For California's Fuel-Efficient Traffic Signal Management Program, also known as FETSIM, he developed and evaluated improved procedures for optimal timing of signalized intersections in signal systems. Engineers nationwide use the findings from his FHWA-sponsored research on timing of coordinated traffic-actuated signals along arterials and networks.

Skabardonis is director of California Partners for Advanced Transit and Highways (PATH), a statewide ITS research center. At UCB, he has taught graduate courses on subjects from ITS to urban traffic control; more than 500 transportation professionals have attended his workshops on traffic management, control systems, and traffic analysis tools.

In 1985, Skabardonis attended his first TRB meeting; later that year, he published his first paper in the *Transportation Research Record: Journal of the Transportation Research Board*. "I remember, through the entire three days of my first TRB Annual Meeting, never leaving the conference hotel—completely absorbed by the paper sessions, committee meetings, and colleagues' discussions taking place," Skabardonis recalls, noting that this still is the norm for the Annual Meetings he attends today.

Skabardonis is an active member of TRB's Freeway Operations Committee, Traffic Flow Theory and Characteristics Committee, and Highway Capacity and Quality of Service Committee. He also was a member of the Working Group on EU–U.S. Transport Research Collaboration, a project of TRB and the European Conference of Transport Research Institutes. He is a reviewer for journals in transportation, and for papers presented at conferences and symposia, including the American Society of Civil Engineers' *Journal of Transportation Engineering*, the World Congress on ITS, and the International Symposia of Traffic Flow and Transportation. He also is coauthor of the widely cited FHWA publication, *Guidelines for Applying Traffic Microsimulation Software*.

PHOTO: NHTSA

Firefighters remove the top from a car at an accident scene. The number of road deaths in the United States and abroad has fallen in the past several years.

Road Fatalities Decline in United States, Abroad

Road deaths in the United States and in many countries worldwide have dropped sharply in recent years, according to studies by the National Highway Traffic Safety Administration (NHTSA) and by the International Transport Forum's (ITF) International Traffic Safety Data and Analysis Group (IRTAD).

NHTSA reports that the number of Americans killed in motor vehicle crashes reached a 61-year low in 2009. Highway deaths fell to 33,808 last year—a drop of nearly 10 percent from 2008. The study also noted the lowest fatality rates ever recorded—1.13 deaths per 100 million vehicle miles traveled, compared to a rate of 1.26 the previous year. The most recent peak point for highway deaths was in 2005 (43,510), but data show that rates have declined steadily since then, according to the report. Road fatalities fell by an annual average of 2.3 percent between 2000 and 2009.

An estimated 2.2 million people were injured in traffic accidents in the United States in 2009, a 5.5 percent decline from 2.3 million in 2008. Forty-one states, along with the District of Columbia and Puerto Rico, experienced reductions in the number of fatalities on their roads. With 422 and 405 fewer fatalities respectively, Florida and Texas saw the greatest decline in road deaths in 2009.

Internationally, 30 of the ITF's 33 member countries experienced an average annual decline in road deaths; in many cases, this decrease was dramatically more in the 2000 to 2009 period than in previous decades. In Spain, annual average traffic fatalities fell by 8.5 percent and in the United Kingdom by 4.6 percent. Portugal, Spain, and France had the largest declines in traffic-related deaths since 2000—55, 53, and 47 percent, respectively. In 2009, Switzerland reached the lowest number of road deaths since systematic records began; Denmark had the lowest number of fatalities since 1932.

The United Kingdom had the lowest rate of road deaths (3.8 per 100,000 inhabitants), followed by Sweden and the Netherlands (3.9) and Israel (4.2). The highest traffic death rates were recorded in Malaysia (23.8) and Argentina (18.4). According to IRTAD, 90 percent of road deaths occur in low- and middle-income countries.

Many countries also saw upticks in the number of deaths associated with motorcycles—in Finland, motorcycle fatalities increased by more than 150 percent. Part of the increase can be explained by increased motorcycle use, according to the study.

The NHTSA report can be accessed at www-nrd.nhtsa.dot.gov/Pubs/811363.pdf. For more information about the IRTAD study, contact Michael Kloth, International Transport Forum, at michael.kloth@oecd.org.

Southeast Initiative Boosts Propane Vehicles

Fifty vehicles were converted from gasoline to propane in August as part of the Southeast Propane Autogas Development Program, supported by the American Recovery and Reinvestment Act of 2008 and the U.S. Department of Energy's Clean Cities Program. Peninsula Propane, an affiliate of a South Florida paratransit, shuttle, and taxi company, converted six vehicles; Georgia-based Force 911, a law enforcement vehicle outfitter, converted 44.

Managed and administered by the Virginia Department of Mines, Minerals, and Energy and Virginia Clean Cities at James Madison University, the $8.6 million program aims to place nearly 1,200 propane vehicles on the road in nine Southeast states and in Washington, D.C., and will open at least 20 refueling stations. Alliance AutoGas, with founding partners Blossman Gas and American Alternative Fuel, is training technicians to perform the vehicle conversions, installing refueling stations, and supplying propane Autogas fuel.

For more information about the Southeast Propane Autogas Development Program, visit www.usepropaneautogas.com or contact Lauren Scott at lauren@msmcommunications.com.

