TR News March-April 2013: Deploying Transportation Research: TRB 92nd Annual Meeting Highlights

DETAILS

62 pages | 8.5 x 11 | PAPERBACK

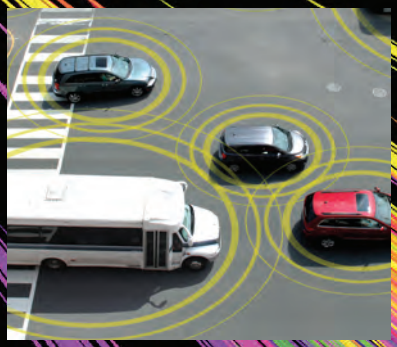
ISBN 978-0-309-43435-5 | DOI 10.17226/22582

AUTHORS

Transportation Research Board

TR NEWS

NUMBER 285 MARCH–APRIL 2013



3

10

27

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.

***TR News* is produced by the Transportation Research Board Publications Office**
Javy Awan, Editor and Publications Director
Lea Camarda, Assistant Editor
Jennifer J. Weeks, Photo Researcher
Juanita Green, Production Manager
Michelle Wandres, Graphic Designer

TR News (ISSN 0738-6826) is issued bimonthly by the Transportation Research Board, National Research Council, 500 Fifth Street, NW, Washington, DC 20001. Internet address: www.TRB.org.

Editorial Correspondence: By mail to the Publications Office, Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001, by telephone 202-334-2972, by fax 202-334-3495, or by e-mail jawan@nas.edu.

Subscriptions: North America: 1 year $55; single issue $10. Overseas: 1 year $80; single issue $14. Inquiries or communications concerning new subscriptions, subscription problems, or single-copy sales should be addressed to the Business Office at the address below, or telephone 202-334-3216, fax 202-334-2519. Periodicals postage paid at Washington, D.C.

Postmaster: Send changes of address to *TR News*, Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001.

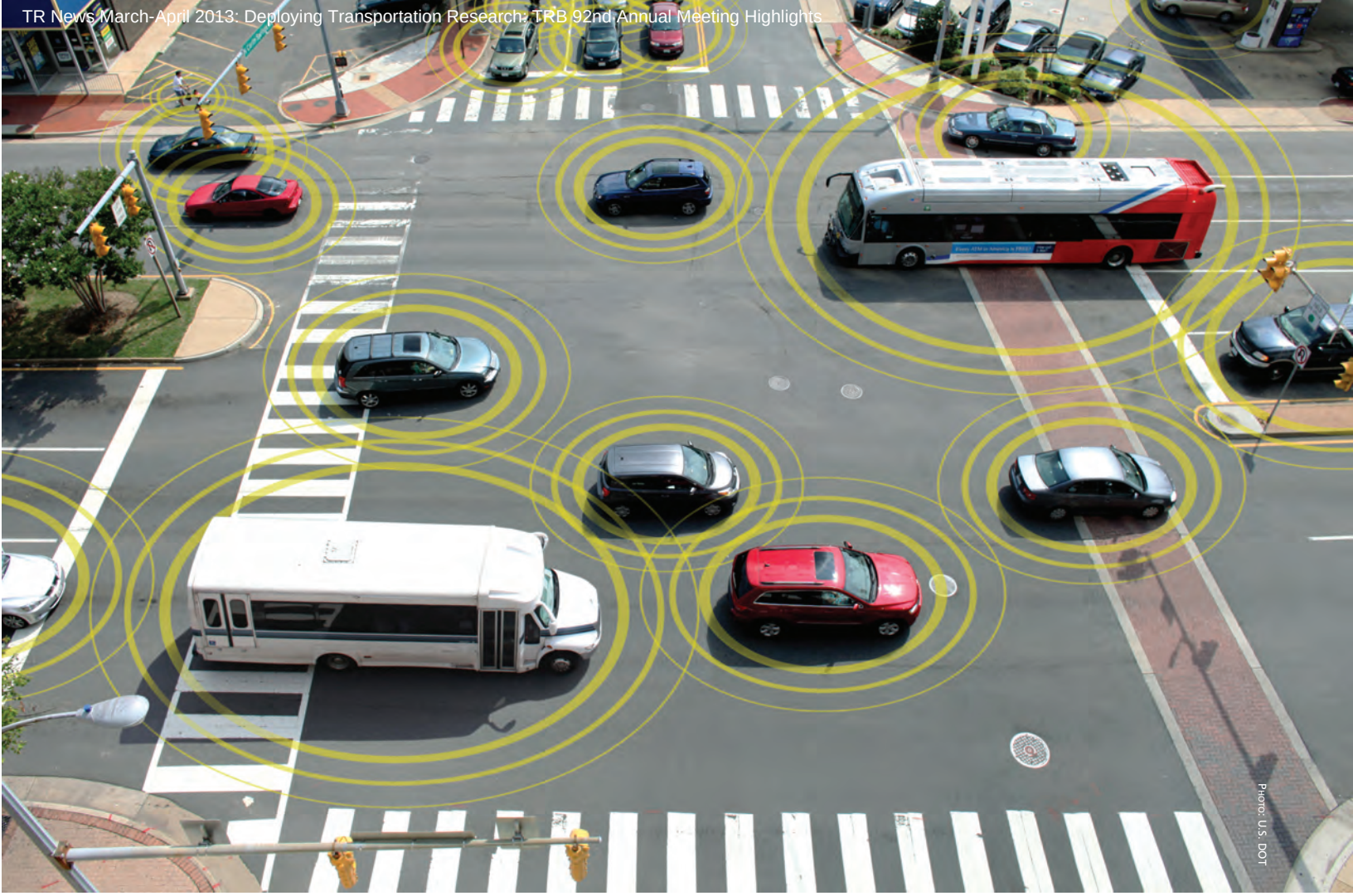
Printed in the United States of America.

ALSO IN THIS ISSUE:

COMING NEXT ISSUE

The role of science and technology in advancing the rail industry is the theme of feature articles in the next issue of *TR News*, highlighting the benefits from research investments that anticipate and meet industry needs. Research and demonstration projects on crash energy management; the design of tank cars to reduce the risk of transporting hazardous materials by rail; track support to improve track safety, efficiency, and the competitiveness of the industry; improvements in safety culture; reducing highway–rail grade crossing incidents; and positive train control are among the subjects to be covered.

Full-scale tank car impact test setup for evaluating safety improvements under the Next-Generation Railroad Tank Car project at the Transportation Technology Center near Pueblo, Colorado.



Keeping the Promise of Connected Vehicle Technology

Toward an Era of Unprecedented Roadway Safety and Efficiency

KENNETH LEONARD

The author is Associate Administrator and Director of the Intelligent Transportation Systems Joint Program Office, Research and Innovative Technology Administration, U.S. Department of Transportation, Washington, D.C.

(*Photo above:*) The connected vehicle program's vast data network virtually connects vehicles to each other and to infrastructure.

Motor vehicle crashes are the leading cause of death for Americans ages 4 to 34, according to the U.S. Centers for Disease Control and Prevention. Improving transportation safety is the top priority for the U.S. Department of Transportation (DOT). The Intelligent Transportation Systems Joint Program Office (ITS-JPO) of the Research and Innovative Technology Administration (RITA) is focusing on crash prevention through the Connected Vehicle Research Program.

The connected vehicle program pursues research and development into low-latency, wireless communications technology to enable motor vehicles to stream secure, private, real-time data about position, speed, and other information that is critical to improving roadway safety and management. The connected vehicle concept relies on a data-rich transportation network of vehicles virtually connected to each other and to infrastructure.

The connected vehicle technology platform supports collision-avoidance systems that can be highly effective at reducing many of the most deadly crashes that do not involve an impaired driver. Connected vehicles move beyond the protections of seatbelts and airbags, to expand roadway safety from crash survival to crash avoidance.

Connected Vehicle Overview

The mission of the ITS-JPO research program is to create an intelligent transportation system in which vehicles and infrastructure use 21st century technologies—such as the Global Positioning System, wireless broadband, and remote sensing—to enhance decision making and operations. To achieve

PHOTO: UNIVERSITY OF MICHIGAN

Technological components like this vehicle awareness device form the core of an intelligent transportation system.

this vision, the program is advancing major research initiatives, exploratory studies, and support for technology transfer, deployment, and training.

Connected vehicle technology emerged as the core focus for the ITS-JPO through cooperative research conducted by U.S. DOT, the academic community, and the automotive industry. The research results showed that connected vehicles can transform the way Americans travel by creating a safe, interoperable, wireless communications network of cars, buses, trucks, trains, traffic signals, cell phones, and other devices.

Connected vehicle technology has the potential to accomplish the following:

PHOTO: KENNETH COLE SCHNEIDER

Besides alerting a driver to imminent crash situations, a connected vehicle relays such information as when a driver enters a school zone.

- ◆ Prevent crashes;
- ◆ Enable communication between vehicles and the infrastructure to realize benefits for safety, mobility, and the environment; and
- ◆ Enable communication among vehicles, infrastructure, and wireless devices to provide continuous, real-time connectivity for all system users.

Research results have encouraged a strategic shift toward developing and testing connected vehicle technologies and applications and assessing the potential benefits and costs. ITS-JPO is taking key steps to ensure that the applications are safe, reliable, and effective in a real-world environment. In addition, the efforts are building a technical, institutional, and policy framework for promoting commercialization and reducing the time to implementation.

Improving Safety

Connected vehicle safety applications reduce crashes through vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) data transmission. V2V and V2I transmissions enable vehicles to warn drivers about dangers on the roadway—including dangers that may not be visible—through a dynamic interface of in-vehicle displays, audible alerts, and even tactile prompts, such as seat vibration.

The interface can warn vehicle operators about imminent crash situations, such as a vehicle on the driver's blind side during a lane change, or traffic ahead suddenly braking during a rainstorm. The safety benefits are not limited to dangerous situations that require immediate action, however; the interface can alert a driver approaching a school zone or road work area or a traffic signal about to change.

Connected vehicle safety applications enable safer and more responsive decision making by providing time-critical information and extending a driver's awareness beyond the line of sight and any interfering elements.

Safety Pilot

U.S. DOT's Safety Pilot Model Deployment was launched in summer 2012 in Ann Arbor, Michigan. The culmination of a decade of forward-thinking research and a strong commitment to new technologies for safer and improved transportation, the safety pilot is an unprecedented test of connected vehicle technology in real-world conditions and will continue through 2013.

Ann Arbor residents are driving nearly 2,800 specially equipped motor vehicles. The drivers' experience and the vehicle data cannot be duplicated in a laboratory; the pilot represents a significant milestone in the development of connected vehicle technology.

In the first phase of the safety pilot, U.S. DOT conducted a series of six driver acceptance clinics to test V2V safety applications with ordinary drivers in controlled roadway situations. The data from the clinics revealed that 9 out of 10 drivers embraced the experience and wanted V2V safety features in their personal vehicles.

The University of Michigan Transportation Research Institute is conducting the second phase of the safety pilot, the model deployment. The vehicles are equipped with safety systems that use dedicated short-range communication (DSRC), a secure, wireless communications technology. DSRC allows the nearly instantaneous transmission of data between highly concentrated numbers of safety pilot test vehicles operating on public streets. The test vehicles can detect each other when in the same driving area.

Devices and Messages

The model deployment includes a mix of cars, trucks, and transit vehicles and is the largest test of connected vehicles in a real-world, multimodal operating environment. The model deployment is testing four types of DSRC electronic devices:

- *Integrated safety devices*, installed during vehicle production;
- *Aftermarket safety devices*, installed after initial vehicle manufacture;
- *Retrofit safety devices*, installed in a truck or bus by an authorized service provider after the vehicle's manufacture; and
- *Vehicle awareness devices*, aftermarket devices installed in a vehicle without connection to the vehicle system.

Each of these devices broadcasts a basic safety message (BSM) about vehicle size, position, speed, heading, acceleration, and braking. The BSM is transmitted 10 times per second, forming the data stream that the vehicles and infrastructure can use to identify potential traffic or roadway dangers. The devices can detect an impending collision at an obscured intersection, a vehicle changing lanes in another vehicle's blind spot, a potential rear collision with a vehicle stopped ahead, a vehicle traveling too fast to navigate a curve safely, and other hazardous conditions.

Applications

The BSM transmission identifies developing crash situations; the in-vehicle safety devices use the data to activate a series of time-critical safety alerts, such as the following:

PHOTO: UNIVERSITY OF MICHIGAN

University of Michigan buses are participating in the safety pilot program.

- *Blind spot warning–lane change warning,* to alert drivers who are changing lanes that a car is in the blind spot or that a vehicle is about to overtake them;
- *Forward collision warning,* to alert and warn drivers who fail to brake when a vehicle ahead has stopped or is traveling slower;
- *Electronic emergency brake lights,* to notify drivers that a vehicle they cannot see ahead is braking hard;
- *Intersection movement assist,* to warn the driver that entering an intersection is not safe—for example, something is blocking the driver's view of the opposing traffic; and
- *Do-not-pass warning,* to warn drivers attempting to change lanes and pass that a vehicle is in the opposing lane within the passing zone.

Informing Decisions

ITS-JPO is coordinating this research initiative in conjunction with several U.S. DOT agencies that are also supporting the model deployment: RITA, the National Highway Traffic Safety Administration (NHTSA), the Federal Highway Administration, the Federal Motor Carrier Safety Administration, and the Federal Transit Administration.

