

TR NEWS

Spreading New Ideas from Peer to Peer *Domestic Scan Program Confirms Its Benefits*



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- **States Improvise to Improve Services**
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- **Managing Staff: An Online Resource**

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An NCHRP project has identified workforce challenges critical to transportation agencies and has packaged a set of resources into a toolkit on workforce management. The structured, searchable, web-based repository can help agencies find information for diagnosing and addressing workforce issues, including recruitment, retention, succession planning, and training, with links to best practices, policies, procedures, data sets, and other tools.

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COVER: The U.S. Domestic Scan program brings practitioners face-to-face with proven innovations, as here during a scan on bridge management decision making, hosted by Ohio Department of Transportation. (Photo: Ohio DOT)

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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COMING NEXT ISSUE

Accompanying a photo essay of highlights from the TRB 91st Annual Meeting—sessions, speakers, events, committee meetings, exhibits, awards, and more—in the next issue of *TR News* are feature articles including the growing role of international cooperation and collaboration in TRB programs and activities; key findings from two recent NCHRP projects examining performance measures and management from network and practitioner perspectives; an exploration of the promise and feasibility of dedicated truck lanes to relieve traffic congestion and improve highway safety; and an account of innovative technology applied to speed environmental response on a road construction project.



In a dialogue with U.S. Transportation Secretary Ray LaHood (*third from left*) and former Kansas Transportation Secretary Debra Miller (*at podium*), James Burnley (*left*), who served from 1987 to 1989, discusses transportation challenges past and present. The event, part of the 2012 TRB Annual Meeting, featured six former transportation secretaries and drew a standing-room-only audience.



Tracing Innovation's Spread

Impacts of the Domestic Scan Program

DYLAN CASEY, PATRICK CASEY, AND ANDREW C. LEMER

Dylan Casey is an Associate and Patrick Casey is CEO with CTC & Associates LLC, Madison, Wisconsin. Lemer is Senior Program Officer, Cooperative Research Programs, Transportation Research Board of the National Academies, Washington, D.C.

Innovation is the application of new ideas confirmed through research or developed through the efforts of practitioners to improve performance. When innovation spreads, the improvements benefit everyone involved. Helping transportation professionals learn about the innovations that their colleagues have applied successfully on the job and that boost performance for system users can accelerate the spread of innovation.

Experience and research show that peer-to-peer communication is one of the most effective ways of learning. The National Cooperative Highway Research Program (NCHRP) has established a U.S. Domestic Scan Program that relies on travel and other methods to create the person-to-person links that facilitate learning and the spread of innovation.

The domestic scan program works to hasten the movement of tested new ideas into widespread practice. The program arranges person-to-person contact between peers who deal with similar problems in different agencies. Participants learn firsthand from colleagues around the country about successful new ideas and practices and then return home to spread the word about what they have learned to colleagues in their own agencies and in professional and trade organizations.

Scan team members and hosts develop professional connections that reach across agencies and geography—connections that persist and grow. By facilitating these connections, the domestic scan program serves as an engine for implementing innovation.

(Above:) The Escambia Bay Bridge in Florida was included in a 2009 scan on accelerated construction techniques. Heavily damaged by Hurricane Ivan, the bridge reopened within three months of the storm thanks to a prefabricated steel bridge system.

(Right:) The 2009 scan on bridge management decision making included a visit to Ohio DOT and a review of the state's bridge maintenance program. Scan participants learn best practices firsthand and disseminate them to colleagues in their home states.



PHOTO: OHIO DOT

History and Precedent

NCHRP launched the domestic scan program as a continuing activity in January 2008.¹ The NCHRP project panel recognized that departments of transportation (DOTs) and other transportation agencies around the country are evolving and discovering new ways to do their jobs. The panel was tasked with designing a program to find and disseminate these discoveries, leading to high returns on the investment of research dollars.

“The goal of the domestic scan program is to facilitate technology transfer,” observes panel chair Harold R. (Skip) Paul, Director of the Louisiana

¹ NCHRP Project 20-68A, U.S. Domestic Scan Program, initiated December 27, 2007. www.trb.org/TRBNet/ProjectDisplay.asp?ProjectID=1570.



Roadway tunnels scan team members (*back row, left to right:*) Louis Ruzzi, Pennsylvania DOT; Michael G. Salamon, Colorado DOT; Jesus M. Rohena, FHWA; Mary Lou Ralls, Ralls Newman, LLC; Melissa Jiang, Arora and Associates; Barry B. Brecto, FHWA; Kevin Thompson, Caltrans; Fulvio Tonon, University of Texas at Austin; (*front row, left to right:*) Alexander K. Bardow, Massachusetts Highway Department; and Bijan Khaleghi, Washington State DOT.

Transportation Research Center. “We have lots of great knowledge and innovation in transportation throughout the country, and we want to see it spread around.”

NCHRP engaged Cambridge Systematics, Inc., to develop a business plan for the domestic scan program² and to conduct two pilot scans as a proof of the concept. The two pilots, on right-of-way (ROW) acquisition and utilities relocation³ and on transportation asset management⁴, provided a basis for estimating the costs and time requirements for the

² NCHRP Project 20-68, U.S. Domestic Scan Program, Final Business Plan, Cambridge Systematics, July 2005. www.trb.org/NotesDocs/20-68_FR.pdf.

³ http://onlinepubs.trb.org/onlinepubs/trbnet/acl/FRI_NCHRP2068_Right-of-Way_all-in-one.pdf.

⁴ http://onlinepubs.trb.org/onlinepubs/trbnet/acl/NCRHP2068_Domestic_Scan_TAM_Final_Report.pdf.

What Is a Scan?

A scan involves a person-to-person exchange in a setting that facilitates “hands-on” learning about the methods, practices, and tools that represent the ideas to be shared. Experience and research show that engineers and other technology professionals prefer to learn from peers and are more likely to accept new ideas when they can see that the ideas work.

A group of 8 to 10 scan team members visit innovative agencies on a one- to two-week tour, meeting with the staff who were involved in developing and implementing the new ideas. A subject matter expert (SME) works with the scan team members, initially conducting what is termed a desk scan to identify sites and individuals to be visited, the duration of the scan, and the technical structure. The SME acts as recording secretary during the scan and produces a report from the team’s observations and conclusions. This format is termed a Type 1 scan.

NCHRP is experimenting with other formats to learn if the objectives may be achieved at lower cost and with less demand on scan team members who must take time from their usual jobs. A Type 2 scan brings representatives of innovative agencies to one or more central locations to meet in a forum with the scan team. A Type 3 scan supplements the desk scan with a 1- to 2-day workshop that brings together the scan team and representatives of the innovating agencies.

program.⁵ Since then, NCHRP has completed 12 additional scans, and seven others are in progress or planned.

As a continuing NCHRP project activity, the domestic scan program is funded primarily by the state DOTs through the American Association of State Highway and Transportation Officials (AASHTO); AASHTO’s Standing Committee on Research has allocated \$500,000 annually since the full program’s initiation. The NCHRP Project 20-68A panel oversees the program as a whole, defining scan topics from suggestions submitted via state DOTs and FHWA and reviewing the program’s overall progress and direction (see list of project panel members, page 8). Producing the scan and preparing the report are the responsibility of a consultant team led by Arora and Associates, PC, with Harry A. Capers, Jr., serving as principal investigator.

The panel selects cochairs to plan and conduct each scan; the cochairs in turn select 8 to 10 scan team members. A subject matter expert works with the team to conduct a desk scan—that is, a limited, office-based, preparatory gathering of information—to define the duration and technical structure of the scan and to explore factors likely to influence the planning of the scan. The subject matter expert also prepares technical materials and drafts the final report. An online document, Prospectus and Status of Programmed Scans, includes complete details on the domestic scan program.⁶

Person-to-Person Exchange

The scan process complements published research and professional conferences by reducing the time lag between the successful application of a new idea and the point at which others learn about that new idea. The scan serves as a forum for knowledgeable practitioners to discuss, debate, and synthesize recent applied research in terms of their own experience.

A scan can be planned quickly and carried out while the ideas and experiences are still fresh. Scan participants are encouraged to take home the ideas for use in their own agencies and are asked to develop implementation plans (see box, page 7). This emphasis on successful transfer of innovative technology and practice is the primary goal and hallmark of the program.

⁵ See Porter, C. Scanning the Home Front for Transportation’s Best Practices: Program Facilitates State Agency Exchange of Information, Technology, *TR News*, May–June 2008 (No. 256), pp. 3–9. <http://onlinepubs.trb.org/onlinepubs/trnews/trnews256.pdf>.

⁶ http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-68A_Prospectus.pdf.

A typical scan first involves the selection of a team of practitioners who are able to understand the value of what their colleagues are doing. Field visits follow, allowing the team to observe the promising practices and to meet with the local practitioners who have developed and applied the new ideas. The scan team's members can identify issues related to development and application and can assess the opportunities and methods for technology transfer.

“Conference calls and webinars are great, but talking with your peers in person has definite advantages,” notes Michigan DOT Director Kirk Steudle, who cochaired the transportation asset management scan.

A byproduct of the scan experience is the development of professional relationships among the participants and the network of personal contacts among peers in the host and visiting agencies. These person-to-person links can remain valuable for years after completion of the scan.

Realizing the range of benefits—for the agencies that send their staff on a scan, the agencies that host a scan team, and the individuals who participate—takes time. Therefore, individuals selected to a scan team should not be close to retirement. The domestic scan program represents an investment in the participants.

Motivating Change

Although spreading ideas is crucial, the goal is the implementation of new technologies and practices. Scan team members are encouraged to use what they learn from visits to sites with new technologies at work, from their conversations with practitioners, and from their own experience to probe the conditions for the innovation's success. They are asked to



PHOTO: DOMESTIC SCAN PROGRAM

A scan team takes a close look at roadway tunnel innovations and practices. As a complement to published research, a scan provides an opportunity for knowledge to be shared face-to-face and quickly transformed into practice.

Scanning the Range of Business Concerns

Two successful pilot scans in 2006 led to the funding of the ongoing U.S. Domestic Scan Program through NCHRP Project 20-68A. The first six scans that were launched after the pilots are the subject of an evaluation study by CTC & Associates LLC, *Accelerating the Rate of Innovation Among State DOTs—Tracing Domestic Scan Impacts*, which started in May 2010. An additional 13 scans are in progress or have been completed. For more details, see the online *Prospectus and Status of Programmed Scans*.^a

Following are the topics and dates of domestic scans:

- ◆ Transportation Asset Management (pilot), August–September 2006
- ◆ Right-of-Way and Utilities Relocation (pilot), July 2006
- ◆ Project Delivery Management, February–March 2009
- ◆ Accelerated Construction Techniques, March 2009
- ◆ Winter Maintenance, March–April 2009
- ◆ Bridge Management Decision Making, May–June 2009
- ◆ Managing STIPS, TIPS, and Metropolitan Transportation Plans in Response to Fiscal Constraints, June 2009
- ◆ Addressing NPDES and Other Water Quality Issues in Highway System Management, July 2009
- ◆ Maximizing Traffic Flow on Existing Highway Facilities, November 2009
- ◆ Work Zone Assessment, Data Collection, and Performance Measurements, March 2010
- ◆ Quality Control–Quality Assurance of Design Plans, October–December 2010
- ◆ Solutions for Lane Departure Avoidance and Traffic Calming, November–December 2010
- ◆ Successful Strategies for Motorcycle Safety, March–April 2011
- ◆ Roadway Tunnel Design, Construction, and Maintenance, August–September 2009
- ◆ Risk-Based Forecasts of Land Volatility for Corridor Management and Sustainable Communities, October–November 2011
- ◆ Addressing Access and Parking Needs of Nonresident Users of Rail and Intermodal Transportation Stations in Transit-Oriented Developments, June 2011
- ◆ Performance Measuring for Highway Maintenance and Preservation, October 2011
- ◆ Supporting Traffic Incident Management Through Integrated Communication Between Traffic Management Centers and Law Enforcement and Effective Performance-Measurement Data Collection, April 2012
- ◆ Regional, Multiagency Traffic Signal Operations Management, November 2011
- ◆ Privatization of Maintenance Functions, June 2012
- ◆ Performance of Accelerated Bridge Construction Connections in Bridges Subjected to Multihazard and Extreme Events, April 2012

^a http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-68A_Prospectus.pdf or <http://domesticscan.org/>.

look for avenues to profitable application in their home agencies and elsewhere.

At the end of the tour, participants develop implementation plans, outlining the short- and long-term efforts to undertake in facilitating the transfer of information to their home institutions. These activities may include presentations to internal groups or to meetings of the Transportation Research Board

(TRB) and AASHTO, shepherding the technologies to implementation, or empowering others to take on the task (see box, page 7.)

“The implementation plans are a key component of the scans,” notes Crawford Jencks, Deputy Director of TRB’s Cooperative Research Programs. “They represent the difference between gathering information and making real change within agencies.”

Typical Scan Itinerary

Each domestic scan tour entails visits to five to seven states; depending on the topic, team members also may visit several cities within a state to gain the perspective of local transportation practitioners. The scan tour organizer, Arora and Associates, PC, designs the itinerary for maximum travel efficiency and cost-effectiveness—travel often is completed after normal business hours.

The itinerary for the scan of Best Practices in Addressing National Pollutant Discharge Elimination System and Other Water Quality Issues in Highway System Management is shown below.

Date	Day	Time	Activities
7/11/09	Saturday		Team members fly to Buffalo, N.Y.
7/12/09	Sunday		Team members fly to Buffalo
		Evening	Team meeting
7/13/09	Monday	a.m.	Meetings with New York State DOT
		p.m.	Meetings with New York State DOT
		Evening	Fly from Buffalo to Baltimore, Md.
7/14/09	Tuesday	a.m.	Meetings with District DOT in Washington, D.C.
		p.m.	Meetings with District DOT
		Evening	Drive from Washington, D.C., to Baltimore
7/15/09	Wednesday	a.m.	Meetings with Maryland SHA in Baltimore
		p.m.	Meetings with Maryland SHA
		Evening	Fly from Baltimore to Raleigh, N.C.
7/16/09	Thursday	a.m.	Meetings with North Carolina DOT
		p.m.	Meetings with North Carolina DOT
7/17/09	Friday	a.m.	Meetings with North Carolina DOT
		p.m.	Meetings with North Carolina DOT
7/18/09	Saturday	a.m.	Fly from Raleigh to Austin, Tex.
		p.m.	Team meeting
7/19/09	Sunday	a.m.	No assignment
		p.m.	No assignment
7/20/09	Monday	a.m.	Meetings with Texas DOT in Austin
		p.m.	Meetings with Texas DOT
7/21/09	Tuesday	a.m.	Meetings with Texas DOT
		p.m.	Fly from Austin to Orlando, Fla.
7/22/09	Wednesday	a.m.	Meetings with Florida DOT and Florida Turnpike
		p.m.	Meetings with Florida DOT and Florida Turnpike
7/23/09	Thursday	a.m.	Meetings with Florida DOT and Florida Turnpike
		Evening	Meetings with Florida DOT and Florida Turnpike
7/24/09	Friday	a.m.	Final team meeting
		p.m.	Final team meeting
		Evening	Team members fly back home

Tracing Impacts

Although scan participants have been enthusiastic about their experiences, and although the theoretical arguments for the value of domestic scans are ample, the NCHRP oversight panel has recognized that solid evidence must justify the program’s continuation. Does a scan facilitate the spread of new ideas, and does the effect extend beyond the immediate group of participants? Are the technologies and practices described in scan reports implemented with good effect in agencies that have learned about the findings?

The panel contracted with CTC & Associates LLC under NCHRP Project 20-68B to trace the technology transfer and implementation resulting from the domestic scans. CTC started with the pilot scans, surveying and interviewing scan team members, host agency personnel, and others who had direct contact with scan participants.

A report, *Accelerating the Rate of Innovation Among State DOTs—Tracing Domestic Scan Impacts*, documents the results of the initial effort.⁷ The report traces the impacts of the ROW acquisition and utilities relocation and the transportation asset management pilot scans and investigates the depth and breadth of the technology transfer. After reviewing the initial findings, the project panel asked CTC to continue investigating the other completed scans.

CTC has documented direct and indirect experiences with the scans, the relative success of the

⁷ http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-68B%2801%29_FR.pdf.



A scan on roadway tunnels featured the Devil’s Slide Tunnel near San Francisco, a double-bore tunnel that

implementation activities, and observations and insights on the effectiveness of the scan program. To investigate the secondary impacts of the scans, the researchers interviewed people who had not participated directly in a scan but who had contact with participants, exploring the ripple effects that are a hypothetical strength of the person-to-person model of technology transfer.

Seeing Is Believing

The research is proving that the ripple effects are more than hypothetical. Participants consider the contacts and communication with peers from other states and regions to be major benefits of the scan. The team members judge the experience of the scan itself as indispensable, providing an opportunity to interact directly with those who developed the relevant technologies.

In addition, the scan participants become believers in the new ideas they encounter on the scan, and this turns them into champions determined to apply what they have learned and to tell others about the opportunity. Many scan team members have direct oversight of implementation efforts within their own agencies and promote scan results by giving presentations, serving on professional committees, and providing their personal testimony in other venues.

Nearly all of the participants surveyed about the value of their participation in the domestic scan program have cited the connections and resources gained through the intense experience. The scan tours were physically and mentally challenging, but all participants agreed that the tours were productive. More than two years later, team members cited specific ideas from the scan that had contributed to improving their departments' performance.

"Talking to the people who made it happen makes all the difference," states John Sherman of Wyoming DOT, a participant in the ROW acquisition and utilities relocation scan.



PHOTO: DOMESTIC SCAN PROGRAM

is under construction and scheduled to open this year. It will be the longest tunnel in California.

PHOTO: UTAH DOT



Current and Future Directions

The examination of the impacts of the pilot scans was the first stage of a program to monitor the impacts of all of the domestic scans. In May 2010, CTC & Associates LLC began to conduct interviews and to survey participants in other scans. The research team created a domestic scan program website to serve the scan participants and to open the scan activities to a wider audience, <http://domesticscan.org>.

Practical impacts of the winter maintenance scan in 2009 included implementation of a maintenance decision support system, a GPS-automatic vehicle location pilot program for a snowplow fleet, and expanded tow plow use.

Implementing Scan Findings

To underscore the importance of spreading scan technologies beyond the team members, each scan tour concludes with the development of an implementation plan. The detailed plans appear in the final report and identify activities to be undertaken, the person or persons responsible, and a target completion date. The scan tour organizer, Arora and Associates, PC, tracks the implementation activities, with follow-up by CTC & Associates, tasked with tracing the impacts of the scans.