Photo: Norfolk Southern Corporation

The first stack train to transit the Heartland Corridor emerges from the Cowan Tunnel in Pulaski County, Virginia, in September 2010.

Norfolk Southern Opens Heartland Corridor

The Heartland Corridor—one of the most extensive railroad projects in recent decades—opened in September, creating the shortest and fastest route for double-stack container trains moving between the Port of Virginia and Columbus, Ohio. A public–private partnership between Norfolk Southern Corportation, the federal government, and the states of Ohio, West Virginia, and Virginia, the new corridor improves transit time from Norfolk, Virginia, to Chicago, Illinois, from 4 days to 3 days; is nearly 250 miles shorter than previous circuitous routings; and can accommodate double-stacked trains.

Construction began in October 2007 to raise the vertical clearances on 28 tunnels—5.7 miles of tunnel in all—and to remove 24 overhead obstacles. Modifications included roof excavation and liner replacement, arched roof notching to allow rectangular containers to pass, and track lowering and realignment. The federal government provided $83.3 million in funds, the Commonwealth of Virginia contributed $9 million, and the State of Ohio provided $836,355; Norfolk Southern covered the rest of the project's $191 million cost.

The original Heartland Corridor line dates to the late 19th century, when its main freight consisted of coal.

For more information on the Heartland Corridor, contact Frank Brown at 757-629-2710 or fsbrown@nscorp.com.

Rough Roads Bump Up Costs

Potholes and poor pavement conditions cost the average urban driver $402 annually, according to a study from national transportation research organization TRIP. Rough roads accelerate vehicle deterioration, tire wear, and fuel consumption, increasing the cost of operating a vehicle for urban motorists. Twenty-four percent of roadways in U.S. metropolitan areas—defined as areas with populations above 500,000—are in poor condition, according to the report.

The study shows California at the top of the list for urban centers with rough pavement: San Jose has the highest percentage of roads in disrepair (64); followed by Los Angeles (63 percent); Honolulu, Hawaii (62 percent); Concord, California (58 percent); and San Francisco–Oakland (58 percent). Atlanta, Georgia, and Jacksonville, Florida, have the highest percentages of roads with pavement in good condition—84 and 74 percent, respectively.

In smaller urban centers—populations between 250,000 and 500,000—Antioch, California, and Santa Rosa, California, have the worst pavement, followed by Trenton, New Jersey; Reno, Nevada; and Hemet, California. Augusta, Georgia, has the highest percentage of pavement in good condition among smaller urban centers—71 percent, according to the TRIP report.

To see the full report, visit www.tripnet.org/Urban_Roads_Report_Sep_2010.pdf.

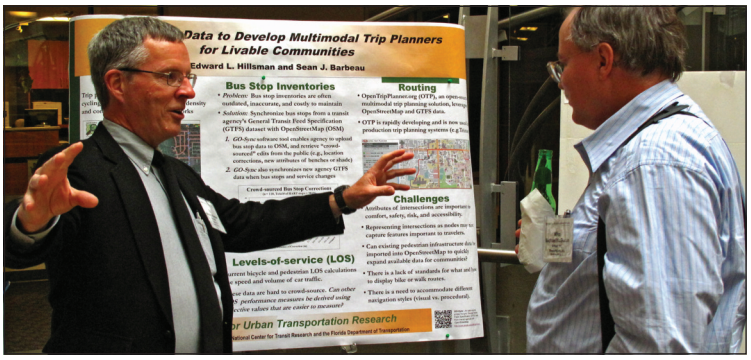
Livability, Economic Development in Focus at 90th Annual Meeting

Transportation, livability, and economic development is the spotlight theme of the TRB 90th Annual Meeting, January 23–27, 2011, in Washington, D.C. The meeting features more than 4,000 presentations in nearly 650 sessions and workshops, with 85 spotlight sessions devoted to the topic of livability and economic development, and provides an opportunity for transportation researchers, educators, administrators, and practitioners to share findings and ideas.

New to the 90th Annual Meeting will be access to the TRB Annual Meeting Online for all registrants. This package includes all papers, posters, presentation visual aids, and more than 40 recorded e-sessions. In addition, the U.S. Department of Transportation (DOT) will sponsor three sessions, including a look at the Transportation Investment Generating Economy Recovery grant program and presentations from U.S. DOT administrators and deputy administrators.

An international award presented to a University of Toronto doctoral student proves the value of Annual Meeting research and networking. Hossam Abdelgawad received the 2010 Young Researcher of the Year award from the International Transport Forum for innovative research on mass urban evacuation in the event of a major catastrophe. Inspired by discussions at the 2007 TRB Annual Meeting on emergency evacuation, Abdelgawad's research develops a framework for optimal use of existing transportation networks, including a city's rapid transit system, buses, and cars; the findings have been successfully applied in a simulated evacuation of the city of Toronto, Ontario, Canada.

For more information on the TRB 90th Annual Meeting, visit www.trb.org/AnnualMeeting2011/Public/AnnualMeeting2011.aspx.