PHOTO: UNIVERSITY OF MICHIGAN

Launched in 2012 and continuing through this year, U.S. DOT's Safety Pilot Model Deployment tests connected-vehicle technology in real-world conditions.

The model deployment research will produce data to support a major decision by NHTSA later this year about future V2V safety applications. Similar decisions are scheduled for 2014 on V2V and V2I safety technology in heavy vehicles.

Integrated Truck Safety

DSRC and similar wireless communications technologies also can yield significant benefits for truck safety and efficiency. U.S. DOT's Integrated Truck Safety Program is incorporating DSRC technology into a commercial heavy-vehicle platform to develop research prototypes capable of testing crash avoidance safety applications. The applications support the transmission of interoperable safety messages across multiple vehicle platforms and models—specifically between commercial vehicles and cars—so that the safety benefits are harmonized for all types of vehicles on the road.

The safety pilot includes two clinics for truck drivers and has recruited a cross section of commercial vehicle drivers primarily from local fleets. The participants will operate the vehicles in a safe, highly controlled, closed course. Researchers will collect subjective driver acceptance data related to integrated safety systems and driver–vehicle interfaces, to guide the development of future applications.

Improving Mobility

Traffic congestion drains $100.9 billion from the U.S. economy every year, according to the Texas A&M Transportation Institute's *2011 Urban Mobility Report*; the cost reflects 4.8 billion hours of lost productivity and 1.9 billion gallons of wasted fuel.

Although the primary goal of connected vehicles is to improve safety, the technology also can ease traffic congestion and limit delays. Connected vehicles can help prevent disruptive incidents—such as crashes—and can generate a wealth of real-time data about traffic flows and travel conditions. Transportation agencies can use this information to optimize traffic signals, guide construction to eliminate bottlenecks, implement wireless roadside inspections, or help commercial vehicle drivers identify areas designated for extended parking.

The same continuously updated, anonymous data, accessible via a new generation of mobile applications, can empower travelers with route planning and other services to inform decision making. For example, applications could locate parking spaces, connect travelers between modes—for example, from a park-and-ride facility to a bus or train—or help a visually impaired pedestrian cross a busy intersection.

Data from connected vehicles can enhance current transportation management tools and can lead to new tools to address service gaps. U.S. DOT is conducting research on dynamic mobility applications that capitalize on V2V and V2I connectivity, such as real-time data from in-vehicle devices and other sources, to improve the efficiency and mobility of the transportation system. The program identifies high-value applications for research and develops the concepts, tools, metrics, and best practices for future

applications—prioritizing development for public agencies and other organizations not adequately served by commercial solutions.

Environmental Benefits

The transportation sector accounted for approximately 27 percent of total U.S. greenhouse gas (GHG) emissions in 2009 and is the second-largest source of carbon dioxide emissions in the United States, according to the Environmental Protection Agency's *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2009*. Vehicles that are stationary, idling, and traveling in a stop-and-go pattern because of system inefficiencies, such as congestion, produce more GHGs than vehicles that are able to move freely and to adjust effectively to changing conditions.

A University of Michigan study released in 2012 found that U.S. DOT action has helped improve the average fuel economy of new vehicles sold in the United States since October 2007 by 4 miles per gallon. Continuing to find reasonable approaches to reduce fossil fuel consumption by vehicles would be a tremendous step forward in reducing GHG emissions and managing climate change.

The real-time transportation data generated by connected vehicles include information useful for environmental applications. The data can support and facilitate more environmentally sustainable transportation choices, operations, and planning.

The ability of a vehicle to communicate with traffic signals can help drivers and transit operators eliminate unnecessary stops and optimize fuel efficiency. Real-time information about travel conditions can help travelers avoid congestion by taking alternative routes, riding public transit, or rescheduling a trip. Applications help drivers mitigate their carbon footprint and manage vehicle operation and maintenance for maximum fuel efficiency.

The data-rich connected vehicle network provides transportation managers with accurate information about traffic and travel conditions—along with new tools to address congestion and other inefficiencies. Traffic signal phase and timing, electronic tolling, and dynamic message signs are among the innovative transportation management applications supported by connected vehicle technology.

The potential environmental benefits of connected vehicles derive from the aggregate impact of access to information about travel conditions by the transportation system users, operators, managers, and planners, enabling better travel decisions. For example, Eco-Signal Operations uses connected vehicle technologies to decrease fuel consumption and GHG and criteria air pollutant emissions by reducing idling, the number of stops, and unnecessary accelerations and decelerations; the application also can improve traffic flow at signalized intersections.

Green Research

Applications for the Environment: Real-Time Information Synthesis (AERIS) is an ITS-JPO initiative to develop "green," or environment-friendly, connected vehicle applications. AERIS will explore the potential for V2V and V2I technology to produce data that can be used to reduce GHG and other pollutant emissions from motor vehicle travel. The initiative also will explore how this capability can evaluate and quantify related air quality and climate change outcomes.

AERIS research will identify, collect, and analyze the most promising data sets and will develop actionable information for transportation users and managers. Possible applications include advising motorists about alternative routes, optimal speeds, and other measures to reduce GHG output during a trip or enabling managers to adjust traffic signals dynamically or to notify travelers about air quality alerts.

In addition, AERIS conducts webinars and public meetings to engage stakeholders and researchers from the transportation and environmental communities. The focus is on promoting environmentally sustainable decisions, so that people and goods can travel in a way that can reduce GHG emissions in the long term and the number of poor air quality days annually.

Core Systems

A new architecture underpins the connected vehicle program's safety, mobility, and environmental applications and links the core system to these functions. The vision is to combine the applications, services, and systems for safety, mobility, and environmental benefits through the exchange of data between transportation users:

PHOTO: U.S. DOT

The Integrated Truck Safety Program uses dedicated short-range communication technology to develop research prototypes for testing crash avoidance safety applications.

◆ *Applications* that provide the functionality for safety, mobility, and environmental benefits;

◆ *Communications* that facilitate data exchange; and

◆ A *core system* that enables data exchanges between mobile and fixed transportation users.

The core system includes the enabling technologies and services that support a distributed, diverse set of wireless and hardwired transportation applications. Open, standardized interface specifications govern all interactions between users, so that devices, agencies, or vendors do not define the boundaries of the core system. The system must be secure from hackers, signal interference, and other elements that can disrupt its safety and reliability.

The integrity of the core system and of the entire connected vehicle environment relies on the trust of the communicating parties that their data will be protected from misuse or disclosure. Maintaining the privacy of participants is a complex task that is crucial to the connected vehicle initiative. The core system will be designed to ensure anonymity in the exchange of data and will define the processes for establishing trust among participants.

Harmonization of Standards

For connected vehicles, standards development and harmonization provides a framework for sharing data and information among public agencies and private organizations and for fostering interoperability. The ITS-JPO has teamed with leading standard-setting organizations and public agencies to accelerate the development of standards for open, nonproprietary communications interfaces that support ITS application development and deployment.

These standards establish the way that ITS systems and components interconnect and exchange information for the delivery of services within a multimodal transportation network. Standards ensure that all motor vehicle fleets will be able to communicate with each other. Reducing the barriers to standardization and achieving a broad agreement on harmonization can reduce the time to deployment by reducing industry risk and cost as connected vehicle technology enters the commercial market.

The United States has cooperative relationships with the international ITS community, both at the policy level and at the technical level, and continues to work with international counterparts on research activities and standardization processes. Because transportation—especially vehicle manufacturing—is a global industry, harmonized standards are necessary to enable the use of common hardware and to reduce the cost and time to reach the marketplace. Sharing data and knowledge on safety, mobility, and environmental applications, as well as on the spectrum of transmission frequencies and other key policy issues, collectively can get the most out of investments made independently.

Policy Implications

The ITS-JPO Policy and Institutional Issues program researches, analyzes, and presents policy options to advance the implementation of connected vehicle technology. The program also identifies critical issues that may hinder or challenge successful implementation.

Of particular interest and focus are social and institutional frameworks most likely to support the transition from the research phase to implementation. Privacy and security, along with a variety of potential

PHOTO: BRADLEY GORDON

Signal Phase and Timing is part of the Applications for the Environment: Real-Time Information Synthesis research initiative. Early information about whether a signal is red or green can help a driver save time and emissions either by coasting to a stop earlier or by not speeding up to make a green light.

Photo: U.S. DOT

Among the in-vehicle safety devices is a forward collision warning, which alerts the driver to a stopped or slow vehicle ahead.

institutional issues, are also of paramount importance. U.S. DOT has reached out to key stakeholders to help guide policy research and to ensure sound, real-world applications of the new technologies.

Successful implementation requires that complex policy and technical issues are addressed in a coordinated, balanced way. The two components are inextricably linked. To address the challenge, U.S. DOT has held meetings and discussions involving the automotive industry, state DOTs, and others to consider such issues as

- Options for security networks;
- The governance of security certificates;
- Privacy provisions, which have been a key part of the program; and
- Business modeling to ensure sustainable funding for implementation, operations, and maintenance.

Looking Ahead

The ITS-JPO is soliciting intensive input from stakeholders in the development of the next four-year strategic research plan,[1] from drafting themes to determining the focused concepts that identify research initiatives. ITS-JPO program managers are using webinars,[2] as well as engaging stakeholders through public meetings in Washington, D.C., and other locations.

Transportation agencies, organizations, and industry leaders are encouraged to share their perspectives for the next plan. The Ideascale website[1] has opened a dialogue and published a discussion document on the following broad themes for the next strategic research plan:

- Maturing connected vehicle systems;
- Piloting and deployment readiness; and
- Integrating with the broader environment.

Many state and local agencies are proactive about ITS and are evaluating V2I applications and capabilities. Transportation agencies and their organizations can ask questions and help set the goals for a connected vehicle environment.

In addition, the program has active partners in the automobile industry, as evidenced by the safety pilot. The industry sees the promise of the technology and is devoting resources to its development. Industry's ability to offer consumers added value through ITS technology will help introduce the technology to cities and communities.

Connected vehicle communication systems can revolutionize roadway safety. In addition, connected vehicles can improve the mobility and the environmental impact of the U.S. transportation system. Like the Internet, which provides information connectivity through open standards, connected vehicle technology can provide a starting point for transportation connectivity that will enable countless applications and spawn new industries.

To learn more about the connected vehicle program, visit the ITS-JPO website, www.its.dot.gov/.

[1]http://itsstrategicplan.ideascale.com/.
[2]www.its.dot.gov/meetings.htm.

Construction Manager–General Contractor Project Delivery

A Better, Faster, Smarter Way of Building Transportation Infrastructure

PHOTO: OHIO DOT

DOUGLAS D. GRANSBERG

The author is Donald L. and Sharon A. Greenwood Chair and Professor of Construction Engineering, Iowa State University, Ames.

(*Above:*) Construction manager–general contractor (CMGC) project delivery allows for shorter project time, input from the contractor during the design stage, and increased certainty about cost.

On road, bridge, and other transportation projects, state departments of transportation (DOTs) across the country are adopting innovations in project delivery methods, procurement procedures, and payment provisions. The growing use of alternative project delivery and the need for rapid renewal of the nation's aging highway infrastructure call for supporting research.

In June 2010, the Federal Highway Administration (FHWA) introduced the Every Day Counts (EDC) initiative to address this issue. The program is designed to accelerate the implementation of innovative practices. FHWA Administrator Victor Mendez has stated that the purpose of EDC is

> to identify and deploy innovation aimed at shortening project delivery, enhancing the safety of our roadways, and protecting the environment….It's imperative we pursue better, faster, and smarter ways of doing business. (*1*)

Construction manager–general contractor (CMGC) and design–build (DB) project delivery are two of the 13 EDC initiatives.

Bridge girders over the Weber River for the Utah I-15 NOW project, which relied on a design–build delivery method for completion in time for the 2002 Winter Olympics in Salt Lake City.

Project Delivery Methods

The Associated General Contractors of America defines a project delivery method as "the comprehensive process of assigning the contractual responsibilities for designing and constructing a project" and notes that "a delivery method identifies the primary parties taking contractual responsibility for the performance of the work" (*2*). Delivery methods are distinguished, therefore, by the contract agreements between the owner, the designer, and the builder and by the technical relationships that evolve between each party.

In design–bid–build (DBB), the traditional delivery method for highway projects, the owner completes the design using either in-house design assets or a design consultant and then solicits a construction contractor to build the project. Generally, the contract is awarded to the lowest bidder, and the designer and the contractor are not contractually obligated to one another.

Although used with success, the traditional DBB method raises many issues. For example, the contractor has no involvement in the design phase. Moreover, the project schedule is linear, eliminating the opportunity to start construction before the design is finished. Under DBB arrangements, adversarial relationships often develop between the parties. Finally, research has shown that DBB projects have a higher average growth in costs than projects delivered with alternative methods.

Alternative Methods

CMGC and DB are two alternative methods of project delivery for highway projects. A study comparing the three delivery methods found that the alternative project delivery methods reduced the growth of cost and of time during construction (3). The main conclusion was that CMGC and DB projects tended to perform better under most metrics than traditional DBB projects. Other major benefits associated with alternative delivery methods included a shorter project delivery time, input from the contractor during the design stage, and increased certainty about cost.