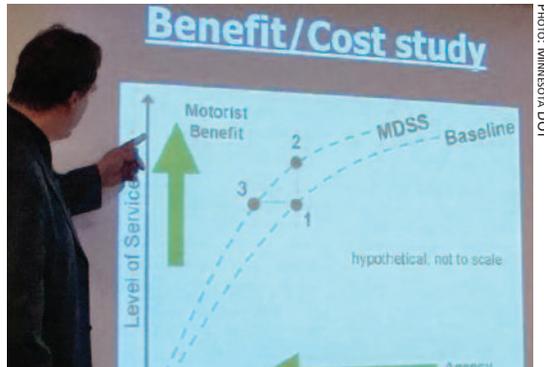
- ◆ **Presentations** of scan technologies and practices at state, regional, and national meetings are the most common implementation activities. Scan team members have made presentations to AASHTO committees and subcommittees, local meetings of the Institute of Transportation Engineers, TRB meetings, and to industry groups, such as the American Road and Transportation Builders Association and the American Public Works Association.

- ◆ **Webinars**, either as single sessions or as a series, have tapped scan team members to present and comment on their findings to interested practitioners, with an opportunity for questions. Many of these webinars are archived and available for replay.

- ◆ **Articles** in agency and trade publications, such as *Focus*, *Public Roads*, and *Roads & Bridges*, have provided detailed descriptions of the technologies and practices explored on the scans.

- ◆ **Direct personal contact** with individual colleagues—an activity not usually specified in the implementation plans—is an effective means for scan team members to transfer the benefits of the new technologies and practices experienced on the tour.

Representatives from Minnesota DOT presented a benefit–cost analysis of maintenance decision support systems to the winter maintenance scan team.



The researchers collect feedback from scan participants approximately six months after the scan report is issued, to learn about the participants’ implementation and dissemination activities and to gain contact information for those who are working on implementing the scan technologies but who did not participate directly in the scan. In addition, researchers survey those who had been briefed by members of the original scan team, to trace how the impacts of the scan move out—and perhaps take on new life in new locations.

The researchers host a webinar with members of the scan team and the NCHRP project panel to review the collected feedback and to discuss the successes and challenges that team members have encountered in their implementation activities. The final report tracing the impacts of the first six scans is posted on the website.⁸

For example, team members on the project

⁸ <http://domesticscan.org/wp-content/uploads/NCHRP20-68B02-Final-Report-December-2011.pdf>.

U.S. Domestic Scan Program Project Panel

Selected by TRB and AASHTO, the oversight panel for NCHRP Project 20-68 provides a variety of perspectives on DOT innovation and on the dissemination of new ideas:

- ◆ Harold R. (Skip) Paul, Louisiana Transportation Research Center, *Chair*
- ◆ Shane Brown, Washington State University
- ◆ Nancy Chinlund, California DOT
- ◆ Marsha Fiol, Virginia DOT
- ◆ Rick Kreider, Kansas DOT
- ◆ Glenn Roberts, New Hampshire DOT
- ◆ Amy Schutzbach, Illinois DOT
- ◆ Mark Van Port Fleet, Michigan DOT
- ◆ David M. (Mike) Burk, FHWA liaison
- ◆ Keith M. Platte, AASHTO liaison
- ◆ Mark R. Norman, TRB liaison
- ◆ Andrew C. Lemer, TRB staff

delivery management scan tour explained to investigators how they have used information from the scan to

- ◆ Develop a new project screening tool,
- ◆ Add to performance measures to assist in program delivery and to promote transparency and accountability, and
- ◆ Launch projects with the contracting practice of construction manager–general contractor, demonstrated in the scan.

As a result of practices seen firsthand during the scan on winter maintenance, participants had taken action to

- ◆ Start a Global Positioning System–automatic vehicle location pilot program for the snowplow fleet,
- ◆ Implement a maintenance decision support system, and
- ◆ Expand the use of tow plows, to clear a second lane with a single truck.

Team members on the scan to address National Pollutant Discharge Elimination System (NPDES) and other water quality issues in highway system management cited the following changes, among others that they were implementing:

- ◆ Adoption of the asset management tools from two host states to implement a stormwater retrofit program,
- ◆ Employing permeable friction course overlays to reduce pollutant discharge from freeways, and
- ◆ Beginning use of flocculants to prevent erosion and improve sediment control.

The NCHRP project panel has initiated an additional research effort to trace how the networks of links from scan team members to others develop over time and facilitate the spread of new ideas between and within agencies. This research will explore the characteristics of an agency’s organization and management that may encourage adoption of new ideas to benefit the agency and its clientele of transportation system users.

AASHTO’s Standing Committee on Research authorized the domestic scan program for a 6-year period. NCHRP expects to complete 19 scans and to have studied the impacts of all of these. The results to date indicate that continuation of the domestic scan program will receive serious consideration.

LEADING IN LEAN TIMES

Findings from the Transportation Research Board's 2011 State Partnership Visits Program



Specialists in the Transportation Research Board's (TRB) Technical Activities Division identify current issues, collect and generate information on the issues, and disseminate the information throughout the transportation community. The TRB Annual Meeting, TRB-sponsored conferences and workshops, standing committee meetings and communications, publications, and contact with hundreds of organizations and thousands of individuals provide TRB staff with information from the public and private sectors on all modes of transportation.

A major source of this information is TRB's annual state partnership visits program. Transportation professionals on the TRB staff meet on site with representatives of state departments of transportation (DOTs) and of universities, transit and other transportation agencies, and industry. In addition, TRB staff is involved with planning and delivering conferences, workshops, and meetings throughout the country. This report summarizes what the TRB staff learned from visits and activities during the past year.

“Leading in Lean Times”—the theme of the 2011 annual meeting of the American Association of State Highway and Transportation Officials (AASHTO)—was an appropriate rallying cry for state DOTs and other transportation organizations during 2011. State DOTs were called to invest in transportation infrastructure even as state governments faced unrelenting economic pressures, including uneven economic growth, reduced federal assistance, and appeals from hard-pressed local governments.

In late 2011, the National Governors Association and the National Association of State Budget Officers released that annual Fiscal Survey of States, noting the state government budgets have improved since the worst of the recession, but that the states face a myriad of economic challenges. Although state general fund revenue increased in 2011 and is expected to continue increasing in 2012, the totals are \$21 billion below the 2008 levels, according to the report. In addition, states face further reductions in federal aid as a result of efforts to slow the growth of the deficit.

State and local governments have cut a total of 455,000 jobs since the beginning of 2010, including many from transportation agencies. The TRB state partnership visits to almost every DOT in 2011, as well as to other transportation agencies, institutions, and organizations, found that staff and leadership were more committed than ever to the mission of providing a safe and reliable transportation system for travelers and freight. This commitment was supported with hard work and innovation. The following summary offers a sampling of these extraordinary efforts.

Cofferdam installation at Exit 5 on I-93 from Salem to Manchester, New Hampshire. This section of the I-93 rebuilding project is financed with GARVEE bonds, one of the funding strategies employed by state DOTs to deal with the delay of long-term federal transportation reauthorization.

Institutional Issues

Policy, Management, and Leadership

The continued inability at the federal level to pass long-term reauthorization legislation for surface transportation and aviation generated uncertainty at all levels of government. Massachusetts, New Hampshire, and Rhode Island offer examples of how state DOTs are managing without a long-term federal transportation reauthorization, moving critical projects forward with such strategies and initiatives as the use of Transportation Infrastructure Finance and Innovation Act loans, Grant Anticipation Revenue Vehicle (GARVEE) bonds, Transportation Investment Generating Economic Recovery (TIGER) grants, pricing initiatives, and Interstate tolling.

Many DOTs are spending a larger portion of their budgets on maintenance instead of on major new projects. But because maintenance is less visible to the public and elected officials, DOTs are having a difficult time gaining public support for funding, especially when competing with education, health care, and other critical needs.

The completion of the Interstate Highway System has changed the roles of state DOTs and their personnel needs. Some state DOTs have reduced their workforce by almost half during the past 10 to 20 years. Although many DOT staff view the most recent reductions as a temporary downsizing, others consider the changes a preparation for the long term.

Many states are downsizing through attrition and retirements, but employees who are eligible are more reluctant to retire during uncertain economic times and with prospects of rising health care costs. The retirement incentives offered by some states can be affected by union contracts.

States are focusing on performance management, succession planning, and knowledge management to facilitate the transition to the future workforce. Strategic management is applying information technology and tools to identify, collect, and analyze data on customer needs.

Planning

Limited and uncertain financial resources have led some agencies to question the role of planning, especially when money for new construction is not readily available. Nevertheless, planners are finding that their skills are increasingly in demand.

Transportation planners are working with engineering staff to identify and fund projects to operate the system with maximum efficiency. The Thurston Metropolitan Planning Organization (MPO) in Olympia, Washington, for example, has worked with local transportation agencies to coordinate the traffic signals along major traffic routes.



PHOTO: NEW HAMPSHIRE DOT

Operational projects are becoming a major part of transportation plans.

In addition, to strengthen their economies and to create jobs, Indiana, Washington, and many other states are working to remove barriers to freight traffic—for example, by including railroad crossings in statewide models and identifying freight bottlenecks to be addressed in short- and long-term transportation plans. In almost every state, job creation is a major criterion in project selection; planners are working with state economists to understand the connections between transportation projects and job creation.

Legal Issues

Issues of interest in transportation law during 2011 involved civil rights and employment, particularly in relation to the Americans with Disabilities Act; environmental justice in transportation planning; and tribal relations. With budget constraints, most states are struggling with such operational issues as maintaining a strong workforce and high morale; ensuring compliance with federal requirements, such as the antidiscrimination Title VI of the Civil Rights Act of 1964; working with Native American tribes in acquiring rights-of-way; and completing National Environmental Policy Act documents.

Tort liability and risk management agencies of state and local governments continued implementation of the 2009 edition of the *Manual on Uniform Traffic Control Devices* (MUTCD). Of particular concern was the perceived loss of flexibility to apply engineering judgment in decisions about traffic control devices, as well as the effects on state risk management programs. By the end of the year, the Federal Highway Administration (FHWA) had proposed changes to the MUTCD to address this problem.

Fallout continues from the U.S. Supreme Court's 2005 eminent domain decision in *Kelo v. City of New London*. Because the court determined that property could be condemned for economic development, state legislatures have enacted provisions to make the use of eminent domain more burdensome or to give property owners more rights. In January 2012, TRB's National Cooperative Highway Research Program (NCHRP) released a report on the *Ramifications of Post-Kelo Legislation on State Transportation Projects*.¹

Environment, Energy, and Climate Change

Many states are responding to directives to address the impacts of climate change through planning, investing in alternative-fuel vehicles for state fleets, and incorporating the concepts of livability and sustainability into all projects. Many current perfor-

¹ NCHRP Legal Research Digest 56, http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_lrd_56.pdf.

PHOTO: WASHINGTON STATE DOT



With roundabouts designed for large trucks and with other accommodations for freight traffic, Washington and other states are implementing plans to encourage economic growth by removing freight transportation barriers.

mance metrics, however, do not incorporate social and environmental factors; to help focus investments on sustainability and the highest triple-bottom-line return on investment, agencies in Oregon and Canada and the Boston Redevelopment Agency have developed approaches to benefit-cost analyses that include these important elements.

The biggest challenge in meeting these directives may be the application to rural environments, which have limited transportation options; difficulties also may arise on small construction projects. The additional planning requirements may cause delays in

Approximately 29,000 miles of public roads in the Indian Reservation Roads program are under the jurisdiction of the U.S. Department of the Interior's Bureau of Indian Affairs and of tribes; 73,000 miles fall under state and local ownership. Many tribes seek legal assistance to acquire rights-of-way.

PHOTO: POKAGON BAND OF POTAWATOMI





PHOTO: WASHINGTON STATE DOT

Construction crews work on the wildlife undercrossing on I-90 at Gold Creek in Washington State. In planning and constructing transportation facilities, many state DOTs are addressing the connectivity of animal habitats.

completing small but important projects.

Water-related issues—such as stream mitigation initiatives, wetland banking, and stormwater runoff and permitting—also continue as state-level concerns. Other important environmental issues at the state level include the application of the new FHWA noise policy, environmental justice considerations, the safety and ecological management issues in protecting animal habitat connectivity, and managing

conflicts with other regulations. For example, complying with certain ADA requirements in rehabilitating a sidewalk sometimes may conflict with requirements to maintain historic viewsheds.

Data and Information Technologies

State information specialists have been helping DOTs face constraints on resources through a variety of approaches, such as mapping data requirements to assist organizational decision making. Analyzing decision makers’ use of information often reveals a need to array the data in a timely way in a format that decision makers can understand; often the solution is to combine information from many sources. For example, Utah DOT’s UPlan is an interactive, web-based tool that brings together data from various state agencies, utility companies, cities, counties, and others to streamline data access and analysis.

State DOTs are seeking to relate their activities to the economy and job creation. To gain support for transportation funding, Kansas DOT has applied information from stakeholders in economic analyses to determine likely project impacts on the economy and jobs, as well as to prioritize projects.

Understanding the evolving DOT customer base also has been a focus. DOTs have pooled funds to obtain special tabulations of Census Bureau data to examine demographics and predict trends. The Census Transportation Planning Products provide household, workplace, journey-to-work, and flow data for policy and planning studies, travel demand modeling, environmental justice analyses, and transit evaluations.

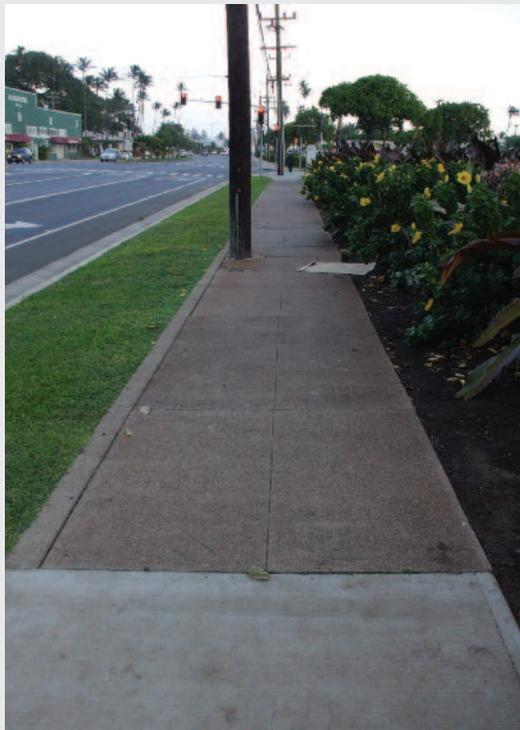


PHOTO: WIKIMEDIA COMMONS

A sidewalk built by the Works Progress Administration during the Great Depression now retrofitted with wheelchair-accessible ramps (*foreground*). State DOTs often must balance environmental or historic concerns with other requirements, such as ADA compliance.

These data often are used in conjunction with data from other sources, such as the National Household Travel Survey (NHTS). Twenty states and MPOs have signed up to receive increased samples of NHTS data. In addition to these collaborative funding efforts, states are partnering with private data vendors to add value to internal data collections, gaining timely information on traffic flows and patterns.

Aviation

With Congress unable to agree on budgets for surface and air transportation, the Federal Aviation Administration (FAA) received an additional blow earlier in the year when an agreement could not be reached for a temporary budget extension. As a result, the agency shut down some activities not related to safety and air traffic control for approximately two weeks.

At the same time, many of the taxes and fees collected for the trust fund that supplies most of FAA's budget were suspended, resulting in the loss of approximately \$30 million per day, according to the U.S. Treasury. The ramifications were significant for federally funded airport construction projects throughout the nation—not only in the loss of revenue to support the projects, but also in the suspension and loss of many construction industry-related jobs associated with the projects.

The lack of stable federal funding sources has many states and airports struggling to manage their capital infrastructure plans. Other programs also face uncertain futures—for example, the Essential Air Service Program could be eliminated, and financial commitments to the Next-Generation Air Trans-

PHOTO: ORAN VERVINCY



portation System (NextGen) are in doubt.

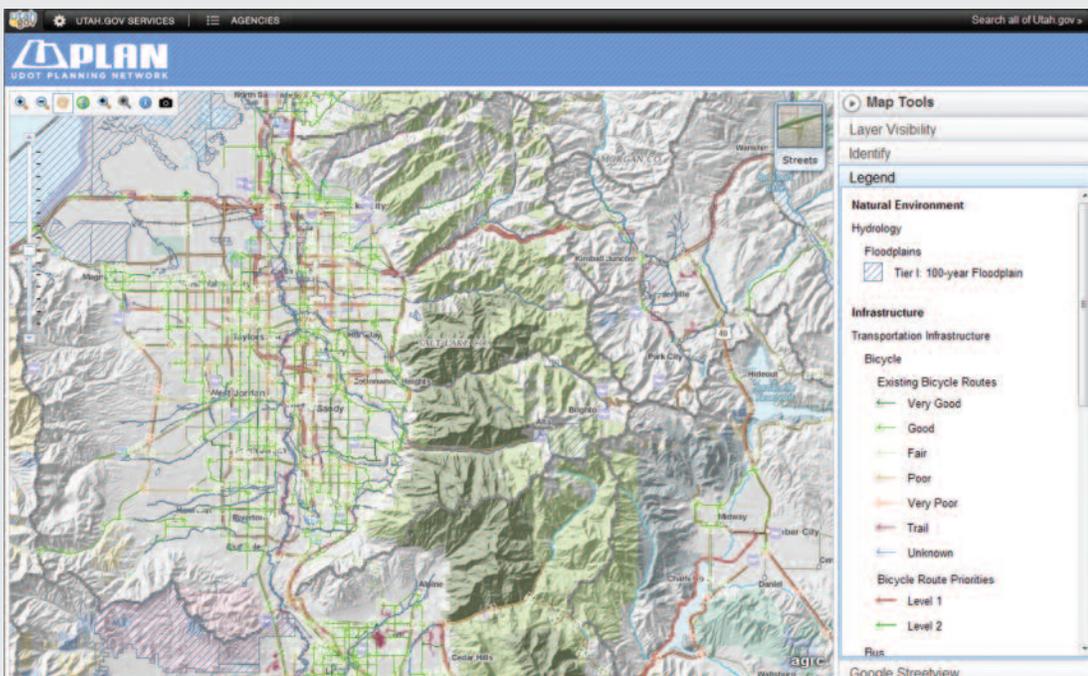
FAA and Congress determined that the agency requires internal changes to answer the future needs of the nation's air transportation system—for example, realigning some functions to manage the transition to NextGen. Congress has approved FAA's organizational changes.

Demonstrations by Alaska Airlines, Southwest Airlines, and UPS have shown that NextGen performance-based navigation and procedures—such as Area Navigation and Required Navigation Performance—can save millions of gallons of fuel, cut noise, and decrease greenhouse gas emissions.

Freight Systems

Freight systems stakeholders—shippers, carriers, private investors, and public agencies—continue to confront economic uncertainty as freight trans-

Passengers wait for the Sounder train in Seattle, Washington. State DOTs apply commuter and other household travel data from the U.S. Census Bureau to planning studies, travel demand modeling, and other analyses.



Utah DOT's UPLAN provides a comprehensive portal to data from cities, counties, state agencies, utility companies, and more.