BUILDING LIVABLE COMMUNITIES—Ed Hillsman, University of South Florida Center for Urban Transportation Research, discusses his paper on multimodal trip planner data for livable communities at the Transportation Systems for Livable Communities Conference, October 18, at the National Academies' Keck Center in Washington, D.C. The two-day conference featured 50 presentations at a poster session and reception, breakout sessions to identify research needs, and addresses from key U.S. Department of Transportation officials, including Peter Appel, Adminstrator, Research and Innovative Technology Administration, and Beth Osborne, Deputy Assistant Secretary for Transportation Policy.

IN MEMORIAM

Arthur B. Mobley (1925–2010)

Longtime TRB staff member Arthur B. Mobley died February 12 at the Rockville Nursing Home in Maryland. He was 84. A driving force behind the Highway Research Information Service (HRIS), founded in July 1967 using a main-frame computer and automated technology, Mobley worked at TRB for more than 25 years before his retirement in 1992.

Mobley started at TRB—then the Highway Research Board—in 1964, as an engineer with the National Cooperative Highway Research Program, and in 1965 was promoted to correlation service coordinator, working part-time with HRIS operations. In 1967, Mobley became the first manager of HRIS, which had been developed over 3 years under the sponsorship of the Bureau of Public Roads and state highway departments. Since then, HRIS has expanded and become the multimodal, worldwide Transportation Research Information Services (TRIS); Mobley was manager of supply operations for TRIS online activities.

A native of Baltimore, Maryland, Mobley graduated from the University of Maryland in 1950. He served in the U.S. Navy in the Pacific during World War II. Mobley worked for the Prince George's Department of Highways, the Army Map Service, and the National Slag Association before coming to TRB.

Mobley delivers a presentation at the 50th Annual Meeting of the Highway Research Board in 1971.

SIMULATOR SAFETY—Andrew Veit (*left*), University of Iowa, explains the National Advanced Driving Simulator to attendees at the USA Science and Engineering Festival, October 23 on the National Mall in Washington, D.C. The TRB booth at the two-day festival demonstrated the dangers of distracted driving; attendees sat in the simulator and attempted to navigate a vehicle during a virtual distracted driving situation. The booth also featured information on transportation and engineering careers for young visitors, as well as video footage of real-life distracted drivers whose cars had been outfitted with video cameras.

Cooperative Research Programs News

Measuring Emissions from Aircraft Auxiliary Power Units, Tires, and Brakes

Increased demand for air travel raises the importance of assessing particulate matter (PM) emissions from aircraft operations. A large database of information is available for PM emissions from aircraft main engines, but few or no PM data are available for on-aircraft auxiliary power unit emissions or for tire and brake emissions during landing. A measurement campaign that would quantify and characterize PM emissions from these sources can address this deficiency. Data should include PM mass and size and should consider its number and chemical composition.

The University of Missouri has received a $500,000, 24-month contract [Airport Cooperative Research Program (ACRP) Project 02-17, FY 2010] to develop a measurement campaign for PM emissions from auxiliary units and from tire and brake wear.

For further information, contact Joseph D. Navarrete, TRB, 202-334-1649, jnavarrete@nas.edu.

Defining and Measuring Aircraft Delay and Airport Capacity Thresholds

Aircraft delay and airport capacity are significant industry issues, and national investments in the aviation system will provide additional capacity—for example, through airspace improvements and new runways and technologies. Although the delays at many U.S. airports generally are caused by squeezed capacity, misunderstandings and conflicting guidance on how to measure delays and establish capacity thresholds impede the development of solutions.

The methods to quantify delay and capacity can be highly technical and data-intensive, and different stakeholders define and measure delay and capacity differently. No readily available source summarizes each of the various metrics and their appropriate uses.

Research can provide guidance on aircraft delay and airport capacity criteria—and the interrelationships between these criteria—to help airports and other stakeholders identify appropriate metrics for their situations and to help practitioners understand the various definitions of delay and capacity. Ultimately, this may improve support for capacity-related projects.

TransSolutions, LLC, has received a $250,000, 15-month contract (ACRP Project 03-20, FY 2010) to develop a guidebook that inventories different metrics used in the industry and offers guidance for the use of various delay and capacity metrics—particularly for evaluating capacity enhancements.

For further information, contact Joseph D. Navarrete, TRB, 202-334-1649, jnavarrete@nas.edu.

Incorporating Pavement Preservation into the *Mechanistic–Empirical Pavement Design Guide*

Although pavement preservation is not expected to increase a highway's structural capacity substantially, it maintains and improves the functional condition of a highway system and slows deterioration; therefore preservation measures should be considered in the pavement design process. The American Association of State Highway and Transportation Officials' (AASHTO) interim edition of the *Mechanistic–Empirical Pavement Design Guide*—and related software developed under the National Cooperative Highway Research Program (NCHRP)—provide methodologies for the analysis and performance prediction of different types of flexible and rigid pavements, but without explicitly considering the contributions of pavement preservation treatments to pavement performance. Approaches to studying the effects of preservation on pavement performance should be identified and incorporated into the MEPDG analysis and design process.

Applied Pavement Technology, Inc., of Urbana, Illinois, has been awarded a $299,994, 24-month contract (NCHRP Project 1-48, FY 2010) to develop procedures for incorporating pavement preservation treatments into the MEPDG analysis process.