The DBB project delivery method situates the owner between the designer and the builder (Figure 1, above right). The owner is responsible for the details of design during construction and is financially liable for the cost of any errors or omissions encountered in construction.

The builder has no contractual incentive to minimize cost growth in a low-bid delivery system. In practice, the system can encourage a builder to look for changes after the award to gain profit after bidding the lowest possible margin to win the project.

In CMGC projects,[1] the contract is between an owner and a construction manager, who eventually will be at risk for the final cost and time of construction. In this agreement, the owner authorizes the construction manager to provide input during project design. The owner either will complete the design with in-house design personnel or will outsource the design work to a consultant.

The contractor generally is selected on the basis of best value through a request-for-proposals process or on the basis of qualifications through a request-for-qualifications process. Two contracts are involved: one for preconstruction services during design and the other for the construction.

Typically, CMGC contracts contain a provision stating a price for the construction; the owner is not liable for payment of costs above that threshold, as long as the scope of the project does not change. If agreement cannot be reached on the price, however, the owner can pay off the preconstruction contract and can advertise the completed design for bids, as in DBB. As shown in Figure 1, the CMGC agreement between the contractor and the designer requires coordination to facilitate input from the contractor on constructability during the design stage.

The quality of a project needs to be addressed at the earliest stages. The early involvement of the contractor in the design adds a resource to enhance project quality.

[1]CMGC takes a variety of forms depending on the state, agency, and other factors: construction manager–general contractor; construction manager at risk; and general contractor–construction manager.

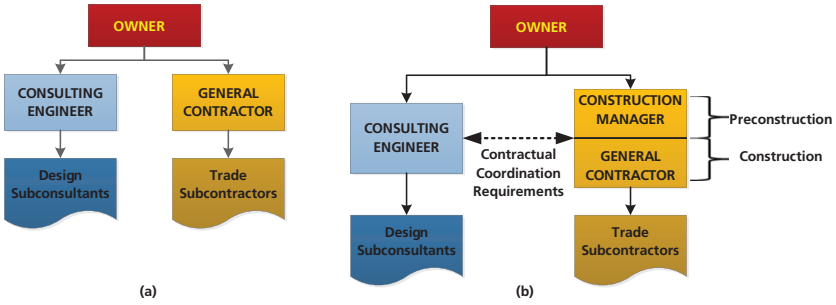


FIGURE 1 (*a*) Design–bid–build (DBB) and (*b*) construction manager–general contractor (CMGC).

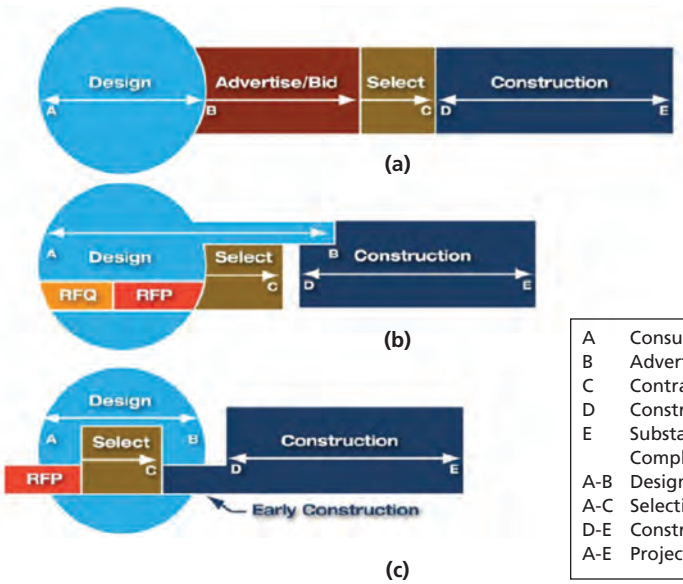
Alternative project delivery also compresses a project's duration. As shown in Figure 2 (below), traditional DBB has the longest duration; the DB and CMGC methods reduce project delivery time. In both DB and CMGC, the contractor is available during the design process, and if necessary, construction can begin before the design is complete.

Advantages of CMGC

An agency cannot choose a delivery method at random for a project but should have a procedure in place for selecting the delivery method that is most appropriate. This selection procedure will be agency-specific, of course, but should include consideration of various project and agency factors. The literature (5) shows that CMGC is advantageous under the following constraints:

- The transportation infrastructure requires immediate improvements;
- The design is technically complex, difficult to define at the early stages, subject to change, or requires the analysis of several alternatives;
- Coordination with external agencies is neces-

FIGURE 2 Project delivery method schedules: (*a*) traditional, (*b*) design–build, and (*c*) CMGC (RFQ = request for qualifications; RFP = request for proposal; NTP = notice to proceed) (*4*).



sary, increasing concerns about cost overruns and the construction schedule; or

◆ The project is sequence- or schedule-sensitive.

Agencies also select CMGC as a project delivery method to address other goals:

◆ Encourage constructability;
◆ Encourage innovation;
◆ Redistribute risk;
◆ Facilitate value engineering;
◆ Maximize constrained budgets;
◆ Resolve third-party issues, such as permits and relocation of utilities;
◆ Benefit from the early involvement of the construction contractor;
◆ Reduce, compress, or accelerate the project delivery period;
◆ Increase flexibility during the construction phase;
◆ Establish the project budget at an early stage of the design development;
◆ Provide a mechanism for follow-on operations and maintenance; and
◆ Compare different means and methods of construction through the proposal process.

Case Study Lessons

NCHRP Project 10-85, A Guidebook for Construction Manager-at-Risk Contracting for Highway Projects, includes case studies of 11 CMGC projects in eight states and the Canadian province of Ontario. The case study of Utah DOT's Mountain View Corridor project shows the potential for accruing cost savings.

Mountain View Corridor

Utah DOT asks the CMGC to submit an "opinion of probable construction cost" to compare against the engineer's estimate at several stages in the design development. Figure 3 (below, left) shows the engineer's initial estimate at roughly 30 percent design—this corresponds to the end of preliminary engineering and to the point at which the design has sufficiently developed to acquire right-of-way and to begin the environmental permitting process.

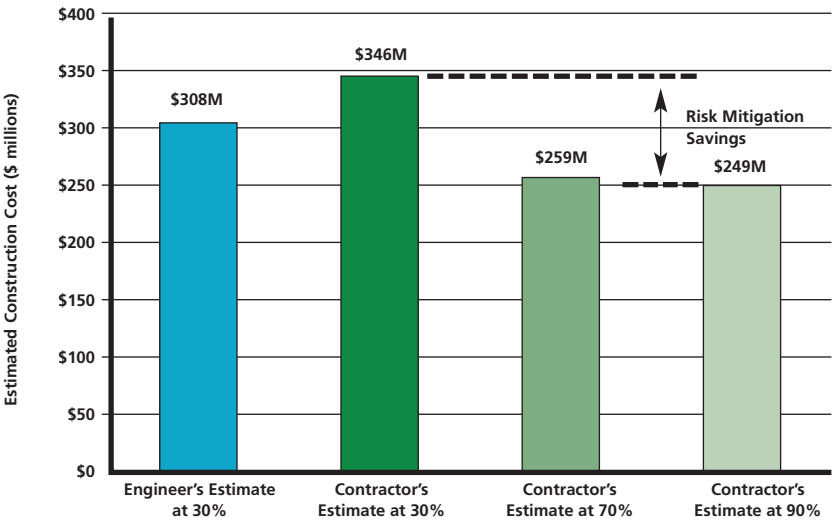
The darker column in the figure represents the CMGC estimate from the same set of documents. Under DB project delivery, this would have been the contract construction cost to Utah DOT for the Mountain View Corridor project.

The CMGC priced the risk at this point in the project at $38 million. As the design process advanced, the team was able to minimize the risk through mitigation measures, such as bidding out early materials packages to lock in pricing. Figure 3 shows a risk mitigation savings of almost $100 million that is attributable to the contractor's involvement in the design process. The figure demonstrates the benefit of involving the contractor in the design process before the contract cost is fixed.

PHOTO: UTAH DOT

Utah DOT Executive Director John Njord discusses the Mountain View Corridor project with media representatives. Early involvement of the contractor in the design process contributed to a risk mitigation savings of approximately $100 million.

FIGURE 3 Utah DOT Mountain View Corridor Project cost progression (*4*).



Sellwood Replacement Project

Another case study, the $160 million Sellwood Replacement Project of Multnomah County, Oregon, is under way in Portland. The county did not have all the necessary funding available when the CMGC contract was awarded. A CMGC preconstruction services contract, however, obligates the owner only for the cost of that contract; therefore the project could begin without having to wait for the full funding—in this case, a grant of approximately $5.0 million.

After the initial constructability review, the CMGC contractor suggested an alternative to building a temporary bridge to carry detour traffic during

Construction of new Sellwood Bridge from work platform.

construction—jack the existing bridge over to temporary piers. This approach reduced the project cost by $6.0 million and eliminated the need to obtain the grant before awarding the first construction package.

Dam Project

A third case study project shows how an in-house team can complete a design under CMGC project delivery. The U.S. Army Corps of Engineers undertook an urgent project to halt the deterioration of a dam's foundation caused by hydraulic flow through the soils supporting the dam.

The agency selected CMGC—calling the process "early contractor involvement"—because the in-house design team could benefit from technical feedback and construction pricing information from the contractor as the design progressed; the project was unique and complex, and the design team had no comparable experience. The project also would require the contractor to develop appropriate means and methods during construction.

The CMGC contractor actually invented a new method of jet grouting; the agency assessed the method with destructive testing that validated both the production and the performance. The early involvement of the contractor and the good communication between the owner and the design team saved the project $75 million; moreover, the project was completed two years early because of the contractor-developed ground modification technology.

Figure 4 (below) shows a schematic of the project; because of the size of the jet-grouting produced during construction, the contractor's involvement was necessary—the owner would not have been able to manufacture the specimens otherwise (*5*).

The contractor for the Tuttle Creek Dam Safety Assurance Project invented a new method of jet grouting; (*above:*) samples produced by the contractor for testing during construction.

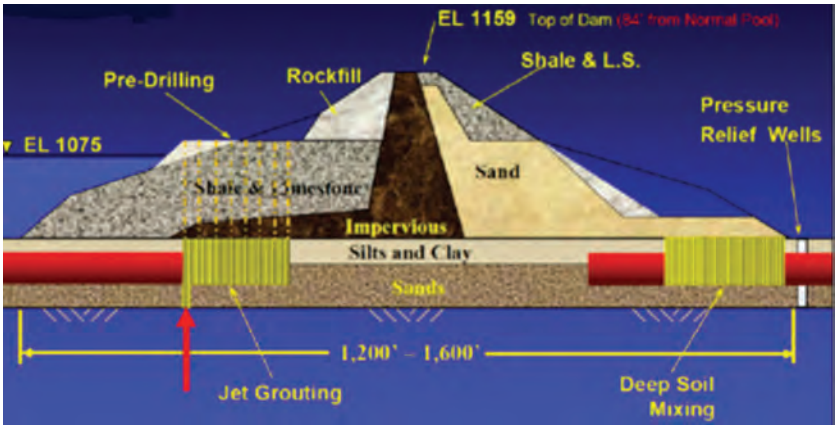


FIGURE 4 (*above*) Tuttle Creek Dam Project cross section, showing original remedial action to address deformation and drainage (EL = elevation, in feet).

PHOTO: U.S. ARMY CORPS OF ENGINEERS

(*Left:*) Tuttle Creek Dam near Manhattan, Kansas.

Jim McMinimee (*standing, left*) helps lead a meeting of the second Strategic Highway Research Program (SHRP 2) Implementation Task Group in 2012. The late McMinimee was a strong proponent of CMGC.

Reviewing the Benefits

Schierholz et al. (*6*) found the following major benefits of the CMGC delivery method:

1. The ability to fast-track,
2. Design input from the construction contractor,
3. Early knowledge of the costs,
4. The ability to bid on early work packages,
5. The owner's control of the design,
6. Flexibility during design and construction, and
7. The sharing of risk.

Although involving the contractor at an earlier stage of the project adds to the cost, the fee for preconstruction services on highway projects generally ranges between 0.25 percent and 0.80 percent of the estimated construction costs. The vertical construction industry typically splits the savings below a given target cost as an incentive to keep costs down. The research for the NCHRP project found that a shared savings clause does not create a significant incentive for the CMGC contractor and may add a layer of administration or accounting to produce auditable financial records of project costs. Earlier research found that "by far the most important incentive that an owner has is the promise of repeat work" (*7*). Interviews with the case study contractors confirmed this conclusion.

The Way Forward

Since the approval of the research needs statement for NCHRP Project 10-85, the number of state DOTs with authority to use CMGC to deliver construction projects has risen from five to 14. In May 2012, Connecticut and Minnesota received enabling legislation, and the California House of Representatives unanimously passed a bill supporting CMGC. Maine, Massachusetts, and Tennessee are actively pursuing legislation.

Maryland, Missouri, Mississippi, and Montana indicated on the survey for NCHRP Project 10-85 that they may have authority to use CMGC but have not tested it. FHWA hosted a CMGC peer exchange in Boston, Massachusetts, on May 23, 2012; representatives from 32 DOTs participated in CMGC training and heard presentations from state DOTs that have used the approach.