PHOTO: BOEING



A Southwest Airlines 737 in a paint hangar. Southwest and other airlines have demonstrated the benefits of NextGen performance-based navigation systems.

portation demand has increased for some sectors, modes, and regions, but declined in others. In addition, cataclysmic events disrupted the global and domestic supply chain—for example, the earthquake and tsunami in Japan; flooding in Thailand; and hurricanes, the Midwest floods, and the October snowstorm in the United States.

These disruptions highlight the supply chain's vulnerability, its importance to industries around the world, and the interdependence of national

economies. As business enterprises reassess their operations, “reverse globalization” is moving some manufacturing and distribution closer to key markets to reduce supply chain costs and risks.

Stakeholders also are exploring measures to enhance freight systems. More states have undertaken the development of statewide freight plans, drawing on input from advisory boards with private-sector participation. At all levels, public agencies are more conscious of the benefits of integrating freight systems and facilities into transportation planning and land use planning. Innovations in technology and operations are gaining attention as a means to create capacity at lower cost.

Environmental concerns are playing an increasing role in freight. The private sector is viewing initiatives to reduce its carbon footprint as good business, affecting shippers' mode choice and carriers' operations. Public agencies' efforts to reduce emissions and roadway congestion raise such considerations as truck size and weight and the diversion of freight from trucking to rail or water modes.

Highways

Design

Designing structures to withstand future changes in weather patterns—such as increased storm intensities—is a challenge facing many DOTs. This includes bridge foundation designs to account for more severe scour from increased precipitation and flooding;

Many states are developing strategies to integrate freight systems efficiently into transportation and land use plans.



PHOTO: PORT OF SEATTLE



(Left:) In 2011, the Souris River flooded levees in Minot, North Dakota, cresting at nearly 13 feet over flood stage. Transportation agencies must adapt bridges and other infrastructure to changing weather patterns and the effect of increased flooding.

(Right:) Inspectors survey reconstruction of NC-12 in coastal North Carolina. An NCHRP project will assist DOTs in determining staffing needs for construction projects.



establishing pavement, bridge deck, retaining wall, culvert, and tunnel elevations to account for rising water levels in coastal areas; and taking into account storm surge and wind velocity forces from extreme tornados and hurricanes. Also of concern to many states in designing for the future are increases in seismic activity, possibly from the movement of the North American and adjacent tectonic plates and fault lines.

Maine DOT, for example, is designing facilities along the coast subject to an increased annual and 100-year peak stormwater flow, storm surges, and 12-foot tides. In combination with a potential rise in sea level, the increased stormwater runoff from more precipitation poses a significant design challenge. The University of Southern Maine is studying the effects on bridges; when Maine DOT replaces bridges, the new designs will account for the compounding risks.

In California, the Caltrans Division of Engineering Services manages a multimillion dollar, problem-focused research program to investigate ways to meet project delivery goals and encourage innovation through research deployment. Recent research start-ups include seismic loading on hinge shear keys, performance of column-to-shaft pin connections, seismic performance of accelerated bridge construction systems, and seismic assessment of cut-and-cover tunnels.

Highway Construction and Materials

The transportation infrastructure is deteriorating, but because of budget constraints, many states are delaying major construction and reconstruction projects and are focusing instead on resurfacing, rehabilitation, and minor improvement projects. A few states are using public-private partnerships or tolling agencies to build major facilities—Maryland's recently completed Intercounty Connector, north of Washington, D.C., for example, operates as a toll road.

With the uncertainty of funding for construction, many agencies are having difficulty ascertaining in-house staffing needs, raising concern about the abil-

ity to provide adequate construction inspection. A new NCHRP project should provide guidance.² State DOTs also are under pressure to deliver projects faster, at less cost, and at higher quality with alternative project delivery methods.

State agencies are using recycled materials and industrial byproducts with increasing frequency in transportation applications, tapping valuable resources and reducing materials costs. Reclaimed asphalt pavement (RAP) in hot-mix asphalt (HMA) is the most widely used recycled material. Most states have an abundance of RAP; an NCHRP project is looking at increasing the percentage of RAP in HMA without loss in the pavement's long-term performance.³

² NCHRP Project 10-89, Best Practices Guidebook for Optimal Construction Inspection, <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3168>.

³ NCHRP Project 9-46, Improved Mix Design, Evaluation, and Materials Management Practices for Hot-Mix Asphalt with High Reclaimed Asphalt Pavement Content, <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=1624>.

Two-way traffic on Route 105 in Newport News, Virginia, is moved to new lanes while the old lanes are being resurfaced. Resurfacing and rehabilitation are favored by many DOTs as cost-effective projects in a tight economy.





PHOTO: OREGON DOT

Contractors for Oregon DOT install rockfall-mitigating wire mesh along U.S. 97 near Klamath Falls. The Rockfall Hazard System was developed in Oregon and now is used by more than 25 transportation agencies throughout North America.

Some states have tried warm-mix asphalt. Researchers in Louisiana and Washington are evaluating the application of photocatalytic compounds on asphalt and concrete pavement surfaces to remove harmful air pollutants.

Geotechnical Engineering

Rockfalls occur along transportation corridors all over the world, and the United States is no exception. In North America, more than 25 transportation agencies are using the Rockfall Hazard Rating System, developed in Oregon and supported by FHWA since 1990, indicating interest in the characterization, investigation, monitoring, and control of rockfalls for safety and economic reasons. A TRB task force on Rockfall Characterization and Control has prepared a comprehensive, textbook-style report, scheduled for publication in 2012, that should provide a wealth of information to practitioners.

Flexible rockfall fence systems are common control measures. An NCHRP project is developing recom-

mendations for testing flexible fence systems, as well as for establishing a related asset management plan.⁴

Findings from national, regional, and local research on intelligent compaction technology have encouraged several state and FHWA demonstration projects. Some states have conducted pilot implementation of the technology for the quality assurance of earthworks; others are planning tests. The studies are expected to assist in bringing the technology into the mainstream, which should benefit the construction of earthworks and improve industry practice.

Dust generated from lightly surfaced and gravel roads can have adverse impacts on safety, health, the economy, and the environment. Efforts are under way to eliminate or minimize dust generation and its effects.

Highway Operations

State DOTs are focusing on strategies to operate and maintain the transportation network more efficiently. Managing demand and optimizing the operation of the system are cost-effective solutions to reduce delays and improve travel-time reliability.

Proactively managing the cross section and operation of a freeway or arterial is common practice in several states. Agencies are attempting to optimize use of the entire roadway to improve the performance of specific lanes or of the entire freeway or highway.

The operating approach known as active traffic management blurs the distinction between managed lanes and traditional forms of freeway management. With active traffic management, the operating agency proactively manages demand and available capacity on the facility by applying new operational countermeasures or modifying the in-place strategies.

Active traffic management strategies include dynamic speed limits, adjustable to conditions; restricted lanes, for high-occupancy vehicles or for trucks; access controls, such as express lanes or reversible lanes; motorist information, via electronic variable messages or lane control signs, for example; temporary use of the shoulders for traffic; ramp metering; and priced or managed lanes.

Real-time traffic information was once the purview of state DOTs, but the private sector increasingly is becoming the main source of real-time traffic information for the driving public. Several applications for smart phones and Global Positioning System (GPS)-based personal navigation devices can help users avoid congestion by providing trip-

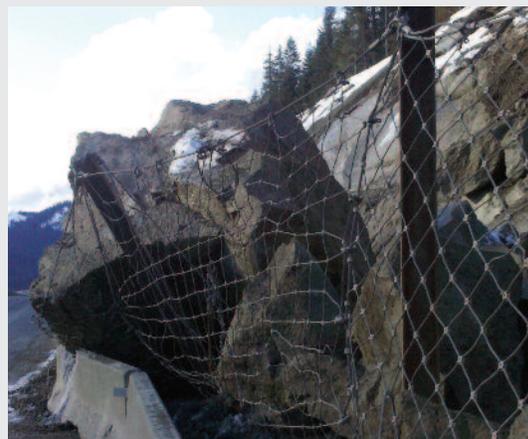


PHOTO: WASHINGTON STATE DOT

Recommendations for testing rockfall fences, such as this one on I-90 over the Snoqualmie Pass in Washington State, are being developed in an NCHRP project.

⁴ NCHRP Project 23-35, Guidelines for Certification and Management of Flexible Rockfall Protection Systems, <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=2985>.



PHOTO: WASHINGTON STATE DOT

Restricted lanes and other active transportation management strategies assist DOTs in efficient operation of transportation networks.

routing and real-time travel and congestion information—often crowd-sourced, that is, based on reports from other mobile-device users on the scene.

Infrastructure Preservation

Among the maintenance and preservation activities to support a transportation agency’s mission of providing for the safe and efficient movement of people and goods, two stand out: the integration of management systems under asset management, and the increased use of preservation techniques and procedures.

Many state DOTs are developing and implementing preservation programs under a comprehensive asset management approach to improve performance and extend the useful life of the transportation infra-

structure components such as pavements, bridges, drainage structures, roadsides, traffic control devices and systems, and rest areas. Successful transition to a preservation program depends on the commitment and support of an agency’s top management and political oversight body; on measurement systems that can appraise asset conditions accurately and that can monitor progress toward achievable goals; on flexibility in the selection of preservation actions appropriate to project conditions; and on champions throughout the agency who can keep the program on track.

Asset management reports on preservation efforts provide agency and public decision makers with project-level indicators of the engineering benefits or life-cycle costs, to support an effective balance of expenditures between new capacity and improvements. Typically the new capacity and improvement projects represent less than 2 percent of the network, with maintenance and preservation projects serving the remaining 98 percent. Investments in preservation activities provide a six- to 14-fold benefit directly to the public, a key advantage in a time of financial constraints.

Highway Safety

From 2005 through 2010, annual traffic fatalities in the United States dropped approximately 25 percent, from 43,510 to 32,788, according to the National Highway Traffic Safety Administration (NHTSA). The number of fatalities is the lowest since 1949 and translates to a rate of 1.09 per 100 million vehicle miles traveled—the lowest on record (1).

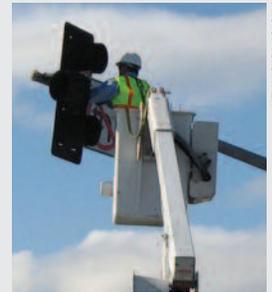
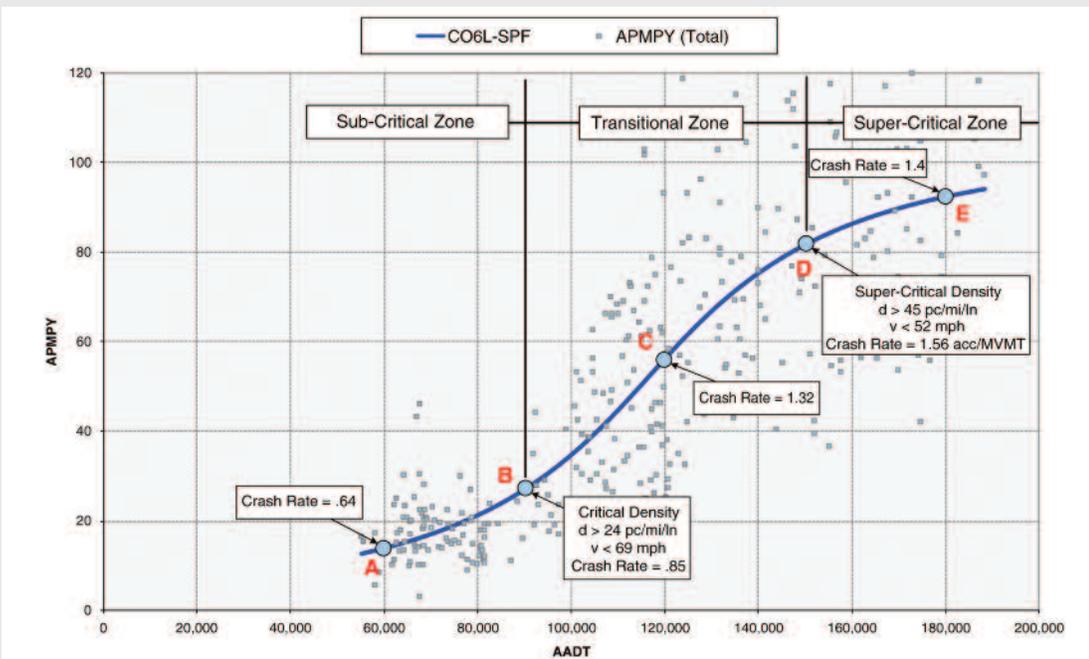


PHOTO: TOASTYKEN

Asset management approaches are improving the maintenance of traffic lights and other transportation infrastructure components.



Recent research by Kononov et al. (2) has linked traffic volume, speed, and crashes and found that managing urban Interstate traffic may lead to a reduced crash rate.

Construction to expand the Panama Canal (*under way in photo below*) will facilitate the travel and use of container ships that are three times the size of current vessels (*right*), and will require expanded accommodations at Gulf and East Coast ports.



PHOTO: PANAMA CANAL AUTHORITY

The last highway reauthorization legislation mandated that each state DOT develop a multidisciplinary, multiagency Strategic Highway Safety Plan (SHSP) for all public roads—not just those that are state-owned. States that developed and implemented SHSPs are seeing positive results. Many states are updating or revising their SHSPs to continue addressing highway safety issues proactively.

The current economic conditions also may have contributed to the decline in fatalities by discouraging the amount of driving. Preliminary data from FHWA, however, show that vehicle miles traveled in 2010 increased by approximately 20.5 billion miles, or 0.7 percent (1).

Research in Colorado has discovered a relationship between traffic volume or density, speed, and

crashes. The plotted curve revealed a surprising breakpoint; managing traffic to avoid the breakpoint may result in fewer crashes in urban Interstate settings (2).

Ports and Waterways

By 2014, the expansion of the Panama Canal will enable the transit of containerships nearly three times the size of current vessels. This development has become a major focus for coastal ports, particularly on the U.S. East and Gulf Coasts, as well as for the supporting infrastructure, including the inland waterways, railroads, and roads and highways. The Port of Baltimore is building a new 200-acre terminal; the Port Authority of New York and New Jersey is deepening its harbor and looking to raise the Bayonne Bridge; the Port of Savannah is seeking funds to dredge a deeper channel; at least three ports in Florida—Miami, Fort Lauderdale, and Jacksonville—also are looking to deepen channels; and the Port of Houston is doubling its capacity with the Bayport development. West Coast ports, in contrast, are working to limit any loss of market share; Southern California ports have undertaken a 10-year, \$7 billion capital expansion program.

Major Midwest floods challenged the nation's inland waterway system, which needs to recapitalize its lock and dam infrastructure. The inland system is vital for the transport of coal, grain, steel, aggregate, and petroleum and is essential to the goal of expanding exports. In the Gulf region, for example, a public-private partnership is investing in a major new grain export facility at Lake Charles, Louisiana, to handle rice, wheat, corn, and soybeans from across the nation, and Ohio and Kentucky are considering creation of a regional body to oversee river commerce and freight issues and to advocate for the river freight industry.



PHOTO: INFOSTRADA.COM

Rail

Passenger Rail

The Federal Railroad Administration (FRA), state agencies, and freight railroads made progress on the use of American Recovery and Reinvestment Act rail grants to promote intercity and high-speed passenger rail service. Federal funding, however, is clouded by local funding constraints and by concerns about the value of public investment in passenger rail. Intercity and high-speed passenger rail will receive no federal funding for Fiscal Year (FY) 2012 but may qualify for funding under other grant programs, such as TIGER.

The U.S. House of Representatives Committee on Transportation and Infrastructure has proposed privatizing the Northeast Corridor and ending Amtrak's state-supported service. Although the proposals have been tabled, long-term federal funding for Amtrak remains at issue. For FY 2012, Amtrak will receive \$1.42 billion—\$64 million less than it received in FY 2011.

Freight Rail

Freight railroads reported continuing increases in revenue, particularly in intermodal traffic, although volume remains below 2007 levels.

The Surface Transportation Board convened several public hearings on freight rail competition and freight rail rate relief. Shippers complained that the freight rail market has become increasingly non-competitive, because of railroad mergers and inadequate rate relief. These matters remain under consideration.

Railroad operators, including Class I freight and

passenger railroads, continue efforts to implement positive train control (PTC) systems, which must be in place by 2015. FRA is reviewing regulations to address concerns about PTC implementation.

Public Transportation

Many public transportation initiatives are moving forward to decrease operating expenses, increase capacity, and help reduce dependence on oil. South Dakota DOT has employed new technology in transit routing and management to increase efficiency in operations and to save costs. The software can route and dispatch rides, record ridership and maintenance, develop reports, and track the locations of buses.

The Illinois Center for Transportation is developing a variety of transportation solutions and innovations to encourage the use of public transportation. One project uses GPS surveying techniques to help Chicago's mass transit agencies improve service to the elderly. In addition, smart phone technologies are being explored to monitor traffic, provide travelers with updates, and encourage public transportation.

The Oregon Transportation Research and Education Consortium assisted Portland's TriMet in improving its operations by examining and finding the causes of bus bunching. The Portland–Milwaukie light rail project is under way in a major growth corridor, connecting the Oregon Health and Science University, Portland State University, Oregon Museum of Science and Industry, Portland Community College's Workforce Training Center, and Southeast Portland.

PHOTO: MARK FISHER



Northeast Corridor Amtrak 66 boards in Williamsburg, Virginia. Long-term federal funding for Amtrak is a concern; Amtrak will receive less funds in 2012 than in 2011.

PHOTO: WIKIMEDIA COMMONS



Oregon's Lane Transit District added 14 new stations to Emerald Express, a bus rapid transit line between Eugene and Springfield.

In addition, Oregon's Lane Transit District expanded its bus rapid transit system, constructing 14 new stations to support the Emerald Express, a 4-mile line between downtown Eugene and downtown Springfield. The system operates on a combination of dedicated transitways and lanes and a block-signal system, to provide fast and efficient service.

Overcoming Constraints

State DOTs and other transportation organizations are employing a myriad of tools and approaches to overcome funding constraints. Examples cited include strategic management systems, technology tools, innovative funding approaches, and more. By leading in lean times, transportation organizations and their staff are deploying innovations that will serve the traveling public well for years to come.

References

1. *Traffic Safety Facts*. DOT HS 811 451, National Highway Traffic Safety Administration, April 2011.
2. Kononov, J., C. Lyon, and B. Allery. Relating Flow, Speed, and Density of Urban Freeways to Functional Form of a Safety Performance Function. In *Transportation Research Record: Journal of the Transportation Research Board*, No. 2236, Transportation Research Board of the National Academies, Washington, D.C., 2011, pp. 11–19.

Did You Know?