For further information, contact Amir N. Hanna, TRB, 202-334-1432, ahanna@nas.edu.

(More Cooperative Research Programs News on page 44.)

TRUCKING PARTNERSHIP REVIEW—Robert Kreeb, National Highway Traffic Safety Administration, discusses new safety technologies at a meeting of the Committee to Review the 21st Century Truck Partnership. In 2000, this cooperative research and development partnership, formed by four federal agencies and 15 industrial partners, was formed to advance bus and truck technologies. Conducted by The National Academies' Division on Engineering and Physical Sciences, the review will examine high-level technical goals, targets, and timetables for research and development; will evaluate the program's progress since 2000; and will comment on the partnership's strategy, the balance and adequacy of its research effort, its rate of progress, an appropriate federal role, and the partnership's response to recommendations made in a 2008 review.

Cooperative Research Programs News *(continued)*

Performance-Related Specifications for Pavement Preservation Treatments

Transportation agencies often use quality assurance specifications to assure the quality of highway pavement construction. Agencies increasingly are incorporating performance-related specifications (PRSs) into construction contracts to achieve long-term performance. These specifications account for value lost or gained by the variances of the parameters from the specified target values.

Although such specifications have been used for the construction of pavements, their use for pavement preservation treatments has been limited, and widely accepted guidelines correlating fundamental engineering properties and construction quality characteristics are not available. PRS guidelines for pavement preservation treatments can provide a direct relationship between quality characteristics and performance and will help highway agencies specify the optimum level of quality balancing costs and performance.

Texas A&M Research Foundation of College Station, Texas, has received a $500,000, 36-month contract (NCHRP Project 10-82, FY 2010) to develop guidelines for preparing PRSs for preservation treatments for all pavement types. Accompanying examples will illustrate the use of the guidelines in estimating quality-related pay adjustment factors for different preservation treatments, pavement types, highway functional classes, and climates.

For further information, contact Amir N. Hanna, TRB, 202-334-1432, ahanna@nas.edu.

Modulus-Based Construction Specification for Compaction of Earthwork and Unbound Aggregate

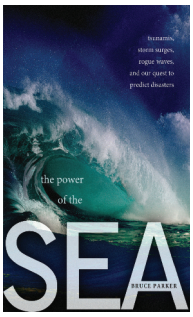
Earthwork and unbound aggregates play an important role in the performance of highway pavements and structures. Although measurement of dry unit weight and moisture content of earthwork and unbound aggregates for construction is relatively straightforward and practical, it does not provide a direct connection between design and construction; the measurement of mechanical properties such as moduli and strengths would. AASHTO's 1993 *Pavement Design Guide* and the MEPDG require the resilient moduli of base layers and subgrade as major input for pavement structural design.

Several test methods and devices can determine the stiffness or modulus of earthwork and unbound aggregates in the field, but concerns about the long-term performance of compacted earthwork and unbound aggregates have led to reluctance to accept field measurements of these factors as criteria for control and acceptance of compaction. The modulus and performance of earthwork and unbound aggregate are strongly influenced by the seasonal variation of moisture content; this, in turn, depends on three factors—material composition, degree of compaction, and available free moisture. These factors should be examined according to the principles of unsaturated soil mechanics for highway engineering and construction. This would allow development of a modulus-based construction specification to provide criteria or limits related to long-term performance of the earthwork or unbound aggregate and to compaction at the time of construction.

The University of Texas at El Paso has received a $500,000, 18-month contract (NCHRP Project 10-84, FY 2010) to develop a modulus-based construction specification for compaction of earthwork and unbound aggregate based on field measurements that can be correlated with design modulus values.

For further information, contact Edward T. Harrigan, TRB, 202-334-3232, eharriga@nas.edu.

The Power of the Sea: Tsunamis, Storm Surges, Rogue Waves, and Our Quest to Predict Disasters

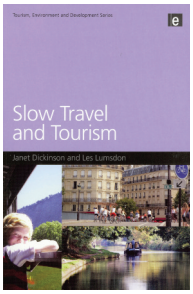


Bruce Parker. Palgrave Macmillan, 2010; 304 pp.; $28; 978-0-230-61637-0.

The Power of the Sea traces the struggle to understand the physics of the sea—a power so immense that it forces change in weather patterns around the world and affects the earth's climate. An understanding of the sea's strength could assist in the prediction of natural disasters, such as the Indian Ocean tsunami on December 26, 2004; the 20- to 40-foot storm surges on the coasts of Bangladesh and India over the centuries; or the droughts and floods caused by the global El Niño effects at the end of the 19th century.

Recounting the scientific journey from early, strange ideas about the sea to modern marine predictions with hydrodynamic computer models, this volume presents stories of scientific discovery and unpredicted natural disasters; lead characters include Napoleon, Moses, Alexander the Great, Julius Caesar, Columbus, and the U.S. Marines in World War II. The historical accounts complement the chronicle of recent scientific and technical advances, culminating in international efforts to build the Global Ocean Observing System—an array of oceanographic sensors on buoys, ships, islands, coastlines, and satellites that provides real-time data for hydrodynamic computer models.