The new transportation legislation, Moving Ahead for Progress in the 21st Century, has provided significant incentives for state DOTs by reducing the state share for CMGC projects from 10 percent to 5 percent and by authorizing the project delivery method for routine use without having to file for experimental project permission. CMGC project delivery clearly will become more common, as DB delivery did more than a decade ago when Utah DOT began the I-15 project in preparation for the 2002 Winter Olympics. As happened with the adoption of DB, training is urgently needed for public agency engineers, construction contractors, and design consultants adopting CMGC.

In 2011, the author and the late Jim McMinimee, retired Chief Engineer at Utah DOT and the nation's most experienced public agency CMGC practitioner, established the CMGC Institute.[2] The organization works to consolidate CMGC project delivery information and lessons learned, as well as to furnish the training necessary to implement CMGC project delivery in an efficient, effective manner by leveraging the experiences of owners, contractors, and consultants on successful CMGC projects. The institute suffered a setback in May 2012 with McMinimee's untimely death but is moving forward to achieve his vision for creating a project delivery tool to complement DBB and DB for public highway agencies.

References

1. Mendez, V. *Every Day Counts: Innovation Initiative*. Federal Highway Administration, Washington, D.C., 2010.
2. *Project Delivery Systems for Construction*. Associated General Contractors of America, Washington, D.C., 2004.
3. West, N. J. N., and D. D. Gransberg. Quantifying the Value of Construction Contractor Preconstruction Involvement. Presented at 1st Australasia and South East Asia Structural Engineering and Construction Conference, Perth, Australia, November 2012.
4. McMinimee, J. C. CMGC Project Delivery. Presented at Every Day Counts Summit, Minneapolis, Minnesota, September 2010.
5. *Tuttle Creek Dam Foundation Modification Project, Manhattan, KS*. Technical References, Trevi Group, Charlestown, Massachusetts, 2005.
6. Schierholz, J., D. D. Gransberg, and J. McMinimee. Benefits and Challenges of Implementing Construction Manager–General Contractor Project Delivery: The View from the Field. Presented at the 91st Annual Meeting of the Transportation Research Board, Washington, D.C., January 2012.
7. Thomsen, C. *Project Delivery Processes*. Parsons Corporation, April 2, 2006.

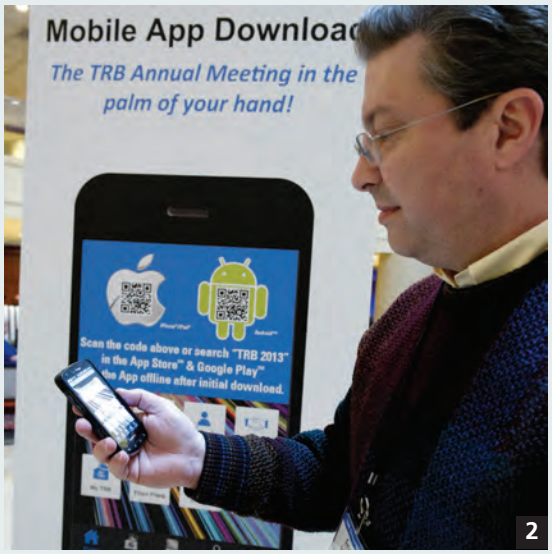
[2]http://cmgcinstitute.org/index.php.

TRB 2013 ANNUAL MEETING HIGHLIGHTS

Deploying Transportation Research

Doing Things Smarter, Better, Faster

1



2

1 U.S. Transportation Secretary Ray LaHood outlines high-speed rail initiatives of the Obama Administration in a session examining Economic and Social Impacts of High-Speed Rail Systems.

2 Frank Broen, TeachAmerica, uses the TRB Annual Meeting mobile app to check his schedule.

3

3 Raiesa Fraser (*left*) and Avril Gordon Joseph, Achievement First Brooklyn High School, New York, conclude their winning argument at a debate on U.S. federal spending on infrastructure in a special session hosted by the National Association for Urban Debate Leagues.

4 The New Attendees Welcome Session offered an overview of TRB, tips on networking and navigating the meeting, and information on career development and committee involvement.

Annual Meeting photographs by Risdon Photography.

Face-to-face interaction and technological innovation converged at the Transportation Research Board's 92nd Annual Meeting, January 13–17, 2013, in Washington, D.C. A record-setting crowd of more than 11,700 transportation professionals, researchers, and policy makers attended more than 750 sessions and workshops on topics from Superstorm Sandy to the Moving Ahead for Progress in the 21st Century Act (MAP-21). Approximately 40 sessions explored the theme of "Deploying Transportation Research: Doing Things Smarter, Better, Faster" and committee meetings, major award presentations, and exhibits provided opportunities for attendees to share knowledge and insights.

A new TRB Annual Meeting mobile application allowed participants to view sessions and events, navigate interactive floor plans, and create a personalized schedule—the "app" was downloaded more than 8,000 times before and during the meeting. Other navigation tools included an interactive Google map, a Compendium of Papers flash drive, Annual Meeting Online, and Facebook and Twitter updates.

Consultant John P. Broomfield delivered the 2013 Thomas B. Deen Distinguished Lecture on "Holistic Approach to Maintenance and Preservation of Transportation Infrastructure." John C. Horsley, Executive Director of the American Association of State Highway and Transportation Officials and the W. N. Carey, Jr., Distinguished Service Award recipient, was the featured speaker at the Chairman's Luncheon.

Details and highlights appear on the following pages.

4

INTERSECTIONS

1 (*Left to right:*) Kewen Wang, Li Zhenbong, and Yiping Wu, Beijing University, plan their Annual Meeting activities.

2 Robert Bertini, Portland State University, explains Operations Section goals to first-time meeting attendees at the Welcome Session.

3 The Technical Activities Council provides leadership, facilitation, and coordination for TRB's standing committees.

4 Gerald Lacosta, National Highway Institute, discusses the Maintenance Leadership Academy and other training initiatives of the Federal Highway Administration (FHWA).

5 The Exhibit Hall featured approximately 200 displays from TRB sponsors and other organizations.

6 (*Left to right:*) Jorge Prozzi, University of Texas, Austin; Henri Van Damme, French Institute of Science and Technology for Transport, Spatial Planning, Development, and Networks (IFSTTAR); TRB Executive Director Robert E. Skinner, Jr.; and Patrick Malléjacq, IFSTTAR, sign a letter of agreement between TRB and IFSTTAR at the International Participants' Reception.

7 Tsippy Lotan, Ran Naor Foundation, Israel, and Fred Wegman, SWOV Institute for Road Safety Research, The Netherlands, sign a memorandum of understanding. Both organizations focus on road safety research.


1

2


3

3 TRB Technical Activities Council (*front row, left to right:*) Paul Jovanis, Johanna Zmud, Thomas Wakeman, Council Chair Katherine Turnbull, Mark Norman, Lucy Phillips Priddy, and Harold (Skip) Paul; (*back row, left to right:*) Mark Kross, Thomas Kazmierowski, Peter Mandle, Paul Carlson, David Wilcock, and Anthony Perl.


4


5


6

7


1


2


3


4


5


6


7

8 Steven Koser (*far right*), Pennsylvania DOT, examines Marcellus shale developmental impacts on his state's roadways. Panelists were (*left to right:*) Jack Olson, North Dakota DOT; Ken Skorseth, South Dakota State University; John Barton, Texas DOT; Tim Ziegler, Pennsylvania State University; and Mark Nahra, Woodbury County, Iowa.

8

SESSIONS AND WORKSHOPS

1 Jeannie Beckett, Beckett Group, leads participants in a workshop on Freight in Megaregions.

2 Margaret Sowah, Georgia Institute of Technology, presents her doctoral research on managing ancillary transportation assets at a session on innovative research from FHWA's Dwight David Eisenhower Transportation Fellowship Program.

3 At the Human Factors Luncheon, Robert Strassburger, Auto Alliance, discusses the role of smartphone technology in driving safety, including the costs and benefits.

4 Nichole Morris, University of Minnesota, Twin Cities, participates in discussion at the Human Factors Luncheon.

5 Michael Lewis, Rhode Island Department of Transportation (DOT), discusses the future of the second Strategic Highway Research Program (SHRP 2) research products for state DOTs.

6 Participants in a workshop on Fostering and Nurturing Research Agendas explore tools for research coordinators on TRB committees.

7 Yaye Keita, University of Illinois, shares her research on the factors that determine transit access by car owners and their planning implications.

8 A session explored Strategies to Mitigate Impacts of Heavy Loads Associated with the Energy Sector on Low-Volume Roads.

SESSIONS AND WORKSHOPS

(continued)

1 Anne Goodchild, University of Washington, presents opportunities for freight logistics to help meet energy and environmental goals.

2 Torgeir Vaa, Norwegian Public Roads Administration, guides discussion on Benefits of Winter Maintenance and Road Condition Information.

3 Claudia Zapata, Arizona State University, answers audience questions on Characterization of Unsaturated Soil Properties.

4 Wilfrid Nixon, University of Iowa, shares research on winter maintenance at a spotlight session on Innovative Approaches for Improving the Effectiveness of Operations and Maintenance Programs.

5 Shailen Bhatt (*right*), Delaware DOT, outlines his agency's efforts to improve efficiency at a session on Current Strategies for State DOT Leadership, moderated by Hyun-A Park (*left*), Spy Pond Partners, LLC.

6 TRB Minority Student Fellow Chelse Hoover (*left*), Texas Southern University, discusses her research on calculating delay time using global positioning system data.

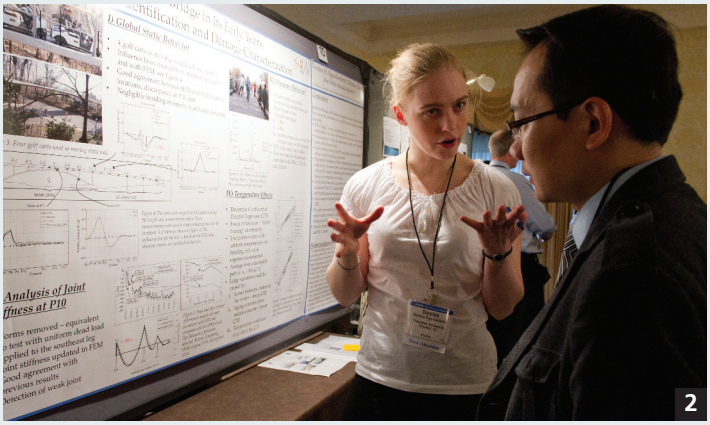
7 At a special session on Superstorm Sandy, Holly Bamford, National Oceanic and Atmospheric Administration, shares ways to help coastal communities prepare for and recover from disaster.

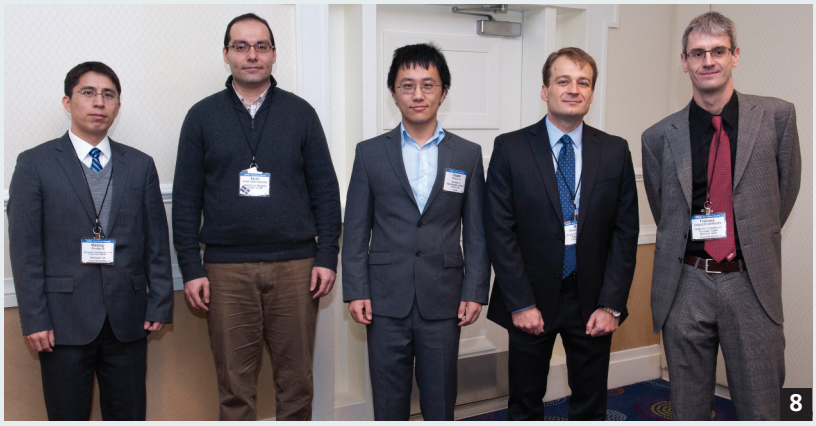
8 Justin Ocel, FHWA, moderates Phased-Array Ultrasonics and Their Use in Fabrication and Inspection.

9 Kristin Fusco Rowe (*left*), Straughan Environmental, Inc., and Dayna Sherwood, Paul Carpenter Associates, Inc., moderated a panel on the Effects of Noise on Wildlife.

10 In a session on TRB's Transit Innovations Deserving Exploratory Analysis (IDEA), Phil Winters, University of South Florida, describes his travel assistance device for transit riders.

11 Christopher Baker, University of Birmingham, explains climate change's possible effects on the United Kingdom's rail network.





SESSIONS AND WORKSHOPS

(continued)

1 Kirk Steudle, Michigan DOT, muses on the future of transportation at a spotlight session on Providing Leadership in Transportation Innovation.

2 At a poster session on Nondestructive Evaluation and Field Testing of Bridges, Dorotea Sigurdardottir, Princeton University, shares research on Streicker Bridge.

3 Shailendra Patel, Virginia DOT, participates in a panel discussion on Variations in Best-Value Selection: Technical Versus Price Considerations.

4 Francesca Russo, University of Naples, examines road design, road safety evaluation, and computerized management of data for road networks at a session for young transportation professionals.

5 Ashok Srivastava, National Aeronautics and Space Administration Ames Research Center, addresses audience questions on Applied Research Opportunities in Airport and Aviation Safety.

6 Heather Lowe (*right*), Maryland State Highway Administration, presents information on Maryland's Watershed Resources Registry at a session on Current Issues in Transportation and the Environment.

7 Shoukry Elnahal, Massachusetts DOT, imparts experiences in the ABCs of Accelerated Bridge Construction Policy Development.