◆ **The nighttime lighted airway beacon system is unique to Montana.** In the 1920s and 1930s, radio navigation for aircraft was virtually nonexistent—pilots relied on a system of federally operated airway beacons. Some of the beacons were bonfires, lighted and stoked by hardy patrons. Electric bulbs replaced the bonfires, lighting airway corridors across mountains and plains at night and during inclement weather. As technology improved, the beacons became a thing of the past. Montana is the only state that still uses its part of this historic network through the rugged western mountains. The original lease required the state to maintain the beacons or return the land to its previous condition. Taking the beacons down would cost more than \$250,000 each, making maintenance the more cost-effective alternative. Division personnel climb and maintain 19 beacons on a regular schedule, and the local and vocal pilot population continues to rely on the guidance.^a

◆ **To encourage activity at general aviation airports,** Kentucky's Division of Aviation created a passport stamp program—pilots collect stamps by visiting the state's airports and become eligible to win prizes.

◆ **In response to research needs statements** received and evaluated as important, the Division of Research and Innovation at California DOT initiated a preliminary investigations report program in 2009 and has posted 29 reports in 11 subject areas, including information about related national and international efforts.

◆ **The Penobscot Narrows Bridge is home to the Penobscot Narrows Observatory.** The cable-stayed bridge over the Penobscot River near Bucksport, Maine, is the first bridge observation tower in the United States and at 420 ft is the ^a <http://www.mdt.mt.gov/aviation/beacons.shtml>.



Although it sometimes requires tall climbs in mountain weather, regular maintenance of Montana's unique, historic network of lighted airway beacons is more cost-effective than taking the beacons down.

tallest public bridge observatory in the world. The bridge opened to the public on May 19, 2007.

◆ **South Carolina has the fourth largest state highway system in America,** although the state ranks 25th in population and 29th in land mass.

◆ **The CEOs of eight state DOTs report to commissions,** instead of reporting directly to the state governors.

◆ **In the three months after Hurricane Irene,** the state of Vermont repaired and reopened some 500 miles of damaged road, replaced a dozen bridges with temporary structures, and repaired approximately 200 bridges, according to a December 6, 2011, *New York Times* article.

Strategies to Attract and Retain a Capable Transportation Workforce

Developing a Pipeline, Learning from Case Studies

BRIAN CRONIN, BETH HEINEN, AND LANCE ANDERSON



PHOTO: MINNESOTA DOT

As state DOTs find ways to maximize their resources, recruiting and retaining good employees become essential.

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“We are being asked to do more with less,” is a statement echoing throughout the transportation industry.

Staffers are expected to understand increasingly complex tasks, across more areas of specialization, while budgets are cut, and the demand for efficient transportation systems mounts. In these times, attracting, recruiting, and retaining the best personnel available are critical endeavors. Making the right workforce decisions is essential as work groups diminish and only a handful of hires is brought in each year.

For this reason, the National Cooperative Highway Research Program (NCHRP) initiated Project 20-81, which produced NCHRP Report 685, *Guide to Implementing Strategies to Attract and Retain a Capable Transportation Workforce*. ICF International, in partnership with Venner Consulting, led the research effort. Although several previous studies had docu-

mented methods for recruiting and retaining employees, few had conducted an in-depth review of the results or provided guidance on implementing best practices. The NCHRP research addressed that gap and sought to complement other ongoing efforts.

Filling the Gaps

Even with workforce investments, many departments of transportation (DOTs) traditionally have experienced difficulty attracting and retaining capable employees. Competition with other industries and fields, plus current economic and demographic trends, has made it difficult to sustain an adequate and competent workforce.

The retirement of the baby boomer generation—born between 1946 and 1964—has been one of the greatest challenges. The effects have been downplayed, because the economic recession has delayed many workforce departures; nevertheless, the number of retirement-eligible employees is growing, and

Economic recovery and a more vigorous job market could increase the rate of staff turnover—unless effective workforce management strategies are in place.



a significant number of senior-level employees will leave DOTs in the next 5 to 10 years. In many cases, the retirees possess specialized knowledge and unique experience critical to the efficient operation of the organization (1).

While transportation demand continues to increase, personnel losses will surge at most transportation organizations and will result in gaps in the core competencies needed for mission-critical tasks. Agencies therefore must begin to invest in workforce programs proactively, before gaps in skills create organizationwide performance problems that are difficult to reverse.

On the positive side, the retirements of baby boomers will open opportunities for the next generation. Jobs that typically were male-dominated—such as engineering—are becoming less so (2). At the same time, the number of ethnic minorities in the applicant pool is also increasing. The influx of younger workers into leadership positions, however, presents its own set of challenges.

Adapting Strategies

Transportation organizations therefore need to adapt their development and retention strategies to the evolving composition of applicants and the workforce—a need that will be more pressing as the economy begins to recover. Although many employees have remained in their current positions during the economic downturn, an improved job market could lead to increased turnover if programs are not in place to retain high-performing staff.

Investing in the workforce while staff members are staying in public-sector jobs makes good business sense. Traditionally, transportation organizations have faced many challenges in recruiting high-quality

employees because of the disparities in wages. For example, in good economic times, private-sector engineering jobs pay more than public-sector jobs. A survey of American Society of Civil Engineers members age 35 and younger found that the average annual salary for private-sector engineers was \$1,000 higher than the average for all engineers, while the average annual salary for public-sector engineers was \$1,000 lower than the average for all (3).

Results from a survey of state transportation employees in Nebraska, Maryland, and Utah earlier in the decade indicated that 25 percent of respondents were considering leaving their jobs because of the potential for a higher salary or better opportunity for promotion elsewhere (4). Moreover, transportation agencies often were competing with each other for qualified engineers.

In today's economy, agencies can expect a committed workforce. Agencies have a unique opportunity to invest in the best and increase the likelihood that staff will remain with the organization even when financial conditions improve. To do this, transportation organizations must be creative in overcoming budget constraints—for example, by offering superior career development opportunities, focusing on the contribution transportation makes to the nation's quality of life, and providing a positive work environment with flexibility in work schedules and other benefits that can enhance individual lifestyles and priorities without compromising the organization's product, morale, or mission.

Even in a weak economy, however, demographic changes in the workforce, evolving perceptions of work, the image of the transportation industry, and the impending retirements of baby boomers are essential issues as agencies begin to revise recruit-

ment and retention strategies targeting the next generation of transportation workers.

Research Efforts

The NCHRP project team developed a guidebook that details the issues facing transportation agencies, as well as effective strategies for attracting and retaining a capable transportation workforce. The project team conducted three core tasks:

1. **Conduct a literature review.** The literature review identified and assembled information from published and unpublished research, technical reports, conference presentations, and case studies. The review consisted of a comprehensive analysis of more than 170 sources, including workforce articles from the transportation literature, as well as a review of materials from related industries.

2. **Conduct a benchmarking study.** The team assessed results from previous benchmarking studies and conducted focus groups with more than 30 professionals who make human resources (HR) decisions inside and outside of the transportation industry.

3. **Conduct a case study analysis.** Results from the first two tasks were analyzed, and 25 programs were identified for in-depth case studies. The goal was to understand the intricacies of implementing and managing each of the 25 practices.

Workforce Pipeline

Research results indicated 15 specific topics within the two major areas of interest—recruitment and retention (see box, at right). A guidebook chapter

Recruitment and Retention Topic Areas in Guidebook*

Recruitment

- ◆ Developing future applicant skills
- ◆ Increasing the number of applicants
- ◆ Screening applicants
- ◆ Promoting staff
- ◆ Branding the organization and industry

Retention

- ◆ Reducing voluntary turnover
- ◆ Anticipating and managing performance issues
- ◆ Developing internal staff skills
- ◆ Improving culture and climate
- ◆ Leadership development
- ◆ Job classification and design
- ◆ Succession planning
- ◆ Developing knowledge management systems
- ◆ Restructuring benefits and compensation
- ◆ Work–life balance

* NCHRP Report 685, *Guide to Implementing Strategies to Attract and Retain a Capable Workforce*.

focused on each of the topic areas and presented a thorough overview of related challenges, industry strategies, and examples of practices that could aid

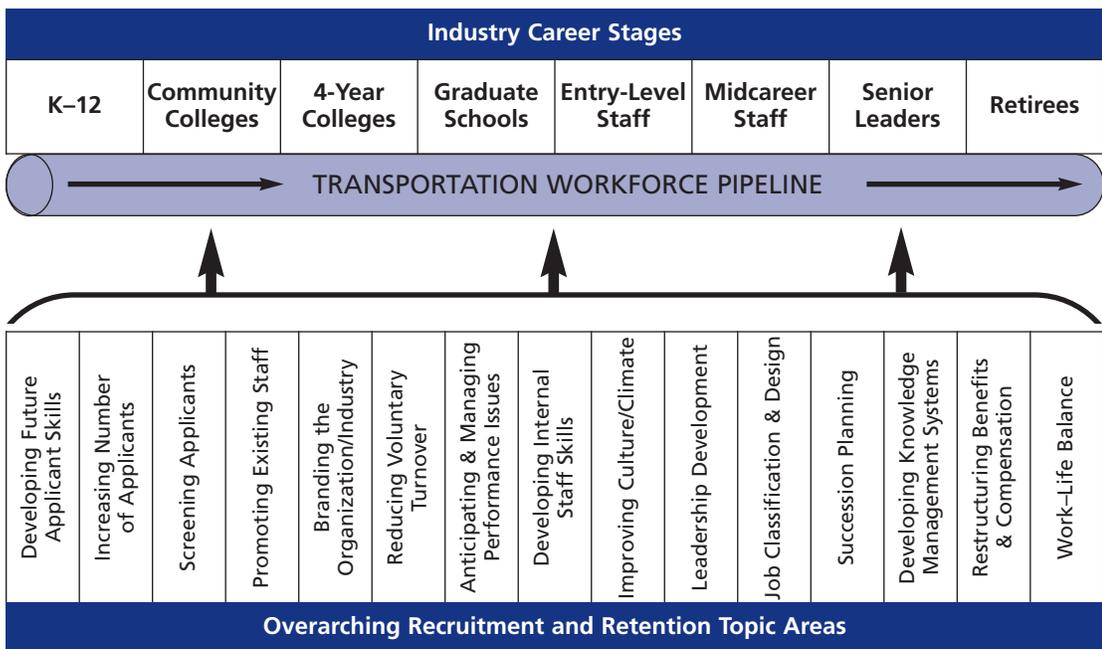


FIGURE 1
Transportation workforce pipeline.



PHOTO: OREGON DOT

Oregon DOT Director Matt Garrett (*right*) chats with Transportation Day participants. The event provides an opportunity to meet with hiring managers, engineers, business professionals, interns, graduate engineers, and some of Oregon DOT's college partners. The department also hosts a college internship program.

transportation agencies in recruitment and retention.

Although each chapter focuses on a topic, all are interrelated. An organization that struggles in one area is likely to struggle in other areas. Similarly, a strategy to improve one specific area is likely to lead to indirect improvements in other areas. For example, a practice that helps brand the transportation industry as an attractive career choice is likely to reduce voluntary turnover.

The research also identified eight general career stages before, during, and after employment at a transportation agency. The “workforce pipeline” in Figure 1 (page 23) highlights the career stages and shows that the 15 recruitment and retention categories influence the entire span of the pipeline.

Following are example challenges, strategies, and descriptions of effective, ongoing transportation workforce practices for five of the 15 topic areas discussed in the guidebook:

Some transportation occupations must combat an image problem—construction positions ranked poorly on a national vocational preference poll.

- ◆ Developing applicant skills,
- ◆ Branding the organization or industry,
- ◆ Developing internal staff skills,
- ◆ Job classification and design, and
- ◆ Work–life balance.

These five topics span the workforce pipeline and are particularly relevant to the issues currently facing the transportation industry.

Developing Applicant Skills

The transportation industry has experienced recruitment challenges because of the reduction in the number of students entering fields such as engineering, construction, and maintenance. Innovative organizations are working to develop the skills and interests of potential applicants as part of their recruitment practices—for example, by conducting internship or fellowship programs, partnering with schools, designing curricula, and establishing scholarships.

Oregon DOT initially designed its College Internship Program to introduce interested engineering students to the agency and to offer hands-on experience on projects, allowing the interns to determine the aspects of engineering they like most and want to pursue. Oregon DOT's strategy is to pursue a diverse set of perspectives and skill sets and to help the interns recognize aspects of the job that are important beyond the pay. Oregon DOT has invested in marketing the program and advertises the opportunity for interns to work on large projects with “smart and creative people.”

Oregon DOT offers 65 to 70 internship opportunities each summer, and more than 200 highly qualified engineering students apply. The program has expanded beyond recruiting interested engineers to candidates with backgrounds in informa-



PHOTO: AAA FOUNDATION FOR TRAFFIC SAFETY

tion systems and to heavy equipment operators and mechanics. Oregon DOT is also recruiting for right-of-way and geotechnical positions and is expanding the internship program to other areas, such as accounting and finance.

The internships provide students with valuable hands-on experience and training with other employees on large, real-world projects. The program itself benefits when students share their positive experiences with other students. Oregon DOT has branded itself as one of the leading places to work.

Branding the Organization

In targeting the next generation of workers—born after 1978 and often called Gen Y—companies have found that some negative and inaccurate perceptions have created recruitment obstacles. In a *Wall Street Journal Almanac* poll of job preference, high school-aged vocational technology students ranked construction worker 248th out of 250 occupations (5).

An effective way to address this image problem and improve recruitment success is to rebrand transportation jobs, portraying transportation as an industry with esteemed career tracks. Such initiatives could include advertising the strengths of an organization, increasing its community involvement, using employees in advertisements to express a job's appeal, building an image as “diversity friendly,” using a comprehensive marketing campaign, capitalizing on social networking technology, and targeting audiences.

Washington State DOT, for example, has made use of social media such as YouTube and Facebook. In 2007, the agency's communications department began identifying ways to rebrand the agency and get information out to technology-savvy and younger—under 30—populations. Washington State DOT's HR division followed this lead and began using social media for recruitment. The goal is that when the agency begins to recruit again, the general population will be more aware of the agency.

Washington State DOT mainly uses Facebook and YouTube to post agency information but has tested other social networking outlets, such as Google Groups, GovLoop, LinkedIn, and MySpace. The agency's Facebook page provides information about the transportation industry and a typical career path at Washington State DOT. A Spotlight Employee piece focuses on a person and the role he or she plays in the department.

Washington State DOT has produced videos on the key position classes and on select employees; the videos are hyperlinked to the agency's employment website. For example, when Washington State DOT



was having difficulty finding qualified maintenance people in the Northwest region, the agency created videos of maintenance employees describing what they do on the job and why. To allow viewers to find out more, hyperlinks connected to different social media outlets with postings about recent and upcoming activities and projects.

The HR division uses social networking to build trust, educate the public about the industry, and develop long-term relationships with users of social media. The agency's approach is based on that of other public- and private-sector organizations. Although no outcome measures have been collected, Washington State DOT judges the success of the social networks by the increased number of inquiries received from other state government agencies.

Developing Staff Skills

To address future skill needs effectively, agencies must analyze gaps and identify training content and methods to address those gaps. Developing internal staff skills reduces turnover—employees are more likely to remain with the organization when they possess the skills required for the job tasks. Strategies to train staff and improve technical skills include job rotations, off-site and higher education training, certification programs, training to build competencies, and using technology to support training.

North Carolina DOT's Transportation Supervisor Conference (TSC) is a good example of a workforce practice that develops internal staff skills. The biennial TSC provides technical training on a variety of work practices to instill standardization, effectiveness, and efficiency across the organization.

The first conference was held in February 2008, after approval by the district engineers and the state

A video detailing career opportunities for prospective employees of Washington State DOT is posted on the agency's YouTube channel.

secretary of transportation. The program is designed to ensure a small and focused audience. The three-day conference is held three times in three different geographic locations with the same structure and the same presenters and includes presentations on technical information. Small groups of 35 supervisors pursue a schedule of sessions in preassigned groups. Each group attends the core sessions plus specific technical sections on topics relevant to their work.

Surveys of the attendees provide feedback on each session. After hearing one of their peers—the conference presenter—explain the value of standardized work practices, many supervisors report that they now understand the value of having a work plan and use one in their daily routines. Supervisors have begun to implement more standardized practices and to communicate across the organization when solving problems.

An unexpected result has been that the conference has placed more responsibility on supervisors to disseminate information about standardization to their staff. At the request of participants, video recordings of the sessions are available for supervisors to share with their staff.

Job Classification and Design

Valid job descriptions and sound job designs are key to many HR functions, including recruitment, retention, training, and development. Thorough and accurate job descriptions ensure that employees' skills fit the requirements and context of the job. Retention issues can arise when a job does not allow flexibility and autonomy or when an employee does not receive opportunities for training or promotion; organizations therefore should determine if jobs are classified and designed to support employees' needs and desires and to retain high-quality and talented personnel. Strategies to increase employee retention include defining separate career tracks for managers and technical experts, emphasizing job enrichment, and creating advancement within positions.

A good example is Minnesota DOT's Transportation Specialist Series (TSS), implemented in 1999 after a decision to combine three classifications that comprised 45 percent of the agency's workforce: highway

technician, highway maintenance worker, and bridge worker. The intent was to increase agency efficiency and responsiveness, to assist the department in dealing with peaks and valleys in work, and to simplify the deployment of resources when needed—having the right skills, in the right place, at the right time.

The goal for the new unified classification was to focus on workforce planning and professional development to target needed skills. The TSS aimed at

- ◆ Creating an environment in which flexible, multiskilled workers are deployed to the fullest capacity;
- ◆ Providing increased flexibility in employee assignments;
- ◆ Improving opportunities for employees to make decisions regarding their daily work activities;
- ◆ Increasing the training and skills development opportunities for employees; and
- ◆ Linking employees' skills development and mastery to wage progression.

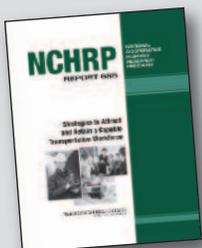
The program has enabled Minnesota DOT to avoid having two temporary seasonal workforces—for summer and for winter—and has eased recruitment and retention problems. The program has improved employees' abilities to make decisions about their daily work activities and has opened opportunities to progress through the series; historically, promotion opportunities had been limited. The agency has been able to improve its staffing despite retirements, budget constraints, and state agency hiring restrictions.

Implementing TSS has saved Minnesota DOT money by shifting employees to areas with workforce needs. The approach has allowed Minnesota DOT to remain competitive, develop a more flexible workforce, and meet customer expectations.

Work–Life Balance

Workers are interested in maintaining a healthy work–life balance and in reducing the conflicts of multiple demands. Many employees value a work–life balance more than higher salaries. Some strategies to help improve employees' work–life balance include adjusting work schedules, allowing flexible schedules and days off, establishing a range of policies to support employees' different needs, and allowing highly productive performers to telework—that is, work by electronic connection.

The Federal Highway Administration's (FHWA) Alternative Duty Location (ADL) program, for example, has improved work flexibility and employees' work–life balance. For several years, the candidate pool for job vacancies had been shallow—technical



NCHRP Report 685, *Guide to Implementing Strategies to Attract and Retain a Capable Transportation Workforce*, is available from the TRB online bookstore, www.trb.org/bookstore; to view the book online, go to http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_685.pdf. The supplemental materials include full case summary details, as well as one-page implementation checklists that show the purpose and intended target audience for each practice.