Slow Travel and Tourism



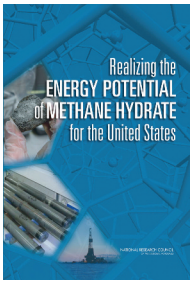
Janet Dickinson and Les Lumsdon. Earthscan, 2010; 232 pp.; $130; 978-1-849-71113-5.

Focusing on locality, ecology, and quality of life, the authors explore "slow travel" as a way to reduce the environmental impacts of travel and tourism. Defined as travel that incorporates environmentally friendly modes of transportation, slow travel is compared with related frameworks, including low-carbon tourism and sustainable tours.

Examples of sustainable transportation tourism are provided from around the world. Key trends in tourism transportation are examined in the context of recent climate change debates, and the potential for new travel patterns is reviewed. The authors present case studies—the Eurostar train as an alternative to air travel; walking the Appalachian Trail; EuroVelo, a network of long-distance cycling routes; canoe tours in Denmark; sea kayaking in British Columbia; and the Oz Bus, which travels overland from Europe to Australia.

The books in this section are not TRB publications. To order, contact the publisher listed.

Realizing the Energy Potential of Methane Hydrate for the United States

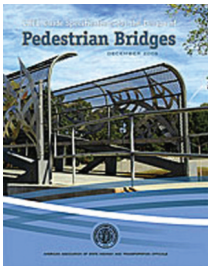


Division on Earth and Life Studies. The National Academies Press, 2010; 204 pp.; $42.25; 978-0-309-14889-4.

In 2000, the Department of Energy's (DOE) Methane Hydrate Research and Development Program was directed to implement and coordinate a national research effort to stimulate the knowledge and technology necessary for the safe and environmentally responsible commercial production of methane from methane hydrate. Methane hydrate is a potentially enormous and untapped source of methane, the primary component of natural gas. The cleanest fossil fuel, natural gas emits up to half the carbon dioxide as oil or coal for each unit of energy produced. In recent years, natural gas has supplied approximately 20 to 25 percent of all energy consumed in the United States.

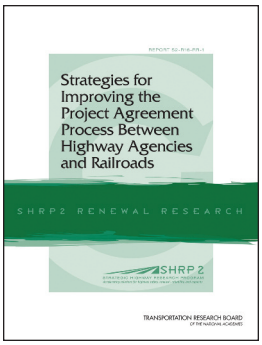
This report explores the research projects and management processes of the DOE program since its congressional reauthorization in 2005. Recommendations for future research and development initiatives are presented.

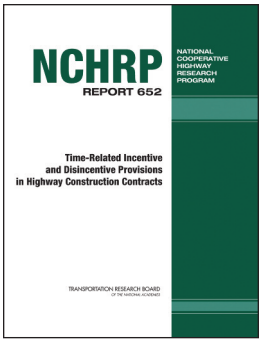
Load and Resistance Factor Design (LRFD) Guide Specifications for Design of Pedestrian Bridges, 2nd Edition



American Association of State Highway and Transportation Officials (AASHTO), 2009; 36 pp.; AASHTO member, $35; nonmember, $42; 1-56051-469-5.

Designed primarily to carry pedestrians, bicyclists, equestrian riders, and light maintenance vehicles, pedestrian bridges are not meant to support typical highway traffic. The new edition of AASHTO's guide addresses the specific needs of these bridges, including resistance and fracture fatigue; pedestrian, vehicle, equestrian, wind, and fatigue loads; girder and half-through truss stability; and design.





TRB PUBLICATIONS

Strategies for Improving the Project Agreement Process Between Highway Agencies and Railroads
Second Strategic Highway Research Program
Report S2-R16-RR-1
North American railroads and public highway departments interact whenever highway agencies conduct projects that cross over, under, or parallel to railways. Each interaction requires a thorough review of the safety, engineering, and operating effects of the project on the railroad during and after construction. Although most of these reviews and agreements proceed smoothly, delays do occur that can increase project cost and consume staff and engineering resources. This report provides recommended standard agreements, standard processes, and best practices to help railroads and highway departments reduce the time and cost of project reviews.

2010; 174 pp.; TRB affiliates, $49.50; nonaffiliates, $66. Subscriber categories: administration and management; highways; law; railroads.

Time-Related Incentive and Disincentive Provisions in Highway Construction Contracts
NCHRP Report 652
This report explores the best practices of time-related incentive and disincentive contract provisions and their effect on staffing levels, productivity, project cost, quality, contract administration, and the contractor's operations and innovations. Also presented is a decision process guide, a potential template for crafting incentive and disincentive provisions in a highway construction contract.

2010; 67 pp.; TRB affiliates, $34.50; nonaffiliates, $46. Subscriber categories: administration and management; construction; economics; finance; highways; planning and forecasting.

Evaluation and Repair Procedures for Precast–Prestressed Concrete Girders with Longitudinal Cracking in the Web
NCHRP Report 654
Current practice regarding precast–prestressed concrete girders with longitudinal web cracking varies—some bridge owners accept cracked girders as-is, others reject the damaged girders. Alternative remedies include strand debonding at girder ends, injecting grout into cracks, or the use of sealants. Suggested revisions to the AASHTO LRFD Bridge Design Specifications are evaluated, along with measures to help develop improved crack control reinforcement details for use in new girders.