8 Panelists in a session on Travel Time Estimation and Processing were (*left to right*:) Wenjing Pu, Metropolitan Washington Council of Governments; Kaveh Farokhi Sadabadi, University of Maryland; Chaoqun Jia, University of Massachusetts, Amherst; Mike Fontaine, Virginia Center for Transportation Innovation and Research; and Francesc Soriguera, Center for Innovation in Transport, Spain.

SESSIONS AND WORKSHOPS

(continued)

1 The 2012 surface transportation legislation reauthorization was the subject of MAP-21 Implementation: A View from the U.S. Department of Transportation.

2 Joseph Yaede, Brigham Young University, presents research on Evaluating, Improving, and Implementing Innovative Concrete Curing Technologies for Concrete Pavements.

3 Elise Miller-Hooks, University of Maryland, guides discussion on Emerging Research in Emergency Evacuation.

4 Elie Hajj, University of Nevada, Reno, examines Green Asphalt Paving Technologies.

5 Postearthquake bridge damage analysis was the subject of a presentation by Oh-Sung Kwon, University of Toronto, at a session on Reverse Engineering of Bridges.

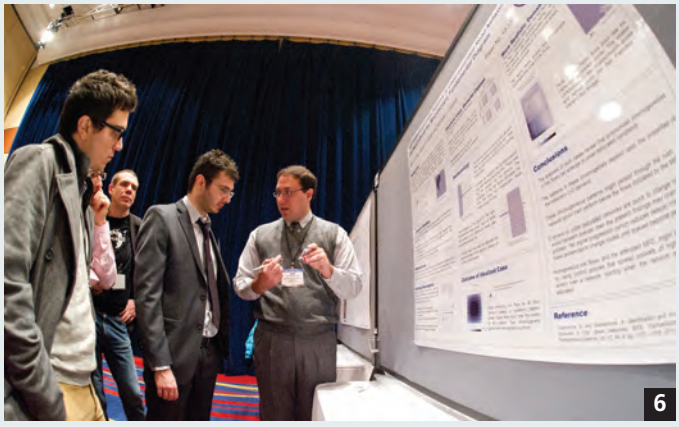
6 Jean Doig Godier (*right*), University of California, Berkeley, shares insights on Traffic Flow Theory and Characteristics.

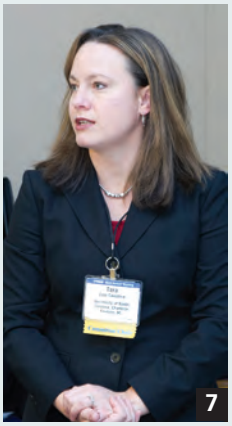
7 Henning Eichler, Southern California Regional Rail Authority, asks a question at a session on Visualizing and Customizing Tools for Implementation of SHRP 2 Renewal Products.

8 Byron Lord, FHWA, recounts lessons from Highways for LIFE, one of the Case Studies of Successful Technology Deployment Methods from Across the Highway Transportation Spectrum.

9 Janette Sadik-Khan, New York City DOT, addresses Innovations in City Transportation.

1 (*Left to right:*) Sylvia Garcia, U.S. DOT; Brian McLaughlin, National Highway Traffic Safety Administration; Peter Rogoff, Federal Transit Administration; Polly Trottenberg, U.S. DOT; and Victor Mendez, FHWA, shared insights on MAP-21.





COMMITTEES

1 Thera Black, Thurston Regional Planning Council, weighs discussion at a meeting of the Metropolitan Policy, Planning, and Processes Committee.

2 At a meeting of the Foundations of Bridges and Other Structures Committee, Njoroge Wainaina, GeoSyntec Consultants, reviews Soil Mechanics Section business.

3 Julie Marie Vandenbossche, University of Pittsburgh, leads the Pavement Rehabilitation Committee through its meeting agenda.

4 Brian H. Zelenko (*center*), Parsons Brinckerhoff, chairs the Tunnels and Underground Structures Committee.

5 Michael Coplen (*right*), Federal Railroad Administration, and other members of the Railroad Operational Safety Committee presented Peri Smith (*left*), Imperial College London, with a Young Member Scholarship.

6 Thomas Rossi (*right*), Cambridge Systematics, conducts his final meeting as chair of the Transportation Demand Forecasting Committee.

7 Tara Cavalline, University of North Carolina, Charlotte, guides the Properties of Concrete Committee.

8 At the Artificial Intelligence and Advanced Computing Applications Committee meeting, Vukan Vuchic, University of Pennsylvania, shares recollections of past chair Shinya Kikuchi, who died in 2012.

9 Lynn Wiegand, Portland State University, participates in a meeting of the Pedestrians Committee.

COMMITTEE LEADERSHIP AWARDS

1 Stephanie Camay (*second from left*), Parsons Brinckerhoff, received the inaugural TRB Outstanding Young Member Award. (*Left to right:*) Joung Lee, American Association of State Highway and Transportation Officials (AASHTO) and chair, Young Members Council; Marsha Anderson Bomar, Stantec Consulting, Inc., which underwrote the award; and Katherine Turnbull, Texas A&M Transportation Institute (TTI) and chair, Technical Activities Council.

2 (*Left to right:*) Sandra Rosenbloom, 2012 Executive Committee Chair; Peter (Jack) Basso, Jr., AASHTO; Anthony (Tony) Kane, AASHTO; and Robert E. Skinner, Jr., TRB Executive Director. Basso and Kane were honored for long-term contributions to TRB standing committees.

3 The newly established Blue Ribbon Awards recognize exemplary standing committee activities. The chairs of four committees accepting the award were (*left to right:*) Jennifer Weeks, Public Involvement in Transportation Committee; Stephen Popkin, Railroad Operation Safety Committee; John Milton, Highway Safety Performance Committee; and Srinivas Peeta, Transportation Network Modeling Committee.

Longtime Volunteer Leaders Gain Emeritus Status

TRB awarded emeritus membership to 16 individuals at the 2013 Annual Meeting in recognition of significant, long-term contributions and outstanding service on technical activities committees. The honorees and their committees are listed below:

(*Photo left, left to right:*) Stephen Maher, TRB; emeritus member Dean Sicking; Richard Albin, FHWA; and Brian Ray, Kittelson Associates.

(*Photo right:*) Jean-Pierre Médevielle.

- **David B. Clark**, Freight Rail Transportation Committee;
- **Philip B. Demosthenes**, Access Management Committee;
- **Conrad L. Dudek**, Freeway Operations Committee;
- **Karl H. Frank**, Fabrication and Inspection of Metal Structures Committee;
- **John W. Fuller**, Social and Economic Factors Committee;
- **Dale A. Janik**, Transportation Programming, Planning, and Systems Evaluation Committee;
- **Robert C. Johns**, Policy and Organization Group;
- **Walter H. Kraft**, Regional Transportation Systems Management and Operations Committee;
- **Michael T. McNerney**, Aircraft–Airport Compatibility Committee;
- **Jean-Pierre Médevielle**, International Activities Committee;
- **Gordon F. Paesani**, Freeway Operations Committee;
- **Christopher L. Saricks**, Transportation and Air Quality Committee;
- **Rolf R. Schmitt**, Transportation History Committee;
- **Guillaume Shearin**, Social and Economic Factors Committee;
- **Dean L. Sicking**, Roadside Safety Design Committee; and
- **Nigel H. M. Wilson**, Transit Management and Performance Committee.

1 (*Left to right:*) William W. Millar, past President of the American Public Transportation Association (APTA), and award recipients James Reynolds, Alexa Delbosc, and Graham Currie, Institute of Transport Studies, Victoria, Australia.

4 (*Left to right:*) John Holt, Texas DOT, and Nauman Sheikh and Roger Bligh, TTI, were awarded for their paper, "Minimum Rail Height and Design Impact Load for Longitudinal Barriers that Meet Test Level 4 of Manual for Assessing Safety Hardware."

BEST PAPER AWARDS

1 Named for the former APTA president, the new William W. Millar Award recognizes the best paper in the field of public transportation.

2 Valerie Karpus (*left*), Massachusetts Institute of Technology (MIT), with Katherine Turnbull, accepts the Pyke Johnson Award for transportation systems planning and administration. (Not pictured: Coauthor Sergey Paltsev, MIT.)

3 The D. Grant Mickle Award for operation, safety, and maintenance of transportation facilities, went to (*left to right:*) Lance Dougald, Virginia Center for Transportation Innovation and Research, and Anthony Gallo and Michael Demetsky, University of Virginia.

4 The K. B. Woods Award recognizes an outstanding paper on design and construction of transportation facilities.

5 In policy and organization, Erik Sabina (*left*), Denver Regional Council of Governments, and Stacey Bricka (*right*), TTI, received the Charley V. Wootan Award.

6 Hilary Isebrands (*left*), FHWA, and Shauna Hallmark (*right*), Iowa State University, were recognized with the Patricia F. Waller Award for safety and system users.

7-9 The Burggraf Award honors researchers under age 35:

7 Nathan Belz (*left*) and Brian H. Y. Lee (*right*), University of Vermont, for planning and environment;

8 Duncan Kisia, Louis Berger Group, Inc., for aviation; and

9 Patrick Icenogle (*left*) and Tyson Rupnow (*right*), Louisiana Transportation Research Center, for design and construction.

MAJOR AWARDS

1 C. Michael Walton, Professor of Civil Engineering and the Ernest H. Cockrell Centennial Chair in Engineering, University of Texas at Austin, was honored with the Frank Turner Medal for his influential 40-year career in transportation research and teaching and for his outstanding service to government and other organizations.

2 Incoming Executive Committee Chair Deborah Butler (*left*) presents the W. N. Carey, Jr., Distinguished Service Award to John Horsley (*right*), AASHTO Executive Director (now retired). Horsley also delivered the Chairman's Luncheon address.

3 David Greene (*left*), Corporate Fellow, Oak Ridge National Laboratory, received the Roy W. Crum Award for his distinguished achievement in transportation research from Sandra Rosenbloom (*right*). A preeminent transportation energy analyst, Greene is a senior fellow of the Howard H. Baker, Jr., Center for Public Policy and a research professor of economics at the University of Tennessee.

EXECUTIVE COMMITTEE

5 Michael Walton (*left*) and Deborah Butler (*center*) lead applause for outgoing Chair Sandra Rosenbloom (*right*) at the concluding Executive Committee session.

6 Robert E. Skinner, Jr., briefs the Executive Committee on TRB's current programs and new developments.

7-9 Representatives from Mexico, Korea, China, and the European Union delivered presentations to the Executive Committee in a special policy session on International Research Activities: Issues, Priorities, and Lessons Learned.

4 John Broomfield (*center*), consulting engineer from Surrey, England, presented the 2013 Thomas B. Deen Distinguished Lecture. (*Left to right:*) Sandra Rosenbloom, Katherine Turnbull, Broomfield, past TRB Executive Director Thomas B. Deen, and TRB Executive Director Robert E. Skinner, Jr.

International speakers (*below*):

7 José Viegas, International Transport Forum;

8 (*Left to right:*) Jaehak Oh, Korea Transport Institute; Xiaojing Wang, China Ministry of Transport; and Alessandro Damiani, European Commission; and

9 Roberto Aguerrebere Salido, Mexican Transport Research Institute.

New Leaders Take Office

Deborah H. Butler, Executive Vice President, Planning, and Chief Information Officer, Norfolk Southern Corporation, is the 2013 Chair of the TRB Executive Committee. Kirk T. Steudle, Director, Michigan Department of Transportation (DOT), is the 2013 Vice Chair.

Butler, who joined Norfolk Southern in 1978, served as Vice President of Customer Service before assuming her current position. She received a bachelor's degree from Agnes Scott College in Decatur, Georgia, and completed executive education programs at Northwestern University's Transportation Center, the Fuqua School of Business at Duke University, and the Harvard Business School. Butler serves on the Board of Trustees of Virginia Wesleyan College, on the Board of Directors of TTX Company, and as a Commissioner on the Norfolk Airport Authority. She also is past Chair of the National Grain Car Council, which is chartered by the U.S. Congress and the Surface Transportation Board.

Steudle has been involved in all aspects of transportation in the State of Michigan since becoming DOT Director in 2006. He is chair of the Strategic Highway Research Program Oversight Committee for TRB and has served on the Executive Committee since 2004. Past president of the American Association of State Highway and Transportation Officials (AASHTO) and current AASHTO Executive Committee member, Steudle also serves on the Board of Directors of the Intelligent Transportation Society of America and the Engineering Society of Detroit and as Chair of the University of Michigan Transportation Research Institute Advisory Board. He graduated from Lawrence Technological University with a bachelor's degree in construction engineering and, in 2012, was inducted into the school's Engineering Hall of Fame. He is a registered Professional Engineer in Michigan.