FHWA has designated Austin, Texas, and more than a dozen other cities throughout the United States for alternative duty location employees.

and policy positions in Washington, D.C., remained vacant, with few qualified applicants, in part because relocating was a requirement. Moreover, many employees left the agency because they believed that advancement was not possible without moving to Washington, D.C.

Under the ADL program, employees can operate from offices in areas with a lower cost of living, while working with teams and supervisors at offices in other locations that may have a higher cost of living, such as Washington, D.C. The HR Department and the Information Management Services Department researched offices to determine feasibility and identified 26 “cost desirable” locations, now approved as ADLs. The objective is to increase the number of qualified applicants applying to positions in areas that have a high cost of living.

Jobs are assessed for their suitability as ADLs. An employee in an ADL position performs the daily job tasks just as he or she would in the main office.

With the ADL program, job vacancies are being filled shortly after they are advertised. Employees have suggested that they would be less likely to leave the agency because of the expanded opportunity for advancement without relocating to an area with a higher cost of living. Relocation, however, still may be required but is not limited to Washington, D.C.

As a result of the program, employees in field offices are gaining exposure to national-level issues and policy making. In addition, ADL employees become resources for a more national perspective on FHWA or on headquarters initiatives. The ADL program has benefited the agency and its employees.

Implementable Practices

Investment in programs to improve the quality of the workforce is essential. Although the effects of HR initiatives can be diminished in a sluggish financial environment, transportation decision makers must realize that the economy will recover and that prepara-

tions should be under way for the challenges ahead—such as the loss of the baby boomers, the evolving composition of the workforce, and renewed competition from other employers. Building a highly skilled and motivated labor force can be difficult in the context of shrinking budgets but should be pursued proactively and doggedly.

The NCHRP guidebook presents straightforward, implementable practices that transportation HR professionals and hiring managers can use to improve the recruitment and retention of qualified employees in their organizations. The guidebook provides information on workforce challenges, industry strategies, and detailed descriptions of the most noteworthy practices within each of the 15 recruitment and retention categories. The guidebook also offers valuable information to transportation agencies facing unprecedented demand and difficulties in recruiting and retaining a professional workforce that can deliver high-quality products and services in a rapidly evolving environment.

References

1. Rothwell, W. J., and S. Poduch. Introducing Technical (Not Managerial) Succession Planning. *Public Personnel Management*, Vol. 33, pp. 405–419, 2004.
2. Cronin, C. B., L. Anderson, C. Martin, S. Swetharanyan, and E. Weingart. What Predicts the Job Choice of Prospective Transportation Construction Workers? Literature Review. Presented at 87th Annual Meeting of the Transportation Research Board, Washington, D.C., 2008.
3. Reese, C. Employment History Survey of ASCE's Younger Members. *Leadership and Management in Engineering*, Vol. 3, No. 1, pp. 33–53, 2003.
4. Warne, T. R. *NCHRP Synthesis of Highway Practice 323: Recruiting and Retaining Individuals in State Transportation Agencies*. Transportation Research Board of the National Academies, Washington, D.C., 2003.
5. *The President's High-Growth Job Training Initiative in the Construction Industry*. Employment and Training Administration, U.S. Department of Labor, December 2004. www.doleta.gov/BRG/pdf/High_Growth_Construction_Report_Final.pdf.

Workforce Management

A Practical Toolkit for Transportation Agencies

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In recent years, transportation agencies have been adapting to changing roles while facing substantial transitions in their workforces because of retirements and budget cuts. Agencies are seeking strategies to maximize the effectiveness of their workforce.

The National Cooperative Highway Research Program (NCHRP), through Project 20-72, Tools to Aid State Departments of Transportation (DOTs) in Responding to Workforce Challenges, has identified workforce challenges critical to transportation agencies and has packaged a set of pertinent information resources into a toolkit on workforce management. The toolkit provides a structured, searchable, and extensible web-based repository to help transportation agencies find relevant information for diagnosing and addressing specific workforce issues.

Workforce Challenges

State DOTs and other transportation agencies are seeking to improve efficiency and implement new models of operation. Anticipating and addressing workforce needs associated with these changes is crucial for success. The following examples illustrate how workforce management is integral to the initiatives currently being pursued:

◆ **Outsourcing.** Many agencies are outsourcing—that is, hiring contractors—for maintenance, operations, and design functions. To ensure acceptable service levels, agencies need staff with strong capabilities in contract development, negotiation, and oversight.

◆ **Flatter organizations.** Some agencies are pursuing flatter—that is, less hierarchic—organizational structures to reduce administrative costs, foster inno-

vation, and emphasize customer service. This model places greater responsibility on field offices, requiring a larger pool of field personnel with technical, leadership, and customer service skills, as well as mechanisms at the central office to provide effective management and support.

◆ **Operations focus.** DOTs pursuing operational improvements to maximize available capacity need staff who can plan for and manage sophisticated technology. The improvements also may entail shifts in organizational culture away from the traditional plan–design–build approach.

◆ **Collaboration.** An increased emphasis on partnerships across state, regional, and local agencies calls for staff with negotiation and communication skills and the ability to work effectively in a networked environment.



PHOTO: LAFAYETTE COLLEGE

Civil engineering students at Lafayette College in Pennsylvania. State DOTs must compete with the private sector to recruit the best young talent.

(Above:) Workforce management is integral to state DOT initiatives that include hiring contractors for maintenance, operations, and design duties.

Addressing the Challenges

As agencies face the challenges of responding to new demands and building new internal competencies, demographic shifts and economic upheavals are changing the size and composition of the workforce. Historically, DOT employees stayed with the organization for their entire careers, but this is no longer the case, as DOTs face competition from the private and academic sectors for a shrinking pool of qualified transportation professionals. Interest has been declining in engineering programs at colleges and universities—the source of entry-level talent for DOTs.

The guide produced under NCHRP Project 20-72 helps state DOT leaders, managers, and human resources personnel to select and apply practical tools to address a variety of workforce challenges. The project addressed several areas of concern to state DOTs:

- ◆ **Competency assessment**—assessing workforce core competencies against those required to meet current and evolving needs;
- ◆ **Succession planning**—ensuring the availability of qualified personnel to take on key management positions at all levels of the organization;
- ◆ **Staff recruiting and retention**—attracting and retaining talented and diverse staff in a competitive environment;
- ◆ **Staff development**—educating, training, and developing staff to provide required competencies; and
- ◆ **Staff departures**—managing staff departures to ensure smooth transitions and retain mission-critical institutional knowledge.

Connecting to Resources

Each of these areas needs strategic planning and diagnostic tools, as well as case studies and models of best practices, to help DOTs implement new programs and procedures. The research team recognized that many useful tools and methods are available at the strategic and operational levels, but most are not readily accessible to practitioners, who have limited time to keep up with the literature. The project therefore focused on connecting available guidance and resource materials to specific workforce needs and developed an approach that allows for adding new resources as they become available.

The toolkit is a searchable, web-based repository of resources to help transportation agencies address workforce challenges in a variety of areas, including recruitment, retention, succession planning, change management, training, career development, and leadership. In addition to documents describing best



PHOTO: TOM SAUNDERS, VIRGINIA DOT

practices, policies, procedures, and current research, the toolkit also offers links to data sets, websites, software, and other tools that support workforce management.

The toolkit is geared to challenges faced by upper- and middle-level managers and presents resources in the categories of strategic workforce planning, operational resources, and organizational models.

Strategic Workforce Planning

The resources on strategic workforce planning assist in assuring that an organization has the right people, with the right competencies, in the right place, at the right time to meet its core mission. The resources support the following tasks:

- ◆ Assessment of competency requirements and gaps;
- ◆ Review and assessment of policies, programs, and procedures that affect workforce composition and capabilities;
- ◆ Development of comprehensive strategies for recruitment, hiring, promotion, and compensation; and
- ◆ Development and use of performance measures to track progress, pinpoint areas for improvement, and support benchmarking against peer agencies.

Operational Resources

Operational resources support the implementation of specific programs and span a range of functions—recruitment, employee performance reviews, supervisor training, employee orientation, in-service training, employee mentoring and career counseling, benefits program design, incentive and advancement programs, succession planning, and knowledge management.

A Virginia DOT employee takes part in a TransSim VS III snowplow simulator demonstration at the VDOT Learning Center in Thornburg. The simulator is used to train drivers and improve decision making.

New technologies can access and apply workforce planning resources, pointing transportation agencies in the right direction.





Workforce planning resources can help assess competency requirements and gaps, review policies and procedures related to workforce composition and capabilities, and develop comprehensive recruitment and retention strategies.

The resources also include information-gathering tools for tracking key statistics from human resources systems on recruitment and retention, as well as specialized survey instruments for competency assessments, exit interviews, monitoring employee satisfaction, and debriefing applicants about the recruitment process.

Organizational Models

Resources were identified that provide organizational models for involving DOT human resources (HR) staff as strategic players. The resources describe the HR competencies and internal partnerships that make the models successful.

Many HR functions at DOTs focus on administrative and compliance-related tasks, not on strategic planning. The models can help agencies integrate strategic workforce planning into agency strategic planning—this can be critical in ensuring optimal results from a streamlined organization after a reduction in force.

Using the Toolkit

The toolkit serves as a resource to support strategic workforce planning and to assist agencies in responding to operational needs. The framework recognizes the diversity of agency needs and situations and does not prescribe any single approach to workforce challenges. To make the resources accessible to a range of users with varying perspectives, the toolkit offers different views and pathways.

Scenario-Based Views

Top 10 Needs

Two scenario-based methods can access the toolkit resources. The first organizes resources by topic areas representing the top 10 workforce needs:

- ◆ Strategic workforce planning,
- ◆ Attracting and retaining talent,
- ◆ Developing the next generation of leaders,
- ◆ Downsizing and reductions in force,
- ◆ Employee conflicts and performance issues,

- ◆ Improving HR efficiency and effectiveness,
- ◆ Outsourcing,
- ◆ Organizational change—reengineering and reorganizing,
- ◆ Preserving institutional knowledge, and
- ◆ Retooling the workforce to meet evolving business needs.

Resources addressing each of these needs are available in four broad categories reflecting a user's possible goals:

- ◆ Understand needs and issues,
- ◆ Learn about peer agencies,
- ◆ Assess the current situation, or
- ◆ Implement programs, policies, and procedures.

Frequently Asked Questions

The second scenario-based view follows a frequently asked questions (FAQ) format, to allow users to access resources addressing specific common questions:

- ◆ What resources are available to help me with reductions in force?
 - ◆ A large percentage of our organization's workforce is due to retire over the next five years. How can we address this?
 - ◆ We are having a tough time filling open positions for engineers, and cannot match consultant salaries. How can we attract and recruit good engineers?
 - ◆ The gap in experience is considerable between our service managers and engineers and the next tier of staff. How do we fill that gap before the senior staffers retire?
 - ◆ Our turnover rates are increasing, especially in urban districts. How can we deal with this?
 - ◆ We have a key career manager planning to retire in two years. How can we smooth the transition to a new person?
 - ◆ We are about to downsize our field units. How can we make the transition as smooth as possible?
 - ◆ We have several managers who need to build their supervisory skills. What resources are available?
 - ◆ After many years of stability, we have undergone several reorganizations in the past two years. Morale is low, with confusion about roles and responsibilities. How do we move to a better track?
 - ◆ Our mission has shifted, and we are relying more on outsourced services. Our staff capabilities do not match our needs for good collaboration, oversight, and negotiation skills. What is the most efficient way to address this mismatch?

◆ We need to measure the performance of our HR functions and to benchmark them against those of other agencies. How do we start?

◆ We need to replace our HR information system (HRIS). How can we learn about new products and capabilities? How can we implement a new HRIS and preserve access to legacy data? How can we influence statewide decision making by the state HR group?

◆ Our HR function does not play a significant role in strategic planning for our agency, yet workforce issues are important to our ability to achieve our mission. Are examples available of agencies that have performed strategic HR planning?

Other Search Modes

Function-based access allows users to browse the collection of resources by type of HR activity—for example, recruiting, compensation, employee performance management, or HR services. HR professionals may prefer this view.

The toolkit includes capabilities for both a faceted search and a full-text search. A faceted search allows users to view resources through a combination of need type or topic; resource type, such as methodology, case study, or general reference; target audience; or source.

Getting Involved

All DOT staff with responsibilities related to workforce management are encouraged to explore the prototype workforce toolkit posted on the AASHTO

website.¹ The toolkit is intended as an evolving resource for state DOTs and other transportation agencies.

The relevance and usefulness of the resources populating the toolkit depend on the active participation of the users. Agencies that have overcome a workforce challenge and developed resources that may benefit other agencies or that have applied resources not included in the toolkit are encouraged to submit a request to add the resources.

The toolkit includes a function allowing for resource referrals. The requests will be reviewed and, if appropriate, added to the website. Similarly, users can identify resources that have outlived their effectiveness and can alert the moderators to remove the material.

In addition to contributing resources, members of the user community are invited to get involved in other ways. As the database grows, curators will be needed for resources in specific categories—for example, state, resource type, or scenario. The curators will be responsible for reviewing requests to add new resources and for removing resources that are no longer pertinent. In addition, curators will seek out or solicit new resources for their domains. For more information, please visit the toolkit website.



Human resources departments can play an essential role in agency strategic planning.

¹ <http://toolkit.ashr.transportation.org/NCHRP.aspx>.

Knowledge Management Architecture

The workforce toolkit is designed to provide quick and easy access to information for a range of users within state DOTs and other transportation agencies. Key design features of the toolkit include the following:

◆ **A central metadata repository.** The core of the toolkit is a repository of resources relevant to transportation agency workforce issues. The repository provides a common structure for describing each information resource, including an abstract that allows a user to discern the relevance to a particular need. The metadata repository includes links to resources on public websites.

◆ **A faceted tagging approach.** Each information resource is tagged for several different facets or categories of interest—the type of workforce need addressed, the source, the target audience for the information, and the type of resource.

◆ **Multiple views into the same resource pool.** The toolkit provides five ways to access the repository: a Top Ten Needs view, an FAQ view, a functional-hierarchical view, a faceted

search, and a text search of the abstracts. This collection of views allows different types of users to narrow down the resources to those most relevant to their specific need and to find information in the way that works best for them.

◆ **Extensibility.** Selecting a link from any of the first three views queries the metadata repository using the facet tag values assigned to the link. In this way, items in the information repository are not directly linked to the views. This decoupled approach allows new resources to be added without changing the toolkit website. New views and extensions to views can be implemented without extensive work to link specific resources to the view components. This design feature also allows for future integration with specialized bibliographic databases and with external information repositories.

Transportation practitioners need improved ways for finding relevant information on demand. Knowledge management applications like the workforce toolkit meet this need and maximize the dissemination of research products.

Equity of Evolving Transportation Finance Mechanisms

JILL WILSON

The author, who served as study director, is Senior Program Officer, TRB Division of Studies and Special Programs.

This article summarizes the conclusions and recommendations of the study committee.

Transportation plays a key role in the functioning of the nation's economy and in determining people's ability to participate fully in society. As traditional sources of funding for the nation's surface transportation system fail to keep pace with demand, proposals for a variety of other funding mechanisms have proliferated, often based on tolling and road use metering—that is, road pricing. As with all transportation policies, these alternative funding mechanisms raise questions about equity.

Because the equity issues associated with surface transportation are complex, and practical experience with emerging finance mechanisms is limited, the Transportation Research Board's Executive Committee requested the National Research Council of the National Academies to appoint a Committee on Equity Implications of Evolving Transportation Finance Mechanisms (see box, page 34).

In Special Report 303, *Equity of Evolving Transportation Finance Mechanisms*, the study committee concludes that broad generalizations about the fairness of high-occupancy toll lanes, cordon

tolls, and other evolving mechanisms oversimplify the reality and are misleading. The fairness of a given type of finance mechanism depends on how it is structured, what transportation alternatives are offered to users, and which aspects of equity are deemed most important.

Issues of Equity

Society increasingly is concerned about issues of equity—notably, who pays for and who benefits from publicly delivered services such as health care, education, and transportation. Transportation influences how people get to work or school, to medical appointments, to the grocery store, and to a variety of social activities and therefore is central in determining who is able to participate fully in society.

Ways of raising the revenues to sustain and renew the nation's surface transportation system have attracted attention, in part because the costs to operate and maintain the road system exceed the revenues flowing into the Highway Trust Fund. Policy makers are exploring alternative finance mechanisms, raising questions about related equity issues.

SR-261 Toll Road in Orange County, California. Emerging funding mechanisms for transportation such as road pricing have raised issues related to equity.



PHOTO: TRANSPORTATION CORRIDOR AGENCIES

The goal of Special Report 303 is to provide guidance about equity issues to public officials responsible for deciding how to fund transportation programs and projects. The report addresses policy makers and their advisers at all levels of government who are considering new finance mechanisms.

Lessons Learned

The most important lesson from the committee's work is that broad generalizations about the fairness of high-occupancy toll lanes, cordon tolls, and other evolving mechanisms oversimplify the reality and are misleading. The fairness of a given type of finance mechanism depends on how it is structured, what transportation alternatives are offered to users, and which aspects of equity are deemed most important. Drawing reliable conclusions about the equity of a particular type of finance mechanism without delving into the details is not possible.

Public policy makers should pay attention to the defining characteristics of all finance proposals, particularly the ways in which the revenues are collected and used, because the fairness of many transportation finance mechanisms depends on application-specific details. Moreover, the equity implications of transportation finance mechanisms are not always what they seem initially.

New transportation finance policies motivate people to find ways of avoiding or passing on additional charges. For example, individuals may change their travel behavior to avoid paying a new tax or fee or to take advantage of new travel options, and businesses may pass on new charges by raising prices to their customers. Determining who wins and who loses as a result of behavioral changes and their consequences is complicated, and the answers rarely are clear-cut.

Comparing financing proposals against current funding mechanisms is important. If the current mechanism is inequitable, a key question for policy makers is "how does an alternative funding method change the equity picture?"

Informing Decisions

To inform decisions about equity issues, researchers need to gather fine-grained data on personal travel and freight movements and to develop models that can simulate relevant travel behaviors. Analysts then can use these tools to explore questions about how travelers and businesses may modify their use of the transportation system in response to changes in prices and services and about the consequences of these responses—recognizing the uncertainties inherent in travel forecasting models.

Determining what constitutes an equitable trans-

PHOTO: CALTRANS DISTRICT 11



portation finance policy entails the recognition that equity has multiple dimensions, some of which may be contradictory. Policy makers need to consider a variety of factors in distinguishing what is equitable in a given situation. Good data and analytical tools; knowledge gained through research; carefully crafted, situation-specific analyses; and meaningful interactions with all stakeholders can help policy makers to compare the equity of alternative mechanisms and to craft policies that will enhance equity.