2010; 65 pp.; TRB affiliates, $32.25; nonaffiliates, $43. Subscriber categories: bridges and other structures; highways; materials.

Recommended Guide Specification for the Design of Externally Bonded Fiber-Reinforced Polymer (FRP) Systems for Repair and Strengthening of Concrete Bridge Elements
NCHRP Report 655
A recommended guide specification for externally bonded FRP system design for the repair and strengthening of concrete bridge elements is examined in this report, along with the design requirements for members subjected to different loading conditions, including flexure, shear and torsion, and combined axial force and flexure. Design examples illustrate use of the specification for different FRP strengthening applications.

2010; 106 pp.; TRB affiliates, $41.25; nonaffiliates, $55. Subscriber category: bridges and other structures.

Criteria for Restoration of Longitudinal Barriers
NCHRP Report 656
By identifying the levels of damage and deterioration to longitudinal barriers that require repairs, this report provides guidance for maintenance personnel working to restore operational performance. Using pendulum testing, full-scale crash testing, and finite element simulations, researchers developed recommended repair guidelines that include damage mode, quantitative repair thresholds, the relative priorities for making repairs, and a sketch of the damage mode.

2010; 91 pp.; TRB affiliates, $30; nonaffiliates, $40. Subscriber category: maintenance and preservation.

Guidebook for Implementing Passenger Rail Service on Shared Passenger and Freight Corridors
NCHRP Report 657
Many passenger rail initiatives envision new or expanded service on freight and passenger rail corridors, but the steady growth of rail traffic—especially freight—has led to capacity problems and constraints. Designed to help states open up shared-use rail corridors to passenger services via partnerships with private freight railroads, this guidebook explores improved principles, processes, and methods to support agreements on access, allocation of operation and maintenance costs, capacity allocation, operational issues, and future responsibilities for infrastructure improvements.

2010; 169 pp.; TRB affiliates, $45; nonaffiliates, $60. Subscriber categories: planning and forecasting; public transportation; railroads.

TRB PUBLICATIONS *(continued)*

Advanced Practices in Travel Forecasting
NCHRP Synthesis 406
As agencies nationwide begin to explore advanced practices in travel forecasting, this report evaluates the potential benefits of advanced models, examines issues that may present barriers to change, and distills lessons learned from agencies that have employed advanced modeling practices. Five types of travel models—activity-based demand, dynamic network, land use, freight, and statewide models—are included in the study, which compiles a literature review, case studies, and interviews with more than 30 transportation agencies and firms.

2010; 80 pp.; TRB affiliates, $36.75; nonaffiliates, $49. Subscriber categories: highways; planning and forecasting; public transportation.

Innovative Approaches to Addressing Aviation Capacity Issues in Coastal Megaregions
ACRP Report 31
Many areas of the United States have the capability to meet projected aviation demand—except for the two heavily populated megaregions along the East and West Coasts. Research on aviation capacity issues is presented in this report, with integrated strategies to address constrained aviation system capacity and growing travel demand in the high-density, multijurisdictional, and multimodal megaregions.

2010; 167 pp.; TRB affiliates, $46.50; nonaffiliates, $62. Subscriber categories: administration and management; aviation; planning and forecasting; railroads.

Intelligent Transportation Systems and Vehicle–Highway Automation 2009
Transportation Research Record 2129
Explored are vehicle reidentification algorithms, privacy preservation in intelligent transportation systems (ITS) and the vehicle–infrastructure integration initiative, advanced traveler information systems deployment, dynamic message sign deployment and traveler diversion behavior, real-time detection of hazardous traffic events on freeways, travel time estimates from inductive loop and toll collection data, real-time estimation of urban street travel time using probe buses, guidelines for inspection and maintenance of ITS, emerging technologies for congestion reduction, video detection at signalized intersections, real-time traffic information and navigation, driver behavior and acceptance of infrastructure-to-vehicle communication systems, traffic flow impacts of adaptive cruise control with on- and off-switching, and other topics.

2009; 151 pp.; TRB affiliates, $49.50; nonaffiliates, $66. Subscriber category: highway operations, capacity, and traffic control.

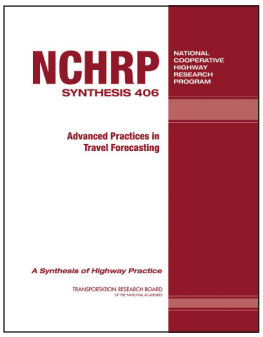
Highway Capacity and Quality of Service 2009
Transportation Research Record 2130
Authors investigate subjects including an estimation of freeway work zone capacity, the level of service and capacity of freeway weaving segments, left-turn delay estimation, left-turning vehicles at a two-way stop-controlled intersection, and U-turn capacity at unsignalized median openings. Papers on the quality of progression on signalized urban streets, peak flow variations, turbo roundabout capacity, the effect of phase countdown timers on queue discharge characteristics, the capacity of Taiwan's Xueshan Tunnel, a delay pattern estimation for signalized intersections, performance measures for truck level of service, a simulation of work zone capacity values, and a model-based estimation of arterial link travel times are also presented.