Newly appointed to the Executive Committee are Scott E. Bennett, Director, Arkansas State Highway and Transportation Department; John S. Halikowski, Director, Arizona DOT; Susan Hanson, Distinguished University Professor Emerita, School of Geography, Clark University; Steve Heminger, Executive Director, Metropolitan Transportation Commission, Oakland, California; Jeffrey D. Holt, Managing Director, Bank of Montreal; Donald A. Osterberg, Senior Vice President, Safety and Security, Schneider National, Inc.; Gary C. Thomas, President and Executive Director, Dallas Area Rapid Transit; and Phillip A. Washington, General Manager, Denver Regional Transportation District. Daniel Sperling, Professor of Civil Engineering and Environmental Science and Policy and Director, Institute of Transportation Studies, University of California, Davis, has been reappointed to the Executive

EXECUTIVE COMMITTEE

(continued)

1 Deborah H. Butler, 2013 Executive Committee Chair.

2 Butler presents Sandra Rosenbloom with a plaque honoring her service as Executive Committee Chair.

3 New member John Halikowski, Arizona DOT, addresses the Executive Committee.

4 Susan Hanson, Clark University, is Chair of the Subcommittee for National Research Council Oversight. She previously served on the Executive Committee from 2002 to 2008.

5 New member Scott Bennett, Arkansas State Highway and Transportation Department, participates in Executive Committee deliberations.

EXECUTIVE COMMITTEE

(continued)

The Executive Committee explored current TRB initiatives and future research directions. Executive Committee members taking part in meeting discussions for the first time since their appointment included

1 Jeffrey Holt, Bank of Montreal;

2 Phillip Washington, Denver Regional Transportation District;

3 Donald Osterberg, Schneider National, Inc.; and

4 Steve Heminger, Metropolitan Transportation Commission, Oakland, California.

5 Newly appointed executive committee member Gary Thomas (*left*), Dallas Area Rapid Transit, confers with Mark Kross (*right*), Technical Activities Council member.

Also participating in meeting discussions were

6 Daniel Sperling, University of California, Davis;

7 Kelly Leone, Federal Motor Carrier Safety Administration;

8 Michael Melaniphy, APTA; and

9 Therese McMillan, Federal Transit Administration.

10 Thomas Leschine, University of Washington, is Marine Board Chair.

11 Technical Activities Council Chair Katherine Turnbull updates the Executive Committee on the status of standing committee programs.

12 Polly Trottenberg, U.S. DOT, addresses the committee, with Victoria Arroyo (*left*), Georgetown University, and John Porcari (*right*), U.S. DOT.

13 Joung Lee, 2012 Young Members Council Chair, shares information about the council's activities.


1


2


3


4


5


6


7


8


9


10


11


12


13



HANDS-ON LEARNING for Transportation's Tomorrow

TransTech Academy in Washington, D.C.

SHIRLEY McCALL

McCall is Coordinator, TransTech Academy, Francis L. Cardozo Senior High School, Washington, D.C. She was the 2004 recipient of TRB's Sharon D. Banks Award for Humanitarian Leadership in Transportation.

Established in 1991, TransTech Academy at Francis L. Cardozo Senior High School was the first transportation studies academy in the Washington, D.C., metropolitan area. More than 600 students have graduated from TransTech, which has expanded to include a strong focus in STEM—science, technology, engineering, and mathematics—with training in engineering, using the nationally renowned Project Lead the Way curriculum; aviation; technology; and electromechanical technology. After celebrating its 20th anniversary, TransTech Academy had an opportunity to reflect on its record from the early days to the present—on its successes and challenges and on the future of high school transportation education in Washington, D.C., and throughout the country.

TransTech's Beginnings

In 1991, a group came together to discuss establishing a specialized program in transportation at a high school in Washington, D.C.; Cardozo High School was selected. Key players included representatives from the U.S. Department of Transportation (DOT), the Washington Metropolitan Area Transit Authority (WMATA), and several universities—Pennsylvania State University (Penn State), the University of Maryland, and Morgan State University. At the time, several local high schools had established career-focused programs, such as Eastern Senior High School's program in health and human services. Anacostia High School and Cardozo both were looking for a focus; Anacostia chose public service and Cardozo chose transportation.

U.S. DOT initiated the process with a memorandum of agreement with the school system signed by the Deputy Secretary of Transportation. In 1990, a task force started meeting to talk about what the program would look like—its curriculum, students, recruitment, and specific goals and objectives. In 1991, TransTech opened its doors to approximately 30 tenth grade students—the high school did not have ninth graders at the time.

TransTech student Rebeca Lara works on a robot in an electromechanical technology class. More than 600 students have graduated from the transportation studies academy.

PHOTO COURTESY SHIRLEY MCCALL

In 1992, TransTech Academy's first class—with coordinator Shirley McCall (*second from right*); past TRB Executive Director Thomas Deen (*third from right*); Reggie Gillum, TRB (*second from left*); and other staff—gathered at the 71st TRB Annual Meeting, beginning a tradition of TransTech attendance at the meeting.

PHOTO COURTESY SHIRLEY MCCALL

In 1994, Federal Highway Administrator Rodney Slater (*second from left*) signed a partnership with TransTech Academy, with (*left to right:*) Cynthia Bell, District of Columbia Public Schools; Cardozo principal Bernard Lucas; and Stephanie Robinson, TRB.

Initially, the program was targeted as a school-to-work transitional program—the curriculum was not rigorous, but included field trips and site visits, shadowing activities, and internships. The task force members from Penn State and Morgan State developed a curriculum that allowed TransTech to offer general courses in transportation, such as introduction to transportation and introduction to transit systems. Transportation-related career pathways were established: engineering, electromechanical technology training, technology, and aviation and aeronautics. Currently, four courses are associated with each career pathway.

Key Partnerships

The alliance of partners has served as a particular strength for TransTech. After the academy was established, the Transportation Research Board, WMATA, Amtrak, Morgan State University, the University of the District of Columbia, and U.S. DOT participated in a partnership signing. Other agencies of U.S. DOT—the Federal Transit Administration (FTA), the Federal Aviation Administration (FAA), and the Federal Highway Administration (FHWA)—signed separate agreements as well.

FTA supplied its first grant for TransTech in 1993. FHWA has been a key funder for many years, supporting TransTech's development of curricula for the career pathways, providing opportunities for college tours, and supplementing the program with conferences and paid internships. FHWA support also has allowed the program to add instructors.

Today, TransTech has a consortium of partners, including Advanced Engineering Design, the American Public Transportation Association, The American Institute of Architects, Aero Club of Washington, Amtrak, Angari International, the Conference of Minority Transportation Officials, Delon Hampton & Associates, U.S. DOT, General Electric, Lockheed Martin, McKissack & McKissack, the National Aeronautics and Space Administration, the National Association of Black Women in Construction (NABWC), Northrop Grumman, TRB, and the U.S. Navy.

A partnership with WMATA and District DOT enabled TransTech to establish the career pathway in electromechanical technology training. The organizations funded that program for 5 years, covering two instructors, equipment and supplies, and student paid internships. As a result of the preengineering and electromechanical technology training career pathways, the number of students who chose to go into engineering increased by approximately 30 percent.

Recruiting Students

Students are recruited from Washington, D.C., middle schools and from within Cardozo. Ninth graders have opportunities to visit the academy, take a look at the classrooms, and sit in on classes. At an ice-cream social, prospective students hear TransTech students talk about their experiences and can submit applications. The academy looks for a minimum 2.0

PHOTO: RISDON PHOTOGRAPHY

TransTech students attend the 2013 TRB Annual Meeting. Students for the academy are recruited from Washington, D.C., middle schools and from within Cardozo.

grade-point average—not beyond attainment for most students—and for expressed interest in one of the career pathways.

Eighth graders are recruited from throughout Washington, D.C. TransTech faculty seek invitations to open houses sponsored by local middle schools and send out packages with program information, brochures, applications, and more to the schools. In 2012, Cardozo sponsored two open houses, providing transportation for interested students. Approximately 150 middle-school students attended the two open houses, and Cardozo received 80 applications to TransTech Academy and to its Academy of Construction and Design.

The regular course work for students entering TransTech Academy as ninth graders does not allow much to be added to their schedules. As tenth graders, students can start on introductory courses—such as Introduction to Aviation or Introduction to Engineering Design—and can add at least one other class to their regular schedule. Eleventh graders take at least one additional class, and seniors take two transportation classes. These four classes fulfill the requirements for the students' chosen pathways.

Feeder Program

In 2011, the program launched TransTech Plus Academy (T2Plus), a Saturday STEM program for middle-school students focusing on the fields of science, technology, engineering, and mathematics. T2Plus fills a need for a feeder base for the high school program. Approximately 45 students rotate among four areas of study: robotics, aviation, technology, and engineering. In each session, students work on a project that they eventually will demonstrate to parents and other visitors. In addition to aviation, engineering, and robotics, students learn how to develop a video game.

T2Plus was piloted for 4 weeks in 2010 and now has expanded successfully to a 9-week program. It was previously funded by a Garrett A. Morgan Technology and Transportation Education Program grant from U.S. DOT, which facilitated staffing and allowed TransTech students to work alongside the middle schoolers.

Photo courtesy Shirley McCall

Yatana Araya (*left*) demonstrates the motion sensor on a programmable robot to TransTech Plus Academy students.

Photo: Rsson Photography

Teacher Ana Martinez (*left*) and graduate Lalaram Guyadim (*right*) helm the TransTech booth in the exhibit hall at the 2013 TRB Annual Meeting.

College students also participate during the week, as schedules permit, to work in the classrooms with TransTech students, teachers, and middle-school students. This arrangement provides high schoolers with the opportunity to see—and be motivated by—someone close in age who is involved in an engineering program at the college level. In the 2013–2014 school year, Cardozo High School will transition to a 6–12 grade campus through the District of Columbia consolidation plan. The addition of middle-school students will be a historic move for the school.

Student Successes

Almost all of Cardozo's top graduating students come from the TransTech program—and frequently the valedictorian and salutatorian both come from TransTech. Many graduates' siblings have followed through the program, sometimes over a period of years, and recently, children of TransTech graduates have entered the academy. The children of several Cardozo faculty and staff members also participate, attesting to their high regard for the program.

One graduate now is a planner in an FHWA regional office. He came to TransTech at the end of his junior year and interned at the TransTech office, but even after that exposure, the student was not convinced about pursuing a career in transportation. As an undergraduate at St. Mary's College of Mary-

Built in 1916, Cardozo Senior High School is on the National Register of Historic Places and is undergoing a renovation.

Teacher Al Rendon helps electromechanical technology students assemble miniature robots in class. The students also learn how to program the robots.

land, he discovered an interest in city planning. He received a Dwight David Eisenhower Transportation Fellowship in 2008 and completed a master's degree program at Morgan State. After completing graduate school, he applied to FHWA and entered the agency's professional development program.

Another student faced situations that interfered with school, and he struggled with anger. Advised to complete his college applications, he responded, "I'm not going to college. I don't think I need to." Finally he agreed to go through the process—if he decided he did not want to attend college, it would not be because he was not admitted or did not submit a financial aid application. So he did it. He was accepted to Shaw University in Raleigh, North Carolina. He completed Shaw's information technology program in three years and ended up working in private industry; he now travels around the world.

Hands-On Learning

In the Electromechanical Technology Training Program, students build robots for the annual FIRST Robotics Competition. They also assemble an electric car and, at the end of each year, strip it down for the following year's students to rebuild and add something different. One year, students added a solar panel to supplement the car's battery power. In the aviation class, students build gliders and work with a miniature remote-control plane. In the summer of 2012, TransTech students rebuilt a Pulsar XP aircraft in partnership with the University of the District of Columbia and Discover Aviation Now, a nonprofit organization.

In the engineering classes, students use computer-assisted drafting systems and programs such as Inventor to go from a drawing to an actual product. After students design something on the computer, they can send it to a three-dimensional printer.

An essential goal is for students to see what can be produced by applying math. The TransTech approach helps high school students see the interconnectivity of what they are learning. In these classes, for example, students can understand Ohm's Law, how it applies to what they do in the classroom, and why it is important.

Beyond the Classroom

TransTech students attend an annual college tour each spring and visit between six and nine colleges—generally along the East Coast from Pennsylvania to Florida. Each year, staff and students visit a different set of colleges and universities, so that students attending the college tours who start in the ninth grade and continue every year can see more than 30 different campuses. The visits include historically black colleges and universities and allow students to determine whether their desired majors are offered and to explore different school sizes, classroom sizes, and student–teacher ratios.

The visits have paid off—TransTech has an 85 percent college attendance rate. Students apply to the colleges and universities they visit because they have seen them, in contrast to many others, who see a campus for the first time when they arrive for orientation. Those other students may know about a school only through photographs and the Internet and have not been able to set foot on the campus. TransTech provides its students with the opportunity for an in-person visit.

TransTech also hosts monthly brown-bag luncheons, sponsored by the Aero Club of Washington, in which professionals in the field of aviation come and speak to students. Speakers have included the vice president of JetBlue, high-level officials from UPS, and researchers who have worked with NextGen.

JetBlue has sponsored day trips for students to fly from Washington, D.C., to New York to explore the facilities of John F. Kennedy Airport. Each year, Northrop Grumman sponsors up to 30 students to attend the annual Black Engineer of the Year Awards Conference and one or two students to travel to Oshkosh, Wisconsin, to attend a summer aviation camp. The East Coast Tuskegee Airmen sponsor a program in which students can receive training in ground school and can start to acquire flying hours.

Lockheed Martin and NABWC are the lead sponsors of Industry Day, with approximately 30 companies participating. Students can explore careers in aviation, engineering, transportation, and construction. Northrop Grumman and Lockheed Martin also offer STEM scholarships to four deserving students,

TransTech students build (and disassemble) an electric car, designing and adding a new feature to it each year.

and a Career Leadership Day is organized by Northrop Grumman and the U.S. Navy.