The I-15 Express Lanes in San Diego were completed in January 2012 and include accommodations for bus rapid transit services.



PHOTO: TAGE OLSSON

The first toll station for congestion pricing in Stockholm, Sweden, began operation in 2006. Cordon tolls and other finance mechanisms involve a variety of factors affecting assessments of fairness.

Recommendations

For Public Policy Makers

Public policy makers should engage their constituents and stakeholders early and repeatedly in discussions of proposed transportation finance mechanisms. Public policy makers and their staff should ensure that appropriate data, analytical results, and communication strategies are used to

address equity explicitly from the outset of a program or project. Specific tasks include the following:

- ◆ Assessing the likely impacts of financing strategies;
- ◆ Gathering lessons learned elsewhere, to inform discussions;
- ◆ Developing outreach programs and educational materials; and
- ◆ Exploring possible remedies for inequities.

For Researchers and Analysts

Researchers and analysts should conduct scientifically rigorous before-and-after and cross-sectional studies to measure the equity implications of evolving financing mechanisms and provide a robust basis for future decision making. These studies should

- ◆ Track short- and long-term behavioral shifts in response to the evolving mechanisms,
- ◆ Conduct verifiable analyses to ensure the validity and transferability of results, and
- ◆ Avoid preconceived notions and oversimplification.

Research could provide useful insights into the equity implications of transportation finance mechanisms by investigating such questions as the following:

- ◆ How do members of different socioeconomic groups systematically alter their behavior to avoid or reduce payments, either in the short or long term? Short-term changes could include changing routes or time of travel, or both; using public transit instead of driving; or forgoing a trip. Long-term changes—over a period of years—could include changing home, job, or business locations or choosing to stop working or to travel less.

◆ Do the consequences of any of these behavioral changes have direct and material equity impacts on the people involved, including the range of costs that they may incur—for example, longer commutes, limited job benefits, or more expensive rents or mortgages?

◆ Do the consequences of any of these behavioral changes have indirect or independent equity impacts on other stakeholders? For example, do behavioral changes in response to new taxes or fees change the competitiveness of certain retail, housing, land, or labor markets, possibly accompanied by a spatial rearrangement of jobs? Do the behavioral changes improve health outcomes by reducing environmental pollutants, noise, or other negative externalities? If they do, what are the equity effects?

◆ What are the behavioral responses to the remedies intended to address inequities in transportation

Committee on Equity Implications of Evolving Transportation Finance Mechanisms

- Joseph L. Schofer**, Northwestern University, Evanston, Illinois, *Chair*
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Beverly G. Ward, National Resource Center for Human Service Transportation Coordination, Tampa, Florida
Johanna P. Zmud, RAND Corporation, Arlington, Virginia

finance and services? How effective are the remedial actions or programs? Have efforts to mitigate the perceived inequities of a finance policy ever worsened the actual equity outcomes?

As practical experience is gained with newer transportation finance mechanisms, researchers and analysts in the United States should take advantage of opportunities to capture lessons learned abroad. In developing and implementing advanced travel behavior and land use models for a variety of applications, researchers and analysts should ensure that the models incorporate features needed to inform equity analyses of transportation finance policies. In particular, models need to reflect the variability of the value of time—that the willingness to pay to save time varies from person to person and for the same person in different situations.

For Federal Agencies

The Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) should ensure that equity assessments integrated into project and program evaluations are effective and meaningful. FHWA and FTA should clarify and publicize that equity assessments are eligible expenses of the federal aid program.

The U.S. Department of Transportation's Office of Policy and the Research and Innovative Technology Administration should support and direct a collaborative effort to build a knowledge base for decision support that includes the following:

- ◆ A program of scientifically rigorous before-and-after and cross-sectional studies to assess the equity outcomes of road pricing and other evolving transportation finance mechanisms as they are implemented in the United States, and
- ◆ An ongoing effort to gather lessons learned about equity implications from the implementation of such mechanisms abroad.

For States and FTA

The American Association of State Highway and Transportation Officials and FTA should support activities under the National Cooperative Highway Research Program and the Transit Cooperative Research Program to develop information, guidance, and analysis tools for state departments of transportation and others to use in studying and understanding the equity implications of evolving transportation finance mechanisms. These activities should include the development of a handbook describing recommended procedures for conducting equity analyses of transportation finance policies.



PHOTO © TRANSPORT FOR LONDON 2005

Managing the Complexity

The equity implications of transportation finance mechanisms are complex, often controversial, and important in decision making. Policy makers addressing equity issues need to understand the issues involved. They also need to recognize that the complexity of the issues can be managed—though not eliminated—by systematically considering the ways in which burdens and benefits are distributed across society and institutions. Such an approach involves the following:

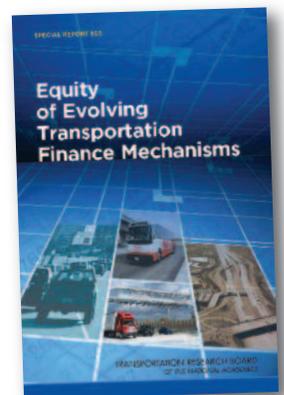
- ◆ Considering the ways in which people and organizations respond to—and sometimes shift—new transportation charges;
- ◆ Taking into account the distribution of the benefits from the use of the funds collected;
- ◆ Weighing the equity concerns about new ways to pay for transportation against those raised by the methods now in use;
- ◆ Exploring and assessing possible remedies to inequities; and
- ◆ Working closely with stakeholders to find solutions that are feasible, effective, and acceptable.

The knowledge and tools to accomplish these tasks are emerging, but investment in research and development is needed to provide more effective support for decisions about new finance mechanisms. In the meantime, much can be done to support transportation systems and to make informed decisions about paying for them.

Acknowledgment

The author thanks Russell Houston, Senior Communications Officer, TRB, for his assistance in preparing this article.

Research can explore questions of traveler behavior in congestion pricing zones—how members of different socioeconomic groups change their behavior to avoid payments, such as using public transportation in London's congestion charge zone.



Special Report 303, *Equity of Evolving Transportation Finance Mechanisms*, is available from the TRB online bookstore, www.trb.org/bookstore/; to view the book online, go to <http://onlinepubs.trb.org/onlinepubs/sr/sr303.pdf>.

Can Travel Training Services Save Public Transportation Agencies Money?

KAREN WOLF-BRANIGIN, MICHAEL WOLF-BRANIGIN, J. D. CULVER, AND KEVIN WELCH

K. Wolf-Branigin is Director of Training and Technical Assistance, Easter Seals Project ACTION, Washington, D.C. M. Wolf-Branigin is Associate Professor of Social Work, George Mason University, Fairfax, Virginia. Culver is Director of Mobility Options, and Welch is Assistant to the Director of Mobility Options, Paratransit, Inc., Sacramento, California.

Travel training services can offer public transportation agencies an alternative to providing increasingly costly paratransit service to customers with disabilities. Research to understand the outcomes and financial implications of travel training services, however, has been scant. To address this issue, a cost-benefit model was tested to measure the value that travel training services can provide to transportation agencies.

Problem

Paratransit is a transportation service that is provided in response to the particular needs of individual travelers, not according to a fixed schedule or route. Public transportation agencies offer paratransit service to customers with disabilities, in compliance with the requirements of the Americans with Disabilities Act (ADA). The service may use a

minibus or taxi, for example, that is dispatched at the request of a customer.

ADA paratransit costs are growing rapidly and represent a financial challenge for many public transportation agencies—ADA paratransit trips are more costly than fixed-route trips. Travel training for ADA paratransit customers is a means of reducing transportation agency costs by equipping and encouraging these customers to travel on the fixed-route system.

Application

Travel training services started in the 1970s and have been delivered and funded by public transportation agencies, school districts, and human services organizations. No wide-scale studies have been conducted to understand the benefits that customers or transit agencies receive from the services. The New



PHOTO: LARRY LEVIN/MMA/TA

The Washington Metropolitan Area Transportation Authority in Washington, D.C., provides travel training for people with disabilities—here, reviewing fares, maps, and accessibility onsite at a Metrorail station.

Freedom Program, initiated under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, encouraged start-ups of travel training programs, presenting opportunities for rigorous research.

The research project described here applied the Easter Seals Project ACTION definition of travel training services, which comprise one or more of three distinct activities:

1. Instruction about how to travel from a specific origin to a specific destination—this involves designing a highly individualized path of travel and delivering route instructions on the street and on transit vehicles.

2. A general overview and orientation to a public transportation system—this covers such tasks as reading a schedule, identifying a stop location, purchasing the fare, and using the transit vehicle's features.

3. Instruction on how to use personal mobility devices on public transportation—this includes safely boarding, riding, and alighting vehicles.

The research started with the hypothesis that ADA paratransit customers who learn how to ride fixed-route vehicles for some or all of their trips will save public transportation agencies money. A cost-benefit model was developed to test the hypothesis.

Solution

Two studies were conducted. The purpose of the first was to define a general cost-benefit model to assist key stakeholders in their decisions about beginning, sustaining, and expanding travel training services. The second study tested the model.

In the first study, researchers convened an expert panel to identify the costs and monetary benefits of providing travel training services (1). The costs and monetary benefits became components of the cost-benefit model. The expert panel comprised four groups: administrators from public transportation agencies or their subcontractors, travel trainers, recipients of travel training services, and other transportation professionals familiar with travel training services.

The panel participated in two teleconferences, each lasting one hour. The panel's work resulted in templates for calculating benefit-cost ratios from the perspectives of the customer, the public transportation agency or subcontractor, and the community. The panel reviewed the drafts, and the final set of templates and formulas incorporated their comments. From these findings, the researchers devel-

PHOTOS: PARATRANBIT, INC.



Travel training familiarizes people with disabilities with transit use, assisting in the transition from paratransit services.

oped algorithms for calculating the benefit-cost ratio from the stakeholders' perspectives.

The second study involved partnering with an experienced organization to provide contractual travel training services to three public transportation agencies in two Western states. The organization's experience in collecting, analyzing, and reporting data about travel training services ensured an appropriate environment for the study.

The components of the cost-benefit model for public transportation agencies included the following:

- ◆ Cost of vehicles and equipment to provide travel training services (represented in the calculation as the variable *a*)—for example, the personal or agency vehicle used by the travel trainer, the mileage, and the parking fees incurred during the travel training;

- ◆ Cost of the travel training personnel (variable *b*)—for example, the salaries and benefits of the travel trainers, the administrative personnel, continuing education, drug testing, and background checks;

TABLE 1 Benefit–Cost Calculations for Three Transportation Agencies

| Agency | Annual Benefit (\$) | Annual Cost (\$) | Benefit–Cost Ratio | Net Benefit (\$) |
|--------|---------------------|------------------|--------------------|------------------|
| 1 | 389,561 | 187,739 | 2.07 | 201,822 |
| 2 | 1,101,817 | 760,517 | 1.45 | 341,300 |
| 3 | 589,000 | 148,082 | 3.98 | 440,918 |

- ◆ Cost of supplies, equipment, and occupancy (variable *c*), such as office supplies, printing, information technology, and occupancy;

- ◆ Increased taxes paid by customers (variable *y*)—the portion of taxes paid by customers that is allocated to public transportation; for example, tax revenue will increase if travel training increases job opportunities or causes training recipients to spend a greater share of their income at local businesses; and

- ◆ Cost avoidance (variable *z*)—the cost of the paratransit trips not provided minus the cost of the fixed-route trips taken instead.

The benefit and cost calculations were as follows:

$$\text{Benefits} = y + z$$

$$\text{Costs} = a + b + c$$

$$\text{Benefit/cost ratio} = (y + z) / (a + b + c)$$

$$\text{Net benefit} = (y + z) - (a + b + c)$$

The calculations for the three transportation agencies are shown in the table above. The data indicate that for every \$1.00 used to purchase travel training services from the agency, Agency 1 saved or diverted \$2.07; Agency 2 saved or diverted \$1.45; and Agency 3 saved or received \$3.98. The savings in large part result from the travel trainers' abilities to teach customers how to use fixed-route transit

successfully—instead of relying on paratransit—for some or all of their trips.

Each of the agencies realized positive benefit–cost ratios. Reasons for the differences in the ratios included economies of scale, distances traveled, and the costs of the fixed-route and paratransit services.

Advantages

Applying the cost–benefit model clarified the value of travel training services paid for by public transportation agencies. The model also provided information to a variety of stakeholders interested in the following:

- ◆ Measuring improvements in community livability for people with disabilities who are able to use a less restrictive mode of transportation;

- ◆ Assisting public transportation agencies in making decisions about funding a travel training program and to what extent;

- ◆ Saving the financial resources of public transportation agencies; and

- ◆ Contributing to the sustainability of local transportation systems.

In short, travel training services can save public transportation agencies money.

For additional information, contact Karen Wolf-Branigin, Easter Seals Project ACTION, 1425 K Street, NW, Suite 200, Washington, DC 20005; 202-347-3066; kwolfbranigin@easterseals.com.

Reference

1. Wolf-Branigin, K., and M. Wolf-Branigin. A Travel Training Cost–Benefit Model for People with Disabilities, Public Transportation Agencies, and Communities. In *International Conference on Mobility and Transport for Elderly and Disabled Persons Conference Proceedings*, 2010.

EDITOR'S NOTE: Appreciation is expressed to Joseph R. Morris, Transportation Research Board, for his efforts in developing this article.

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).

Transit agencies and other stakeholders can use a cost–benefit model to measure the improvements in community livability for people with disabilities who have participated in a travel training program.

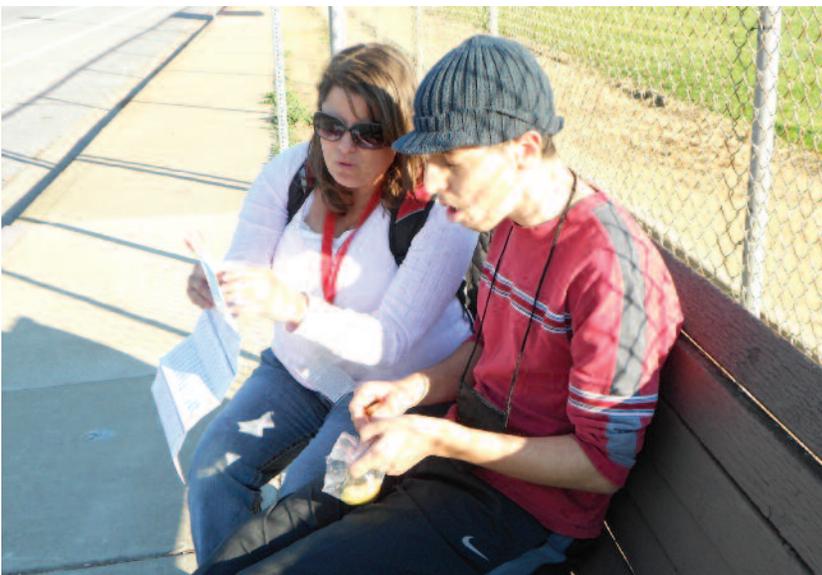


PHOTO: PARATRANSIT, INC.

TRB Meetings 2012

April

16–18 9th National Conference on Asset Management
San Diego, California

17–19 Joint Rail Conference: Technology to Advance the Future of Rail Transport*
Philadelphia, Pennsylvania

22–24 Symposium on Mileage-Based User Fees and Transportation Finance Summit*
May 1 Jersey City, New Jersey

30– May 2 Innovations in Travel Demand Forecasting
Tampa, Florida

30– May 3 International Conference on Winter Maintenance and Surface Transportation Weather
Coralville, Iowa

May

7 Relationship Between the Design and Construction of Rockfall Mitigation Techniques
Redding, California

20–23 8th National Aviation System Planning Symposium
Galveston, Texas

20–25 14th International Conference on Alkali–Aggregate Reactions
Austin, Texas

22–24 14th International HOV–HOT and Managed Lanes Conference
Oakland, California

23–25 International Society for Asphalt Pavements Symposium on Heavy Duty Pavements and Bridge Deck Pavements*
Nanjing, China

23–25 Making Progress: Transportation Planners and Programmers Turn Ideas into Reality
Denver, Colorado

June

2–8 11th International and 2nd North American Symposium on Landslides*
Banff, Alberta, Canada

4–7 North American Travel Monitoring Exposition and Conference (NATMEC): Improving Traffic Data Collection, Analysis, and Use
Dallas, Texas

18–20 North American Transportation Statistics Interchange 2012 (*invitation only*)
Washington, D.C.

19–22 Innovations in Traffic Flow Theory, Highway Capacity, and Quality of Service Symposium
Fort Lauderdale, Florida

20–22 7th RILEM International Conference on Cracking in Pavements
Delft, Netherlands

24–27 4th Urban Street Symposium*
Chicago, Illinois

24–28 Equipment Management Workshop*
Mobile, Alabama

26–28 Diagnosing the Marine Transportation System: Measuring Performance and Targeting Improvement*
Washington, D.C.

July

8–11 TRB Joint Summer Meeting
Irvine, California

8–11 Waste Management and Resource Efficiency in Transportation Summer Workshop
Madison, Wisconsin

8–12 6th International Conference on Bridge Maintenance, Safety, and Management*
Lake Como, Italy

11 Measuring the Transportation System from a Supply Chain Perspective
Irvine, California

12–13 Transportation Knowledge Networks—Broadening the Base Workshop
Irvine, California

14–19 13th AASHTO–TRB Maintenance Management Conference*
Seattle, Washington

17–19 10th National Conference on Asset Management*
Dallas, Texas

August

28–30 Annual Harbor Safety Committee and Area Maritime Security Committee Conference*
Pittsburgh, Pennsylvania

28–30 Seventh International Conference on Maintenance and Rehabilitation of Pavements and Technological Control*
Auckland, New Zealand

28–30 Data Analysis Working Group Forum on Pavement Performance Data Analysis
Auckland, New Zealand

Additional information on TRB meetings, including calls for abstracts, meeting registration, and hotel reservations, is available at www.TRB.org/calendar. To reach the TRB staff contacts, telephone 202-334-2934, fax 202-334-2003, or e-mail TRBMeetings@nas.edu. Meetings listed without a TRB staff contact have direct links from the TRB calendar web page.

*TRB is cosponsor of the meeting.

Paul J. Carlson

Texas Transportation Institute

In his work developing transportation research results into regulations, guidelines, policies, and practice, research engineer Paul J. Carlson thrives on building relationships—from colleagues in professional groups to those in organizations that sponsor his work. He is head of the Texas Transportation Institute (TTI) Operations and Roadway Safety Division and is a graduate faculty member of the Zachry Department of Civil Engineering at Texas A&M University. As division head, Carlson coordinates the state's traffic safety and design research, promotes national research initiatives, facilitates sponsor interaction, and manages projects. His long record of research and service in advanced traffic control materials and highway safety measures includes legible traffic signs and the visibility of pavement markings at night in wet weather.



“The most satisfying aspect of research is implementing new discoveries and technology applications internationally and throughout the United States.”