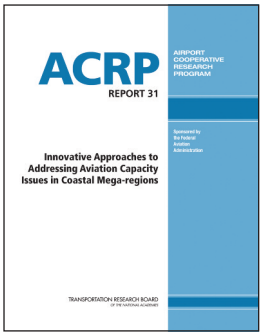
2009; 157 pp.; TRB affiliates, $49.50; nonaffiliates, $66. Subscriber category: highway operations, capacity, and traffic control.

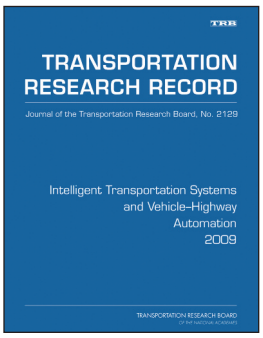
Structures 2009
Transportation Research Record 2131
The 15 papers in this volume examine light support structures for traffic signs and signals, steel bridges, concrete bridges, and culverts. Among the specific topics discussed are the structures' design, testing, seismic design, and the properties of the materials used in these structures—concrete, steel, polyvinyl chloride pipe joints, carbon fiber–reinforced polymer, glass fiber–reinforced polymer stay-in-place forms, and FRP–concrete bond.

2009; 162 pp.; TRB affiliates, $49.50; nonaffiliates, $66. Subscriber categories: bridges and other structures; hydraulics and hydrology.

Travel Demand Forecasting 2009, Volume 1
Transportation Research Record 2132
Authors present research on topics including transit, land use, and auto pricing strategies to reduce vehicle miles traveled and greenhouse gas emissions; continuous departure time models; an artificial neural network delay model for traffic assignment; work departure time analysis; adding mode choice to multiagent transport simulation; the heterogeneous decision rule model of mode choice; evacuation planning; assessment of user benefits in the presence of random taste heterogeneity; an estimation of random coefficient logit models with a full covari-







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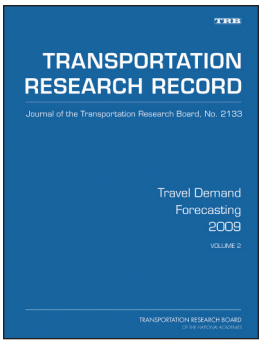

TRB PUBLICATIONS *(continued)*

ance matrix; a model for person and household mobility attributes; risk and uncertainty in toll road projects; implementation of the Transportation Analysis and Simulation System in Chittenden County, Vermont; large dynamic network assignment and traffic equilibrium problems; generating connectors in transportation planning models; and enhanced destination choice models.

2009; 151 pp.; TRB affiliates, $49.50; nonaffiliates, $66. Subscriber category: planning and administration.

Travel Demand Forecasting 2009, Volume 2
Transportation Research Record 2133
Toll plaza delay estimation, travel demand forecasting models to anticipate welfare impacts, adapting travel models and urban models to forecast greenhouse gases, spatial equity analysis on expressway network development in Japan, an integrated land use and transportation modeling framework for a small metropolitan area, calibrating a synthetic built form generator, integrated transport and gravity-based land use models for policy analysis, dynamic origin–destination estimation, and other topics are studied in this volume.

2009; 141 pp.; TRB affiliates, $46.50; nonaffiliates, $62. Subscriber category: planning and administration.

Travel Behavior 2009, Volume 1
Transportation Research Record 2134
Research is presented on departure time choice behavior; the implications for climate policy of fuel costs, circulation taxes, and car market shares; household expenditures for travel, communication, and facilities; the effects of physical activity on propensity for sustainable trips; intrahousehold interaction in transit-oriented residential choice behavior; travel time ratios for activity participation in the Netherlands; estimation of road traffic demand elasticities for Mexico City, Mexico; travel time reliability for Stockholm roadways; how sustainable commuting can be explained by neighborhood design; a daily activity type, timing, and duration sequence model; a multiday, multiagent model of travel behavior with activity scheduling; and other topics.

2009; 185 pp.; TRB affiliates, $52.50; nonaffiliates, $70. Subscriber category: planning and administration.

Travel Behavior 2009, Volume 2
Transportation Research Record 2135
The papers in this volume investigate ego-centered social networks; whether the value of travel time increases as travel time increases; a continuous choice model of timing and duration of joint activities; the perception of waiting time at signalized intersections; the relationship between work and travel behavior on weekdays; location choice modeling for shopping and leisure activities; built environment or household life-cycle stages for explaining sustainable travel; the travel behavior of minority cohorts in Texas; a simultaneous model for household interactions in daily activity, information and communication, and social behavior; e-shopping, spatial attributes, and personal travel; and more.

2009; 169 pp.; TRB affiliates, $49.50; nonaffiliates, $66. Subscriber category: planning and administration.

Statistical Methods 2009
Transportation Research Record 2136
Authors present research on subjects including aggregated and disaggregated Poisson–gamma models for modeling crash data; performance-based contract analysis using hazard-based duration and zero-inflated random parameters Poisson models; a Bayesian multinomial logit for modeling route choice; a Bayesian mixture model for estimating freeway travel time distributions; studying ice-related crashes using lattice data analysis, network K-functions, and geographic information system software; Bayesian statistics to identify highway sections with high rates of median-crossing crashes; and spatial autocorrelation and a Bayesian spatial statistical method for analyzing intersections prone to injury crashes.