TransTech has a partnership with Howard University and its summer transportation institute. In the four-week program, students participate in a series of classes that range from career training to writing and speaking skills. They take field trips to Baltimore–Washington International Thurgood Marshall Airport and other sites and participate in research activities, such as traffic counts. In the program's culminating activity, students break into groups to deliver presentations about their experience.

Challenges and Future Directions

Cardozo has a rich legacy, with graduates who give back to the school by volunteering and in other ways. The school struggles with enrollment—an issue for many of the public high schools in the district facing competition from charter schools. TransTech has been looking at public-sector models to market the program.

The Garrett Morgan grant allowed TransTech staff to look at high school–level programs in supply-chain management in different areas of the country, with a goal of establishing a new career pathway in logistics at TransTech. Logistics offers many job opportunities. Howard University, which has a supply-chain management program, is partnering with TransTech to discuss development of a curriculum appropriate for the high school level.

TransTech staff is working with the school's career and technical education office to certify graduates for skills at a demonstrable level of efficiency. Students who leave TransTech will receive a certificate delineating what was covered in the career pathway and what skills were gained.

A program operating for 20 years should show growth. TransTech is improving—helping students and helping the workforce. With baby boomers retiring, TransTech aims to prepare students for those positions and to equip them with the skills to do well.

PHOTO COURTESY SHIRLEY MCCALL

A TransTech team participates in the FIRST Robotics competition, a national contest in which students build and program robots to perform prescribed tasks.

In a 2011 presentation to TRB staff, TransTech students in the aviation career pathway used a flight simulator to demonstrate their studies in proper airport runway traffic pattern procedures.

Serving as a Model

TransTech staffers are examining ways to replicate the program in other areas of the country and how to package it in a way that would be easy to integrate into a school system; TransTech could provide assistance in training, share the benefit of knowledge and experience, and open the school for visits. With TransTech's partnership with WMATA as a model, Philadelphia schools started a program with the regional transit authority and have visited TransTech several times.

Many of Cardozo's ninth graders are not aware of the career opportunities in transportation. TransTech's philosophy is that just about every type of career that can be imagined can be pursued in a transportation context. If a group of middle school students is asked what careers they would associate with the word "transportation," most answer "bus driver"—they do not know about all the other career opportunities in the field.

Providing that exposure to students requires concerted efforts—educators and transportation officials cannot sit back to see what happens, or the field will lose out. Transportation is important, and TransTech is working to make sure that students understand this as soon as possible.

Rural Roads

Harbingers of Opportunity, Prosperity, and Livability in Developing Countries

ASIF FAIZ

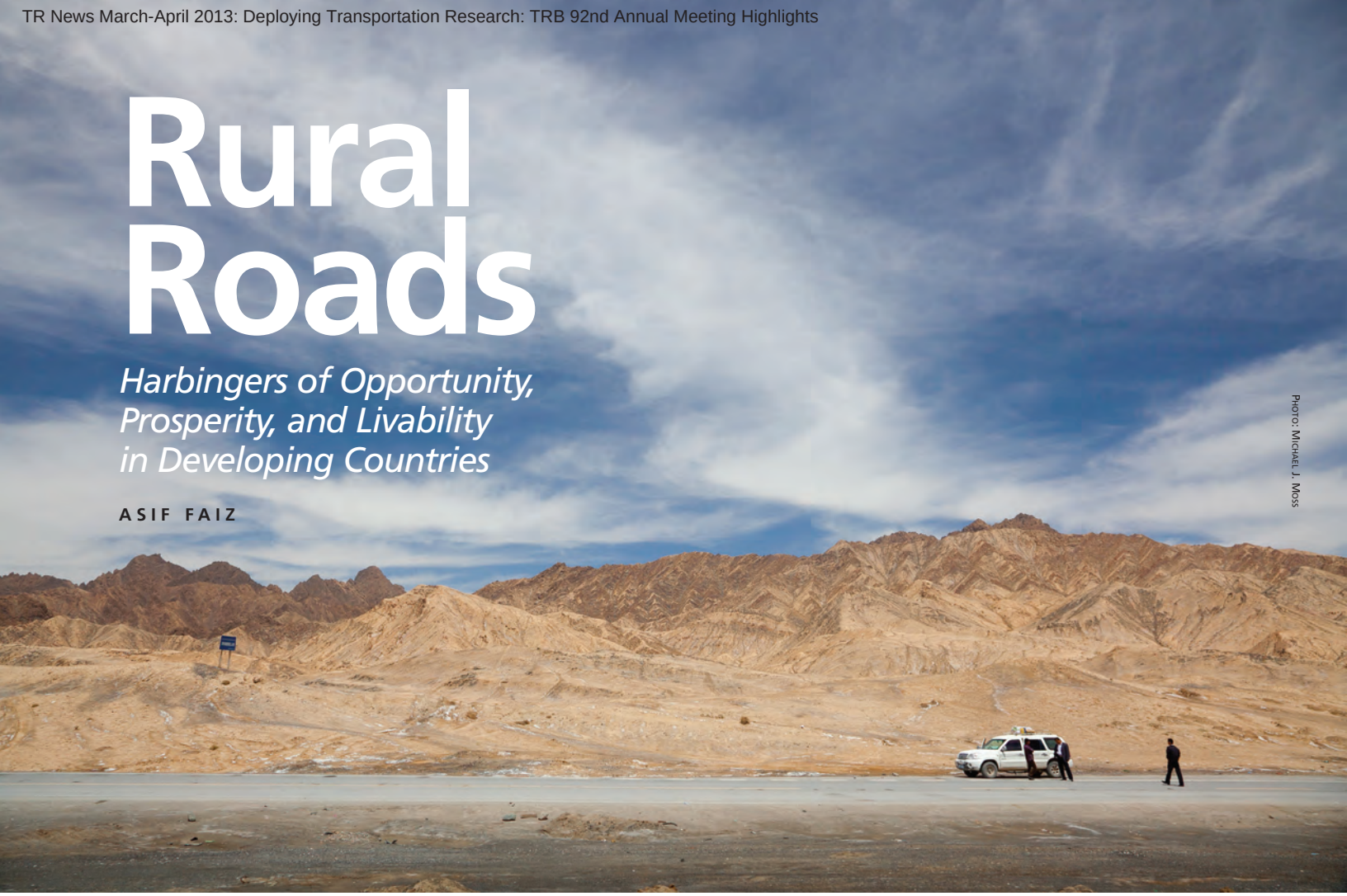


PHOTO: MICHAEL J. MOSS

Emeritus member of the TRB Low-Volume Roads Committee, the author is an adviser and consultant in transportation planning and engineering for the Asian Development Bank and has served as highways adviser for the World Bank, Washington, D.C. This article is based on his keynote address to TRB's 10th International Conference on Low-Volume Roads, Orlando, Florida, July 2011.

Sections of the southern Silk Road in the Taklamakan Desert in northwest China can be bumpy and often are under construction. The 30 million kilometers of low-volume public road across the globe range from paved highway to dirt.

Approximately 30 million of the 34 million kilometers of classified public roads that girdle the earth's land mass are low-volume roads, with an annual average daily traffic of 1,000 or fewer vehicles. These low-volume roads range from barely motorable earthen roads to modern, high-speed, two-lane, paved highways; nearly 13 million kilometers are unpaved, without an engineered bituminous, cement, or stone surfacing.

The geographical distribution of roads is dominated by countries with large land masses or large populations; only eight countries—with the United States in the lead—account for approximately 59 percent of the global road network (Table 1, page 33).

Worldwide, the public road network increased by 3.9 million kilometers in the first decade of the new millennium—an increment of 13 percent. At the same time, roadway quality underwent a quantum increase, with 4.2 million kilometers upgraded or constructed to paved standards.

Rural Roads Spectrum

In the first decade of the new millennium, China emerged as the global leader in rural road expansion and modernization. China's road network passed 4 million kilometers in 2010, and the proportion of paved roads increased from 25 percent in 2000 to 61 percent in 2010.

The expansion of the Chinese road system answers the nation's rapid increase in motorization during the past 20 years, similar to the advent of motorization in the United States at the beginning of the 20th century. China now boasts the world's second largest motor vehicle fleet. The surge in road building in China from 2000 to 2010 exhibits some similarity to the massive and unrivaled expansion of the U.S. road network between 1910 and 1920; the annual growth rates are nearly identical (Figure 1, page 33).

The importance and value of rural roads to economic growth and rural prosperity is underscored by China's emergence as the second largest global economy; at the same time, its motor vehicle fleet and its road system became the second largest in the world. Although the causal relationship is difficult to trace, it is not mere coincidence. The impact of road expansion has had a profound impact on agricultural diversification and marketing in China.

At the other end of the rural roads spectrum, sub-Saharan Africa has the least developed road networks, with the exception of South Africa, which accounts for 30 percent of the region's roads. The road networks of the 49 sub-Saharan nations combined are approximately 60 percent the size of

China's road network and 75 percent the size of India's. In terms of quality, only 15 percent of sub-Saharan roads are paved, with South Africa accounting for 40 percent of all paved roads in the region.

Rural Connectivity

Rural roads provide the spatial connectivity that fosters development and alleviates poverty. Isolation or lack of accessibility is one of the key dimensions of poverty; other dimensions include lack of assets and income, physical debility, vulnerability to emergencies and disasters, and powerlessness.

Improving access can relieve the constraints of rural communities and offer opportunities to improve livelihoods. Improving *connectivity* therefore should be a major objective for rural development. This includes improving *mobility* by reducing the time and effort to gain access and improving *accessibility* by bringing supplies, services, facilities, and information closer to people.

Alleviating Poverty

Empirical evidence shows a positive relationship between public spending on rural roads and the reduction of poverty. Roads are the foundation of rural development—good road networks reduce the costs of electrification, irrigation, fertilizers, output or product markets, and of such services as education, health, agricultural extension, and finance, among a host of others.

Rural roads help to lower input prices, increase agricultural production, and reduce the monopoly power of intermediaries, or middlemen, in agrarian markets. Food security is enhanced by increased purchasing power from rising rural incomes and by more diversified opportunities for employment. Rural roads improve access to employment and can help create jobs through labor-based construction and maintenance.

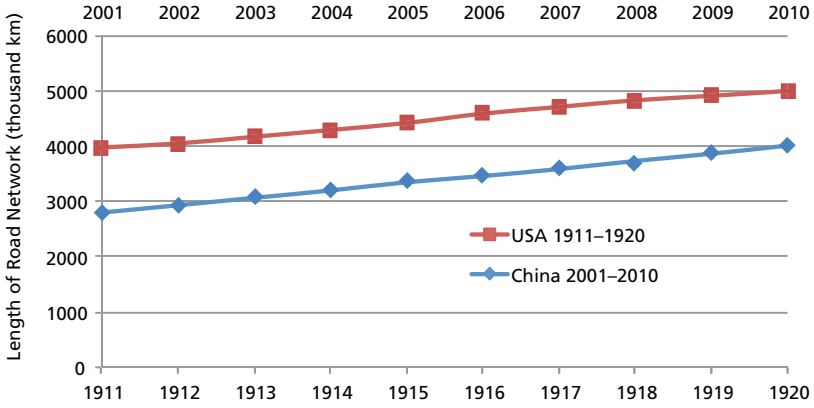


FIGURE 1 Comparative growth in road networks: United States, 1911 to 1920, and China, 2001 to 2010.

Public spending on rural roads—especially in areas that are lagging economically—contributes significantly to lifting rural residents out of poverty. Research shows that the highest marginal returns on public investments to promote economic growth and reduce rural poverty come from agricultural research, rural road construction, and education.

Crisis Management

The natural and man-made disasters that captured headlines in the first decade of the 21st century—earthquakes, tsunamis, droughts, floods, the forced displacements of people by wars and civil strife, and

TABLE 1 Growth in the Global Classified Public Road Network, 1998–2008

	1998 Length (million km)	Percent Paved	2008 Length (million km)	Percent Paved
World	**29.912**	**50.8**	**33.839**	**57.4**
United States	6.310	59.0	6.494	67.4
China	2.210	18.0	3.730	53.5
India	3.010	49.0	3.320	52.0
Brazil	1.630	9.6	1.633	12.9
Japan	1.152	74.9	1.204	79.8
Canada	0.902	35.3	1.042	39.9
France	0.893	100.0	1.027	100.0
Russia	0.948	67.2	0.982	79.0
Sub-Saharan Africa[a]	1.837	13.1	2.496	15.2
South Africa	0.534	11.8	0.747	20.6

Note: 1 km = .62 mi.

[a]Including South Africa.

SOURCES: *CIA World Factbook and IRF World Road Statistics* for data for sub-Saharan Africa, Canada, France, and Japan. Data for United States, Brazil, Russia, India, China, and South Africa are derived from national statistics or World Bank sources. World totals derived from *CIA World Factbook* have been adjusted as necessary with national data. The years 1998 and 2008 were selected as benchmark years to allow the use of comparable global data sets over a 10-year period.

Photo: BrandonTheMandon, Flickr

Road construction in the Chinese countryside. Public investments in roads have a high rate of return in promoting economic growth.

the combined fuel, food, and financial crisis of 2008—point to the critical role of rural roads in disaster management, emergency preparedness, and relief and recovery operations.