“Transportation research affects everyone every day by promoting safe and efficient travel,” Carlson observes. “For me, the most satisfying aspect of research is implementing new discoveries and technology applications internationally and throughout the United States.”

In 2008, Carlson received the Transportation Safety Award from the U.S. Secretary of Transportation for a Federal Highway Administration project that spurred the development of minimum sign retroreflectivity levels and measures for nighttime traffic sign visibility. This research also resulted in a new federal regulation by the U.S. Department of Transportation (DOT) for maintaining the retroreflectivity levels of traffic signs on public roads and in the *Sign Retroreflectivity Guidebook*, which includes management resources for agencies to adapt to the new standard.

“The retroreflectivity of a sign degrades over time due to natural—and occasionally criminal—causes,” Carlson explains. “Nighttime fatal crashes occur about three times as often as daytime fatal crashes, so maintaining traffic sign retroreflectivity is essential to safety.”

In 2005, he conducted research on unlit freeway signs that used the Clearview font, a road sign typeface that is more leg-

ible for older drivers, those with diminished nighttime visibility, and for drivers of vehicles with newer headlamp designs. The U.S. DOT then approved Clearview for highway signs—to date the only alternate typeface approved since the original font was developed in the 1940s. In recognition of these efforts, Carlson and fellow researcher Andrew Holick received TRB's Fred Burggraf award for young researchers. Carlson's other projects have included traffic safety standards and specifications in China, Latin America, the United Arab Emirates, and Spain; his research has initiated changes to state and national DOT standards and specifications as well.

Carlson received bachelor's and master's degrees in civil engineering from Pennsylvania State University. In 1995, after several years as a research assistant at the Pennsylvania Transportation Institute, Carlson joined TTI as assistant research scientist. Also in the mid-1990s, Carlson became a friend to several TRB committees on geometric design and traffic control devices. He joined the Signing and Marking Materials Committee in 2001 and served as chair from 2004 to 2010; since then, he has served on the Visibility Committee, the Maintenance and Preservation Section, and two National Cooperative Highway Research Program project panels. As chair of the Operations and Preservation Group, Carlson also is a member of the Technical Activities Council.

Carlson counts mentoring undergraduate and graduate students as one of his most rewarding endeavors. He assigns real-world research projects to enhance their education and careers and often guides them in preparing articles for peer-reviewed journals.

“I tell my students that the most important thing they can do to prepare for their professional life is to find a niche that is personally interesting. Then I encourage them to put themselves into the right kind of work environment,” Carlson comments. “An organization with a strong and diverse transportation program can offer a broad set of opportunities, resources, and expertise.”

Carlson's recent paper topics have included a comparison of different designs of field test decks for pavement marking materials; an evaluation of retroreflectivity measurement techniques; an explanation of the benefits of pavement markings; and nighttime visibility of prototype work zone markings in different weather conditions.

“So how do you know when you find that special topic that excites you enough to invest the time and energy to make a difference?” Carlson muses. “Listen to your gut. When you find your niche, your days on the job will be fun, time will fly, and your overall quality of life will be top-notch.”

Georgene M. Geary *Georgia Department of Transportation*

Georgene M. Geary gained a passionate enthusiasm for materials and pavement and geotechnical issues as an undergraduate at the University of Illinois. Today, as State Materials and Research Engineer at the Georgia Department of Transportation (DOT), she combines these interests with safety, traffic policy, and the environment, the subjects of her master's degree studies at Georgia Institute of Technology (Georgia Tech).

A licensed professional engineer, Geary began training as a geotechnical engineer at Georgia DOT in 1985, immediately after graduating from college. She then worked in the Construction Office as a liaison engineer and in 1995 became the Assistant State Utilities Engineer. Geary's office pioneered an electronic plan transfer process with utility companies, work-

monthly data-driven meetings to identify trends and research areas that require in-depth investigation. Recently, she has worked with other offices within the DOT to revise the construction portion of the *Local Administered Projects Manual*. She created a *Mechanistic–Empirical Pavement Design Guide* implementation team to adopt DARWin-ME, the new software from the American Association of State Highway and Transportation Officials. This effort required the assistance of the heads of OMR's Research Branch and of the Pavement Design section, who now are working directly with outside consultants to ensure smooth and efficient implementation.

"I really enjoy seeing synergy in action—when different areas of the department collaborate to develop a better process, or when Georgia DOT and contractors work together to solve a problem," she affirms, adding that the TRB Annual Meeting provides a good example of synergy in action.

"Possibly the best benefit in my current position is representing Georgia as a TRB state representative, which always puts me first on the list for my favorite learning experience—the TRB Annual Meeting," Geary comments.

Geary is a past member of TRB's Basic Research and Emerging Technologies Related to Concrete Committee. She currently serves on the Management of Quality Assurance Committee and the

Rigid Pavement Design Committee, as well as several National Cooperative Highway Research Program (NCHRP) project panels on asphalt, cementitious materials, and aggregate bases. She also is a member of the Task Force on Nanotechnology-Based Concrete Materials and of the NCHRP Innovations Deserving Exploratory Analysis (IDEA) project panel. In her work with the NCHRP IDEA program, Geary notes that she has seen an increase in nanotechnology-based submittals.

"When I consider nanotechnology, I remember how I felt about the Internet back in the 1990s, when we were just starting to transfer plans to utility companies electronically over what then was called the World Wide Web," she observes. "In 10 years, nanotechnology can totally change the materials and methods we use in transportation—just as the Internet has changed communications in all aspects of life."

During the annual National Engineers Week, Geary shares her enthusiasm for "the exciting world of engineering in action." She is chair of Georgia's Introduce a Girl to Engineering program, working with Georgia Tech students and organizations including the American Society of Civil Engineers and the Society of Women Engineers to develop engineering-related activities for middle-school girls.



"I really enjoy seeing synergy in action—when different areas of the department collaborate to develop a better process, or when Georgia DOT and contractors work together to solve a problem."

ing with district utilities engineers, and in 1998 the effort received an Awarding Computing Excellence recognition from the Georgia Information Technology Policy Council.

In 1999, Geary became Administrator for the Office of Information Services and helped reorganize information technology activities into a strategic Information Technology Division. She took the helm as administrator of the Office of Materials and Research (OMR) the following year, overseeing a staff of more than 300. OMR supervises the department's \$6 million annual research program, performs pavement and geotechnical design and the quality assurance program for materials, and provides technical assistance to field construction operations throughout the state. Managing OMR's overall program involves setting policy and procedure frameworks and goals, organizing schedules and budgets, and maintaining a standard of customer service in several different areas.

Geary created Georgia DOT's first pavement management branch and oversaw the development of its current pavement design manual. She also serves on the Local Technical Assistance Program Advisory Board, which coordinates with local governments to address transportation needs.

With constant process improvement as a goal, Geary guides

PHOTO: KOMU PHOTOS/ANNA BURKART



A truck parked at a rest stop along I-70 in Booneville, Missouri. ATRI studied how new FMCSA safety regulations were perceived among members of the trucking industry.

Surveys Gauge Trucking Industry Perspectives

Recent studies from the American Transportation Research Institute (ATRI) examine the top critical issues facing the North American trucking industry and how the Federal Motor Carrier Safety Administration's (FMCSA) Compliance, Safety, and Accountability (CSA) initiative is perceived among truck drivers and carriers.

A survey of more than 4,000 trucking industry executives found that, for the third year in a row, the economy is the primary concern in the motor carrier industry. A new FMCSA regulation on hours of service was second on the list of critical issues, and a driver shortage was third. Other concerns included truck size and weight, congestion, transportation funding, and tort reform.

CSA is a controversial topic among truck drivers

but is not well understood, according to an ATRI knowledge test of more than 4,500 drivers and a smaller survey of 204 drivers recruited at the Mid-America Trucking Show (MATS). Drivers who had definitive opinions on CSA, whether negative or positive, tended to know more about the program than those who had not formulated an opinion; according to the MATS survey, opinions on CSA were found to be evenly divided between positive and negative.

In the knowledge test, more than three-quarters of drivers surveyed believed erroneously that state data for traffic tickets and convictions are part of FMCSA's Safety Measurement System (SMS) calculations for roadside inspections and crash reports and that a trucking company inherits past violations from new hires. State and SMS data are separate, and carriers do not inherit any past violations of a newly hired driver. Seventy-two percent of drivers thought that FMCSA can revoke a commercial driver's license as a result of CSA; however, only states have that authority. A majority of respondents understood that a carrier cannot remove CSA violations from its record by firing a driver and that clean roadside inspections improve driver and carrier scores; nearly all drivers surveyed knew that all violations are added to driver and carrier records under CSA, not just out-of-service violations.

A November report also analyzed CSA's impact as perceived by motor carriers. The survey, collected from nearly 700 carriers, revealed that most carriers see CSA as an improvement over FMCSA's previous system, SafeStat. According to ATRI, most carriers did not report dramatic impacts from CSA's first year, but carriers cited for a higher-than-average amount of categories of improvement were more likely to experience negative changes to their shipper and broker utilization.

For more information, or to access these reports, visit www.atri-online.org.

INTERNATIONAL NEWS

European Data Show Global Freight Below 2008 Levels

A statistics brief from the International Transport Forum shows stagnating global freight values. Data collected through September 2011 reveal that total external trade by sea in European Union (EU) countries and the United States, in tonnes, has dropped to levels that are 4 and 5 percent, respectively, below what they were before the global economic crisis in 2008. Trade by air rose briefly but dropped back to 4 percent above precrisis levels in the EU and 1 percent above precrisis levels in the United States.

According to the report, exports to Asia—specif-

ically to China—have increased in the EU and United States, with exports by sea now 28 and 17 percent above their respective precrisis levels. Trade by air has decreased, and imports from Asia have been declining since April 2011, however. In the EU, data in seasonally adjusted tonne-kilometers show rail and road freight steadily growing since 2008, but both still are below precrisis levels. Rail freight volumes in the United States are 4 percent below what they were in 2008; in Russia, they are only 2 percent below 2008 volumes.

For more information, contact Aline Plez at aline.plez@oecd.org.



PHOTO: M. LINDNER, PORT OF HAMBURG MARKETING

A container terminal at Port of Hamburg in Germany.

Transportation Research Group of India Hosts First Conference

ASHISH VERMA AND G.P. JAYAPRAKASH

Verma is Assistant Professor, Indian Institute of Science, Bangalore, India, and President, Transportation Research Group of India; Jayaprakash is Senior Program Officer, Transportation Research Board, and Soils, Geology, and Foundations Engineer in TRB's Technical Activities Division.

At a TRB-hosted special session on sustainable pavement materials and technologies, Devesh Tiwari (right) asks a question of Louay N. Mohammad (left). Chetana B. Rao (second from left) moderated the session.



The newly formed Transportation Research Group of India (TRG), a private, not-for-profit organization, held its first conference in the Garden City of Bangalore—also known as the Silicon Valley of Southeast Asia—in December. Inspired by the 1st Indo–United States Symposium on Mass Transit and Travel Behaviour Research in Guwahati, Assam, in 2008, the conference was attended by approximately 300 delegates.

TRG was developed by the transportation community in India to assist the government by providing research-based input on transportation policies and investments. Because India is a developing country, a domestic organization was needed to focus research needs for highly complex transportation challenges. Transportation-related problems in India range from providing all-weather-accessible roads throughout the country, to managing increasing traffic on urban roads, to improving road safety and encouraging travelers to obey safe traffic rules. Mixed traffic on India's urban and interstate roads includes pedestrians, bicyclists, mopeds, scooters, motorcycles, auto rickshaws, tempos, cars, sport utility vehicles, vans, buses, and freight trucks—along with the occasional animal-drawn vehicle.

Through regular, peer-reviewed conferences such as the Conference of the Transportation Research Group (CTRG) and activities such as a research journal, magazine, and newsletter, TRG aims to promote transport research and capacity building in India and to bridge the gap between researchers, industry, and government. TRG aspires to a role similar to that of TRB in the United States, with a goal of becoming a national adviser on every aspect of transportation.

The first CTRG received 310 abstracts; 140 peer-reviewed papers from more than 13 countries were recommended for presentation and publication. Keynote speakers included Kumares Sinha, Lalita Sen, Imad Al-Qadi, Serji Amirkhanean, and Srinivas Peeta from the United States; Rosario Macario from Portugal; Yoshitsugu Hayashi from Japan; and B. B. Pandey, S. Gangopadhyay, and P. K. Sikdar from India. The conference received support from TRB, the Transportation and Development Institute of the American Society of Civil Engineers, and the Association of Transportation Professionals of Indian Origin (ATPIO).

Tutorials, technical field trips, and sessions explored subjects related to planning, urban transit, traffic operations and management, safety, sustainability, freight transportation and logistics, materials, and pavements. TRB organized events on topics such as the properties of asphalt mixtures and binders and sustainable pavement materials and technologies. ATPIO hosted sessions examining pragmatic issues in transportation engineering in India and solutions for congestion relief, road infrastructure financing, and safety.

TRG has scheduled its next conference in North India in December 2013. For more information on TRG or CTRG, visit www.trgindia.org/trg_conference_2011/index.html.

COOPERATIVE RESEARCH PROGRAMS NEWS

Practical Bridge Preservation Actions and Investment Strategies

Bridge preservation involves actions to deter or correct structural deterioration and extend a bridge's useful service life. Drawing on practical experience in bridge preservation, many transportation departments have assessed the effectiveness of these actions, but few efforts have been made to identify, measure, evaluate, and document the short- and long-term performance of specific actions.

Practitioners often base preservation strategies on judgment or common sense using available resources, but translating these strategies into convincing arguments for funding aggressive, well-planned bridge preservation programs is difficult.

Michigan State University has received a 40-month, \$450,000 contract (NCHRP 14-23, FY 2011) to develop a handbook to assist state DOTs in making bridge preservation investment decisions for an individual bridge, a category of similar bridges, and a bridge network. Also included will be a decision-making process and associated tools to quantify the benefits of various bridge preservation strategies.

For further information, contact Waseem Dekelbab, TRB, 202-334-1409, wdekelbab@nas.edu.

Measuring Project Delivery Performance and Sharing Best Practices

JOE CROSSETT

Crossett is Partner at High Street Consulting Group, Pittsburgh, Pennsylvania.

A survey of 39 state departments of transportation (DOTs) covering the period 2001 to 2010 found that, on average, 53 percent of transportation projects are delivered over budget and 45 percent are delivered late. State DOTs can learn from each other about how to improve project delivery performance according to the findings published in the final report for National Cooperative Highway Research Program (NCHRP) Project 20-24(37)A. Some states typically deliver 80 percent or more of their projects on time and on budget—offering an opportunity to share best practices.

The research, conducted in coordination with the Standing Committee on Performance Management of the American Association of State Highway and Transportation Officials, provides a benchmark for the collective performance of DOTs, a first step toward comparative reporting of project delivery performance. The goal is not to rank DOTs publicly but to help transportation agencies share best practices for delivering more projects quickly and cost-effectively.

The NCHRP project has created a first-of-its-kind online database that lists on-time and on-budget project performance for all DOTs by project. Employees of any participating DOT can access a secure performance website and check their department's results relative to the average of all other participating DOTs or can look at disaggregated results by project cost and other parameters.

One of the top performers in the NCHRP study was Texas DOT. According to the department's construction engineer, project delivery performance measures have helped deliver more projects on budget. The study data show that Texas DOT had the

second-best on-budget delivery record out of the 39 surveyed states, with 84 percent of projects completed within the original bid award amount. The average DOT completes only about 47 percent of its projects on budget (see figure, below).

Among the lessons learned from Texas, Arkansas, California, Georgia, and Iowa, all of which outperformed their peers, are that states should

- ◆ Make construction project delivery a high priority for top management;
- ◆ Create a formal program or process to measure project delivery;
- ◆ Monitor schedules and budgets closely and continually through regular project meetings and reports;
- ◆ Maintain a strict process for changing schedules and budgets, to encourage project managers and contractors to keep projects moving and on budget;
- ◆ Publish performance results at a district or regional level to promote competition and share best practices;
- ◆ Create a contract administration framework that holds contractors accountable, with penalties that range from liquidating damages to preventing a contractor from bidding on other state jobs;
- ◆ Allow flexibility for staff to find ways to keep projects on time and on budget; and
- ◆ Consider on-time and on-budget performance during the project design phase—doing homework in preconstruction phases of project delivery helps improve performance.

For more information, see [http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-24\(37\)A\(01\)_FR.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-24(37)A(01)_FR.pdf).

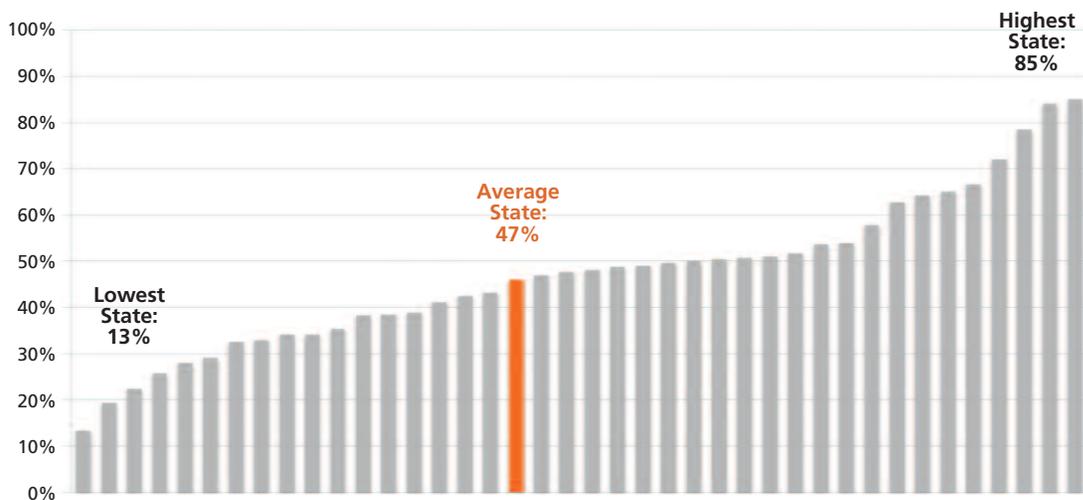
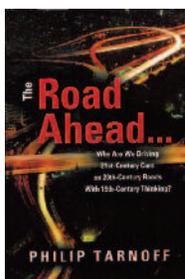


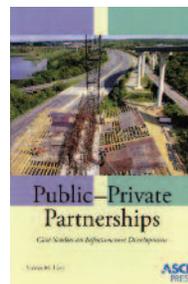
FIGURE 1 Nationwide average project-by-project cost performance.

The Road Ahead: Why Are We Driving 21st-Century Cars on 20th-Century Roads with 19th-Century Thinking?
Philip Tarnoff. Strategic Book Group, 2011; 196 pp.; \$29.97; 978-16-1204-532-0.