2009; 100 pp.; TRB affiliates, $42; nonaffiliates, $56. Subscriber category: safety and human performance.

Safety 2009: Security; Emergencies; Management; and School Transportation
Transportation Research Record 2137
The use of harmful events data in transportation safety management, a national traffic safety index, prioritization of patients for evacuation from a health care facility, a case study for improving evacuation planning, rural preparedness for traffic control in agricultural emergencies, vulnerability assessment for the Swiss road network, field studies of operations and conflicts in drop-off–pick-up zones, a new approach to the school bus routing problem in large-scale networks, the elements of urban form that affect children's ability to walk and bicycle to school, and other topics are examined in this volume.

2009; 158 pp.; TRB affiliates, $49.50; nonaffiliates, $66. Subscriber category: safety and human performance.

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INFORMATION FOR CONTRIBUTORS TO

TR NEWS

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FEATURES are timely articles of interest to transportation professionals, including administrators, planners, researchers, and practitioners in government, academia, and industry. Articles are encouraged on innovations and state-of-the-art practices pertaining to transportation research and development in all modes (highways and bridges, public transit, aviation, rail, and others, such as pipelines, bicycles, pedestrians, etc.) and in all subject areas (planning and administration, design, materials and construction, facility maintenance, traffic control, safety, geology, law, environmental concerns, energy, etc.). Manuscripts should be no longer than 3,000 to 4,000 words (12 to 16 double-spaced, typed pages). Authors also should provide appropriate and professionally drawn line drawings, charts, or tables, and glossy, black-and-white, high-quality photographs with corresponding captions. Prospective authors are encouraged to submit a summary or outline of a proposed article for preliminary review.

RESEARCH PAYS OFF highlights research projects, studies, demonstrations, and improved methods or processes that provide innovative, cost-effective solutions to important transportation-related problems in all modes, whether they pertain to improved transport of people and goods or provision of better facilities and equipment that permits such transport. Articles should describe cases in which the application of project findings has resulted in benefits to transportation agencies or to the public, or in which substantial benefits are expected. Articles (approximately 750 to 1,000 words) should delineate the problem, research, and benefits, and be accompanied by one or two illustrations that may improve a reader's understanding of the article.

NEWS BRIEFS are short (100- to 750-word) items of interest and usually are not attributed to an author. They may be either text or photographs or a combination of both. Line drawings, charts, or tables may be used where appropriate. Articles may be related to construction, administration, planning, design, operations, maintenance, research, legal matters, or applications of special interest. Articles involving brand names or names of manufacturers may be determined to be inappropriate; however, no endorsement by TRB is implied when such information appears. Foreign news articles should describe projects or methods that have universal instead of local application.

POINT OF VIEW is an occasional series of authored opinions on current transportation issues. Articles (1,000 to 2,000 words) may be submitted with appropriate, high-quality illustrations, and are subject to review and editing. Readers are also invited to submit comments on published points of view.

CALENDAR covers (*a*) TRB-sponsored conferences, workshops, and symposia, and (*b*) functions sponsored by other agencies of interest to readers. Notices of meetings should be submitted at least 4 to 6 months before the event.

BOOKSHELF announces publications in the transportation field. Abstracts (100 to 200 words) should include title, author, publisher, address at which publication may be obtained, number of pages, price, and ISBN. Publishers are invited to submit copies of new publications for announcement.

LETTERS provide readers with the opportunity to comment on the information and views expressed in published articles, TRB activities, or transportation matters in general. All letters must be signed and contain constructive comments. Letters may be edited for style and space considerations.

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◆ All manuscripts should be supplied in 12-point type, double-spaced, in Microsoft Word 6.0 or higher versions, on a CD or as an e-mail attachment.

◆ Submit original artwork if possible. Glossy, high-quality black-and-white photographs, color photographs, and slides are acceptable. Digital continuous-tone images must be submitted as TIFF or JPEG files and must be at least 3 in. by 5 in. with a resolution of 300 dpi or greater. A caption should be supplied for each graphic element.

◆ Use the units of measurement from the research described and provide conversions in parentheses, as appropriate. The International System of Units (SI), the updated version of the metric system, is preferred. In the text, the SI units should be followed, when appropriate, by the U.S. customary equivalent units in parentheses. In figures and tables, the base unit conversions should be provided in a footnote.

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Transportation, Livability, and Economic Development in a Changing World

The global economic downturn and continuing fiscal uncertainties are changing the context in which transportation programs are planned and implemented. Recently, national attention has focused on the concept of livable communities and how to promote them.

TRB and the National Academies have examined the synergies among transportation programs, livability, and economic development, including how their interaction could contribute to a more sustainable future.

Listed below are some of the forward-looking titles produced by TRB and the National Academies.

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  http://books.trbbookstore.org/fc008.aspx
- **Social, Environmental, and Economic Sustainability, Including 2010 Thomas B. Deen Distinguished Lecture**
  http://books.trbbookstore.org/r2163.aspx
- **Pathways to Urban Sustainability: Research and Development on Urban Systems**
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  http://books.trbbookstore.org/syh407.aspx
- **Effective Use of Citizen Advisory Committees for Transit Planning Operations**
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