The American highway system traces its roots to the movements of major armies in colonial times—early thoroughfares that developed into modern highways. America depends on a highway system that can support industry and the travel needs of its citizens, but inadequate funding and poor management have led to a gradual deterioration of this system. Author Philip Tarnoff, former director of the University of Maryland's Center for Advanced Transportation Technology Laboratory, investigates solutions to the problem of infrastructure deterioration—and to the nation's funding crisis.

Public-Private Partnerships
Sidney M. Levy. American Society of Civil Engineers (ASCE) Press, 2011; 416 pp.; ASCE members, \$90; nonmembers, \$120; 978-07-8441-013-4.



Public-private partnerships (PPP) are becoming increasingly popular as a way for planners to make the most of limited resources. Using examples from the United States, Canada, and Mexico, author Sidney M. Levy outlines the history and development of the PPP movement, addresses its benefits and challenges, and offers tools for successful PPP implementation. Case studies include the Chicago Skyway and Indiana Toll Road; such projects as the Pocahontas Parkway, Dulles Greenway, and the ongoing I-81 project in Virginia; and a Texas Department of Transportation (DOT) strategic plan involving PPPs.

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

TRB PUBLICATIONS

Load and Resistance Factor Design (LRFD) Metal Loss and Service-Life Strength Reduction Factors for Metal-Reinforced Systems
NCHRP Report 675

Transportation agencies use many metal-reinforced systems in geotechnical applications to support retaining walls and soil and rock slopes and stabilize roadway cuts and fills. Corrosion can have an impact on the service life of these systems, and engineers need reliable techniques for assessing corrosion and estimating metal loss. This report explores the development of metal loss models for metal-reinforced systems that are compatible with the American Association of State Highway and Transportation Officials' (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications.

2011; 105 pp.; TRB affiliates, \$40.50; nonaffiliates, \$54. Subscriber categories: highways; bridges and other structures; geotechnology.

Design of Concrete Structures Using High-Strength Steel Reinforcement
NCHRP Report 679

Existing AASHTO LRFD Bridge Design Specifications, relevant to the use of high-strength reinforcing steel and other grades of reinforcing steel having no discernible yield plateau, are evaluated in this report. Also included is recommended language to the specifications that will permit the use of high-strength reinforcing steel with specified yield

strengths of 100 ksi or less.

2011; 72 pp.; TRB affiliates, \$36.75; nonaffiliates, \$49. Subscriber categories: highways; bridges and other structures.

Strategies to Attract and Retain a Capable Transportation Workforce
NCHRP Report 685

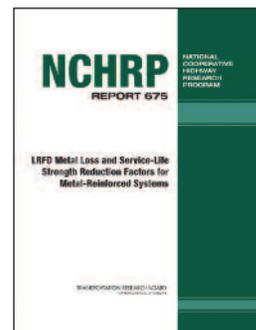
This report supplies transportation human resources managers and hiring professionals with straightforward, easily implemented practices to help improve the recruitment and retention of qualified employees. Addressed are workforce challenges, industry strategies, and noteworthy practices.

2011; 137 pp.; TRB affiliates, \$45; nonaffiliates, \$60. Subscriber categories: administration and management; education and training; transportation, general.

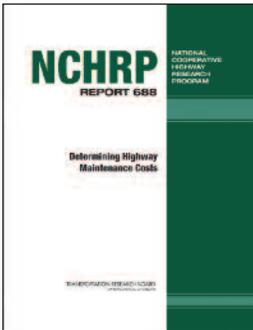
Road Pricing: Public Perceptions and Program Development
NCHRP Report 686

Road pricing concepts are examined in this volume, which includes guidelines for project planning, integrating pricing into regional and state planning processes, and directions for communicating strategies and engaging involved parties.

2011; 138 pp.; TRB affiliates, \$47.25; nonaffiliates, \$60. Subscriber categories: administration and management; finance; highways; planning and forecasting; policy; society.



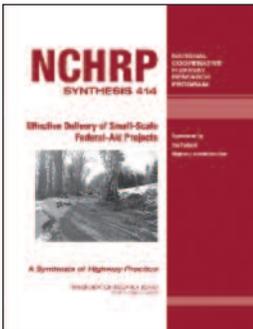
TRB PUBLICATIONS (continued)

**Determining Highway Maintenance Costs**

NCHRP Report 688

A process to assist highway agencies in determining the full costs associated with highway maintenance is illustrated in this report. The process helps ensure that the full cost incorporates a fair share of the support costs of maintenance programs and enterprises. Also explored is an application of the process that demonstrates the options, exceptions, and decisions needed to perform the full-cost calculation for highway agencies and maintenance activities.

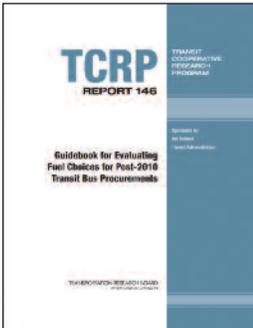
2011; 91 pp.; TRB affiliates, \$40.50; nonaffiliates, \$54. Subscriber category: maintenance and preservation.

**Effective Delivery of Small-Scale Federal-Aid Projects**

NCHRP Synthesis 414

This synthesis examines streamlined methods for meeting federal funding requirements for small-scale highway projects and explores the ways that state DOTs work with state or local transportation agencies to implement projects that are eligible for less than \$300,000 of federal funding.

2011; 82 pp.; TRB affiliates, \$37.50; nonaffiliates, \$50. Subscriber categories: highways; pedestrians and bicycles; public transportation; administration and management; planning and forecasting.



\$54. Subscriber categories: highways; administration and management.

Guidebook for Evaluating Fuel Choices for Post-2010 Transit Bus Procurements

TCRP Report 146

This report updates, expands on, and replaces TCRP Report 38: *Guidebook for Evaluating, Selecting, and Implementing Fuel Choices for Transit Bus Operations*. The guidebook and life-cycle emissions model spreadsheet, FuelCost2, provide tools to simplify the process of developing an alternative fuel strategy—clearly identifying issues, costs, and benefits associated with the conversion to available alternative fuel technologies.

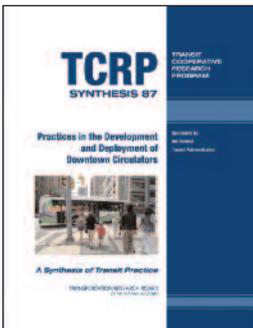
2011; 234 pp.; TRB affiliates, \$54; nonaffiliates, \$72. Subscriber categories: public transportation; energy; vehicles and equipment.

Toolkit for Estimating Demand for Rural Intercity Bus Services

TCRP Report 147

This report provides a planning guide and tools—on a supporting CD-ROM—that can assist in forecasting demand for rural intercity bus services. Described are key considerations in using the various methods presented for estimating demand.

2011; 186 pp.; TRB affiliates, \$58.50; nonaffiliates, \$78. Subscriber categories: motor carriers; planning and forecasting; public transportation.

**Design Fires in Road Tunnels**

NCHRP Synthesis 415

Basic information is provided for tunnel operators, first responders, and tunnel agencies to understand tunnels and train personnel. Included are statistical data for fire incidents in road tunnels since 1949 through the past decade, as well as statistical data documents for several tunnel fire safety projects in the United States and Europe.

2011; 150 pp.; TRB affiliates, \$47.25; nonaffiliates, \$63. Subscriber categories: bridges and other structures; design; highways.

Practices in the Development and Deployment of Downtown Circulators

TCRP Synthesis 87

The development, deployment, and sustainability of downtown circulator systems are addressed in this synthesis. Seven case studies offer insight on innovative and successful practices in downtown areas including Baltimore, Maryland; Hartford, Connecticut; Louisville, Kentucky; Philadelphia, Pennsylvania; Washington, D.C.; Los Angeles, California; and Austin, Texas.

2011; 113 pp.; TRB affiliates, \$14.25; nonaffiliates, \$57. Subscriber categories: public transit; administration and management; planning and forecasting.

Implementing Race-Neutral Measures in State Disadvantaged Business Enterprise Programs

NCHRP Synthesis 416

This synthesis assesses effective race-neutral strategies that state DOTs are using to meet Disadvantaged Business Enterprises participation goals. The report also reviews and synthesizes problems faced by DOTs in administering the programs and identifies race-neutral remedies used to overcome the challenges.

2011; 87 pp.; TRB affiliates, \$40.50; nonaffiliates,

Strollers, Carts, and Other Large Items on Buses and Trains

TCRP Synthesis 88

Research compiled from interviews, a literature review, and 42 transit agency surveys reveals the state of the practice for transit agencies managing capacity on vehicles carrying customers with large items.

TRB PUBLICATIONS (continued)

Also included is a discussion of vehicle designs to accommodate various large items.

2011; 162 pp.; TRB affiliates, \$47.25; nonaffiliates, \$63. Subscriber categories: public transportation; passenger transportation; safety and human factors; society.

Public Participation Strategies for Transit

TCRP Synthesis 89

This synthesis documents the state of the practice in public participation strategies for transit-related activities that inform and engage the public. Ideas and insights into successful techniques and challenges in public involvement are included in this volume.

2011; 87 pp.; TRB affiliates, \$40.50; nonaffiliates, \$54. Subscriber categories: administration and management; public transportation; society.

A Guidebook for the Preservation of Public-Use Airports

ACRP Report 44

This report describes why public-use airports close and identifies measures and strategies that can be undertaken to help preserve and prevent an airport closure. The guidebook presents step-by-step procedures on how to identify risk factors that can lead to a future airport closure and how to formulate an effective airport preservation program.

2011; 53 pp.; TRB affiliates, \$39.75; nonaffiliates, \$53. Subscriber category: aviation.

Guidebook for Developing and Leasing Airport Property

ACRP Report 47

This volume explores the issues associated with developing and leasing available airport land and summarizes airport sponsor best practices. Also included are case studies that show the diverse approaches airports have taken to develop and lease property for aeronautical and nonaeronautical uses, as well as two presentation templates to aid effective communication with stakeholders.

2011; 129 pp.; TRB affiliates, \$45; nonaffiliates, \$60. Subscriber category: aviation.

Bird Harassment, Repellent, and Deterrent Techniques for Use on and near Airports

ACRP Synthesis 23

A literature review and interviews with airport operators and industry experts provide airport managers and biologists with a document detailing techniques for reducing bird collisions with aircraft and the relative effectiveness of these methods.

2011; 32 pp.; TRB affiliates, \$30.75; nonaffiliates, \$41. Subscriber categories: aviation; environment.

Strategies for Reuse of Underutilized or Vacant Airport Facilities

ACRP Synthesis 25

As the airline industry continues to consolidate resources, airports must respond to an environment in which demand and revenue for facilities are not only unpredictable but often are reduced at short notice. This synthesis reviews the issues surrounding the reuse of aeronautical facilities and terminals.

2011; 62 pp.; TRB affiliates, \$34.50; nonaffiliates, \$46. Subscriber categories: aviation; economics; finance.

Current Airport Inspection Practices Regarding Foreign Object Debris or Damage (FOD)

ACRP Synthesis 26

This synthesis details the components of a comprehensive program for managing foreign object debris or damage (FOD) and compiles current practices, techniques, and lists of tools available or currently being used by airports for FOD inspections.

2011; 86 pp.; TRB affiliates, \$40.50; nonaffiliates, \$54. Subscriber categories: aviation; safety and human factors.

Guidebook for Conducting Local Hazardous Materials Commodity Flow Studies

HMCRP Report 3

An update of U.S. DOT's *Guidance for Conducting Hazardous Materials Flow Surveys*, this guidebook supports risk assessment, emergency response preparedness, resource allocation, and analyses of hazardous commodity flows across jurisdictions. Included are all modes of transportation, all classes and divisions of hazardous materials, and the effects of seasonality on hazardous materials movements.

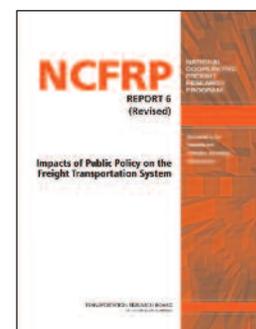
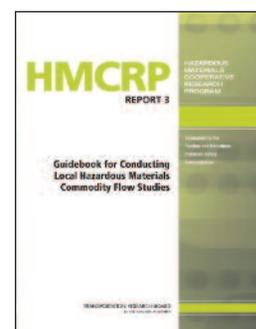
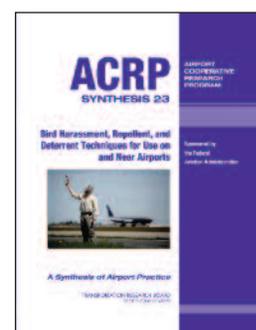
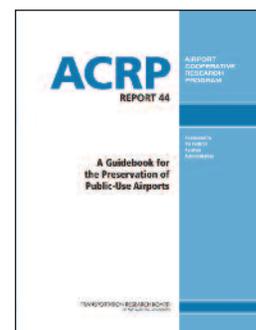
2011; 192 pp.; TRB affiliates, \$51; nonaffiliates, \$68. Subscriber categories: motor carriers; planning and forecasting; security and emergencies.

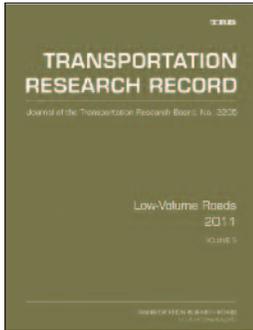
Impacts of Public Policy on the Freight Transportation System

NCFRP Report 6

This report describes the many ways that government policy decisions affect the freight system, identifies current and recent policy issues with potential freight system impacts, and evaluates the magnitude and expectation of these impacts.

2011; 103 pp.; TRB affiliates, \$39.75; nonaffiliates, \$53. Subscriber categories: aviation; environment;





TRB PUBLICATIONS (continued)

freight transportation; highways; marine transportation; motor carriers; pipelines; railroads; safety and human factors; terminals and facilities; vehicles and equipment.

Low-Volume Roads 2011, Vol. 3 Transportation Research Record 2205

This volume explores topics applicable to low-volume roads: late-season paving with warm-mix asphalt in Alaska; chip seal with lightweight aggregates; an integrated, mechanistic-based framework for sustainable “green street” urban road rehabilitation; improvement recommendations for unsealed gravel roads; and more.

2011; 253 pp.; TRB affiliates, \$63; nonaffiliates, \$84. *Subscriber categories: pavement; materials; geotechnology.*

Public-Sector Aviation: Graduate Research Award Papers, 2009–2010

Transportation Research Record 2206

Graduate research award papers in this volume examine air traffic flow management, reactive chemistry in aircraft exhaust, a rolling dynamic deflectometer device for evaluating rigid airfield pavements, a sustainability evaluation of selected airport pavement treatments, a public policy model of delays in major airports, legal challenges to airport expansion, and other topics.

2011; 99 pp.; TRB affiliates, \$44.25; nonaffiliates, \$59. *Subscriber category: aviation.*

Asphalt Materials and Mixtures 2011, Vol. 1

Transportation Research Record 2207

Research is presented on direct measurements of volatile and semivolatile organic compounds, a nano-titanium dioxide additive, the performance of Superpave® projects, a new low-temperature performance-grading method, the intrinsic healing of asphalt binders, the recyclability of polyphosphoric acid-modified asphalt, the separation of thixotropy from the asphalt binder fatigue process, and more.

2011; 135 pp.; TRB affiliates, \$49.50; nonaffiliates, \$66. *Subscriber categories: materials; pavements; environments.*

Asphalt Materials and Mixtures 2011, Vol. 2

Transportation Research Record 2208

The 14 papers in this volume investigate subjects including hot-mix asphalt with nickel slag aggregate, the performance characteristics of thin-lift overlay mixtures, the effect of mineral filler characteristics on asphalt mastic and mixture rut-

ting potential, the effects of recycled asphalt pavement amounts on low-temperature cracking performance, and a new moisture-conditioning method for the adhesive failure of hot- and warm-mix asphalt binders.

2011; 117 pp.; TRB affiliates, \$45.75; nonaffiliates, \$61. *Subscriber categories: materials; pavements.*

Asphalt Materials and Mixtures 2011, Vol. 3

Transportation Research Record 2209

Explored in this volume are such topics as shear bond characteristics of tack coats, estimating material-specific moisture damage characteristics of the binder-aggregate interface, specifications for aggregate frictional qualities in flexible pavements, the effects of warm-mix asphalt technologies on moisture characteristics of asphalt binders, and a laboratory evaluation of open-graded asphalt mixes.

2011; 81 pp.; TRB affiliates, \$42; nonaffiliates, \$56. *Subscriber categories: materials; pavements; maintenance and preservation.*

Asphalt Materials and Mixtures 2011, Vol. 4

Transportation Research Record 2210

Papers in this volume examine permanent deformation, semirigid asphalt concretes, cracking performance in hot-mix asphalt mix design, asphalt binders and mixtures containing polyphosphoric acid, crack resistance of hot-mix asphalt, a permanent deformation model, fatigue behavior in bituminous mixes, flow number and crack size distribution in asphalt mixtures, an evaluation of dynamic modulus predictive equations, and more.

2011; 129 pp.; TRB affiliates, \$49.50; nonaffiliates, \$66. *Subscriber category: materials.*

Research and Education 2011

Transportation Research Record 2211

The six papers in this volume investigate a system to implement research and innovation, a design-focused course in transportation engineering, traffic engineering in a hybrid format, an introductory course in transportation engineering, online discussions that support learning in transport planning, and factors that influence the rollout of policies.

2011; 50 pp.; TRB affiliates, \$38.25; nonaffiliates, \$51. *Subscriber category: education and training.*

The TRR Journal Online website provides electronic access to the full text of more than 11,700 peer-reviewed papers that have been published as part of the Transportation Research Record: Journal of the Transportation Research Board (TRR Journal) series since 1996. The site includes the latest in search technologies and is updated as new TRR Journal papers become available. To explore the TRR Online service, visit [www.TRB.org/TRR Online](http://www.TRB.org/TRROnline).

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INFORMATION FOR CONTRIBUTORS TO

TR NEWS

TR News welcomes the submission of manuscripts for possible publication in the categories listed below. All manuscripts submitted are subject to review by the Editorial Board and other reviewers to determine suitability for *TR News*; authors will be advised of acceptance of articles with or without revision. All manuscripts accepted for publication are subject to editing for conciseness and appropriate language and style. Authors receive a copy of the edited manuscript for review. Original artwork is returned only on request.

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 words (12 double-spaced, typed pages). Authors also should provide charts or tables and high-quality photographic images with corresponding captions (see Submission Requirements). Prospective authors are encouraged to submit a summary or outline of a proposed article for preliminary review.

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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.

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- ◆ All manuscripts should be supplied in 12-point type, double-spaced, in Microsoft Word, 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. 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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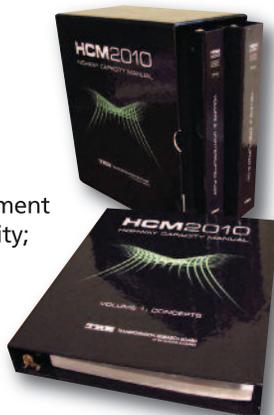
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