Well-engineered rural roads can facilitate the prompt and cost-effective delivery of relief to disaster zones. Although not designed for this purpose, rural roads often serve as places of refuge and as evacuation routes in the aftermath of natural disasters.

Rural road construction and maintenance have played a significant role in safety-net workfare programs—such as food-for-work, cash-for-work, and public works programs—aimed at creating employment for the poor. Job creation through rural road construction and maintenance is highly cost-effective, in terms of the cost per job created, compared with other infrastructure interventions.

Photo: Stig Nygaard

The foundation of rural development, public roads allow for the movement of agricultural goods and services and are vital in agrarian economies.

Rural roads also have a critical role in peace building and in the political integration of a country. Generating employment through rural road programs in areas affected by conflicts helps to reduce poverty through large cash infusions into local communities; this in turn increases the opportunity cost of resorting or returning to violence.

Livability

Livability refers to sustainable outcomes that directly affect people's lives, such as access to jobs, economic opportunities, high-quality schools, and reliable health services. In rural areas, roads can make many of these outcomes possible.

At the community level, livability relates to the environmental and social qualities of an area as perceived by residents. Green, ecofriendly, and people-friendly rural roads not only address environmental concerns—such as water quality, land conservation, and wildlife protection—but enhance livability in rural neighborhoods by limiting speeds and by reducing noise and safety hazards.

Translating the principles of livability into practice requires that human factors take precedence over motor vehicle factors in the provision of rural roads. Design vehicle speed must yield to the needs of pedestrians and nonmotorized locomotion; moreover, rural roads must hug—not blight—the natural landscapes.

Context-sensitive solutions therefore are needed, in sync with local community values and working to balance economic, social, and environmental factors. Context-sensitive solutions for rural roads would allow for narrower lanes, lower design speeds, sharper curvatures, and special features, such as bus bays, foot paths, and bike paths. By minimizing the

use of cut-and-fill construction and by providing appropriate drainage and stable slopes, context-sensitive solutions can help to make rural roads more resilient to manifestations of climate change.

Prospects and Challenges

The world's population reached 6 billion in 2000 and is projected to reach 9 billion by 2050, with the global rural population increasing by 1.2 billion to 1.5 billion. A major portion of this growth will be in sub-Saharan Africa. Global passenger transport, measured in passenger kilometers, is expected to increase an estimated threefold to fourfold between 2000 and 2050; freight transport, measured in ton-kilometers, is expected to grow by a factor of 2.5 to 3.5. Rising incomes will propel global mobility and motorization, especially in China, India, and sub-Saharan Africa.

The next surge of rural road building that will match the extent of that in the United States and China, nearly a century apart, is expected to occur in sub-Saharan Africa before 2050. In other parts of the developing world, the focus will shift to improving road capacity and quality. The addition of 1 million to 2 million kilometers of rural roads every decade to the classified public road system between now and 2050 is not improbable.

The continued growth in rural roads is predicated primarily on the food requirements of a global population of 9 billion by 2050. The required increase in food production will demand massive improvements in the agricultural supply and marketing systems, and rural roads will provide the first value-enhancing link as agricultural produce moves up the value chain from the farm to the market and on to the consumer.

Possible responses to the emerging global challenges and opportunities for low-volume roads may include the following:

◆ Reexamine the concept of rural accessibility, with rural connectivity becoming the byword for rural accessibility planning.

◆ Formally recognize the critical role of rural roads in crisis management, and designate this as a public service with specific budget appropriations. For rural roads to function as an asset for emergency preparedness and disaster management, a core nationwide network of rural roads would need to be retrofitted for climate resilience.

◆ Develop urgently needed engineering and technical guidelines for the planning and execution of workfare programs of road construction and maintenance, to ensure that the infrastructure is context-sensitive and sustainable.

◆ Champion the application of livability principles and context-sensitive solutions to all aspects of rural roads. A research program to synthesize and document context-sensitive solutions for low-volume roads would be a timely and useful endeavor.

Resource

Faiz, A. *Transportation Research Circular E-C167: The Promise of Rural Roads: Review of the Role of Low-Volume Roads in Rural Connectivity, Poverty Reduction, Crisis Management, and Livability.* Transportation Research Board of the National Academies, Washington, D.C., 2012. www.trb.org/Publications/Blurbs/167787.aspx.

PHOTO: DAVID GONZALEZ, FEDERAL EMERGENCY MANAGEMENT AGENCY

A distribution center for victims of a 2009 tsunami in Asili, American Samoa. Rural roads are critical connection points in times of natural or man-made disaster.

Practical Approaches for Involving Traditionally Underserved Populations in Transportation Decision Making

DAVID AIMEN AND ANNE MORRIS

Aimen is Assistant Director, Planning and Technical Assistance, Alan M. Voorhees Transportation Center, Rutgers University, New Brunswick, New Jersey. Morris is Principal, Anne Morris and Associates, LLC, Columbia, South Carolina.

Effective transportation decision making recognizes, responds to, and addresses the unique needs, cultural perspectives, and financial limitations of different socioeconomic groups. A comprehensive and inclusive approach, however, is needed for developing an understanding of the value systems and viewpoints of these groups.

Transportation agencies—state departments of transportation, metropolitan planning organizations, county and local governments, transit services and other transportation agencies, and tribal authorities—implement many different approaches to meet the letter and spirit of the federal laws, regulations, and executive orders that promote nondiscrimination, environmental justice, and the public health, safety, and welfare of all communities.

Engaging the Public

Transportation agencies often find that traditional public involvement techniques fail to create opportunities for meaningful contributions by traditionally underserved populations. Community stakeholders and residents should be able to participate in decisions about a proposed activity that will affect their environment, safety, or health. Affected communities should have their expressed concerns considered and should have the means to influence government decisions.

Despite the best efforts of agencies and practitioners, the public may appear too busy to care about planning or other transportation-related decisions. Nevertheless, practitioners have a responsibility to assess if they have done everything feasible to engage a sometimes distracted, sometimes distrustful public. Achieving meaningful involvement may require other creative approaches, not only at transportation meetings, but at other forums and at other times, and working with the right organizations, the right people, or the right incentives to connect with the affected public.

Florida's Miami–Dade Metropolitan Planning Organization took part in a call-in radio show for the local Haitian community.

An apprenticeship and mentoring program within Oregon Department of Transportation (DOT) for minorities and women in the highway construction industry is one of the approaches by state DOTs to engage minority and underserved populations.

NCHRP Report 710, *Practical Approaches for Involving Traditionally Underserved Populations*, is an encyclopedic 508-page guidebook—a broad-based, matter-of-fact, and easy-to-use toolkit of practical approaches—that agencies and practitioners can use to foster the meaningful involvement of traditionally underserved populations—particularly minority, low-income, limited-English-proficiency, and low-literacy groups—in transportation decision making. The report offers a compendium of effective practices, tools, techniques, and data sources.

Public Involvement's Roots

Ways of identifying the affected public and determining who should participate in transportation decision making have changed significantly in the past 50 years. NCHRP Report 710 looks at this transition, beginning with a short history of urban high-

way construction in the post–World War II Interstate era, highlighting the factions that benefitted from the highway program and the consequences to the communities excluded from decision-making processes.

The new highway infrastructure introduced unprecedented mobility and spurred suburbanization, but urban neighborhoods were split apart by large-scale demolition and displacements. By 1969, federal highway construction was demolishing more than 62,000 housing units annually, potentially affecting as many as 200,000 persons a year (*1*). Disproportionate burdens were imposed on politically powerless neighborhoods, racial and ethnic minorities, and the poor.

Public opposition to the urban highway construction program emerged in the late 1960s, leading to reforms in the relationship between agencies making transportation decisions and the affected public. The Federal Highway Administration and the U.S. Department of Transportation began to reassess their policies. Some expressway projects were canceled, and other routes were altered to avoid neighborhood destruction.

Landmark legislation and shifts in policies began to change the ways that transportation agencies worked with the public. Major federal laws, including Title VI of the Civil Rights Act of 1964, Section 4(f) of the Department of Transportation Act of 1966, the Freedom of Information Act of 1966, the National Environmental Policy Act of 1969, the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, and the Clean Air Act of 1970, were instrumental in opening up decision-making processes to greater public scrutiny.

Establishing meaningful involvement as a standard for agencies and practitioners, however, faces institutional, individual, and cultural barriers. NCHRP Report 710 describes these barriers, as well as the need for a commitment to bridge social and cultural gaps in public involvement.

PHOTO: WIKIMEDIA COMMONS

A mural at Chicano Park in San Diego, California. In 1970, a 12-day nonviolent protest of a proposed office building and of the construction of I-5 and the San Diego–Coronado Bridge, which divided the historic neighborhood Barrio Logan, spurred the development of the park.

Driving Change

To identify and address the unique needs, cultural perspectives, and financial limitations of different socioeconomic groups, the transportation agency and the practitioner must be conversant with the various populations they serve. These may include foreign-born residents (see Figure 1, below), refugees, and asylum seekers; persons with limited English proficiency; persons with disabilities;

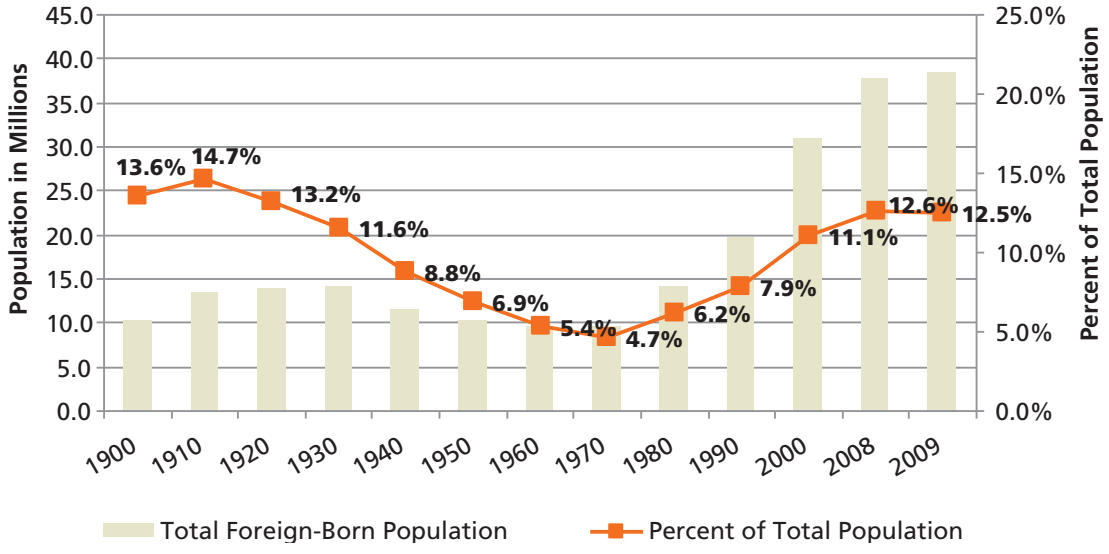


FIGURE 1 Foreign-born and share of foreign-born, 1900 to 2009. (Sources: U.S. Census Bureau, American Community Surveys; C. Gibson and K. Jung, *Historical Census Statistics on the Foreign-Born Population of the United States: 1850 to 2000*, U.S. Census Bureau, Washington, D.C., 2006.)

Who Are the Traditionally Underserved Populations?

The Federal Highway Administration's rules require a metropolitan planning organization's public participation plan to describe procedures, strategies, and desired outcomes for seeking out and considering the needs of people who are traditionally underserved by transportation systems—such as low-income and minority households.[a] Executive Order 12898 on environmental justice identifies the traditionally underserved as low-income and minority populations, including Hispanics, African Americans, Asian or Pacific Islanders, and Native Americans.[b] Other populations recognized in Title VI and other civil rights legislation and executive orders[c] include persons with limited English proficiency, such as the foreign-born; low-literacy populations; seniors; and Americans with disabilities—including the visually and hearing-impaired. Transportation legislation adds transit-dependent populations.

Terms synonymous with, or close in definition to, "traditionally underserved" include "historically underrepresented," "socially disadvantaged," "vulnerable," "at risk," "in need" and "communities of concern." These terms are in general use or are referenced in reports and governing policies and recognize that some individuals and groups experience a persistent inability to meet basic needs, access opportunities to improve their circumstances, or influence decision makers because of their social position, lack of resources, or powerlessness. The terms encompass classes and groups protected and not protected under the nation's civil rights and other laws, regulations, and executive orders.

PHOTO: TRIMET, PORTLAND, OREGON

Workers dependent on late-night public transportation have limited options for complex travel involving trip chaining and transit transfers.

Several resources for NCHRP Report 710, *Practical Approaches for Involving Traditionally Underserved Populations*, defined the traditionally underserved in terms of vulnerability and difficult economic, physical, or social circumstances. The traditionally underserved include persons without a high school degree, the unemployed, and the underemployed, who may have less access to opportunities. Single mothers, undocumented workers, immigrants with limited proficiency in English, the homeless, substance abusers, and domestic violence victims are vulnerable populations. Women, the elderly, physically or mentally impaired persons, late-night transit-dependent workers, or youth may have limited options for mobility—particularly for complex travel that involves trip-chaining and transit transfers. These groups may have excessively difficult commutes in terms of time or risks to personal safety to reach jobs or other opportunities because of their isolation.

Traditionally underserved populations may be the term most appropriate for transportation contexts because it places the onus on the governing institutions responsible for the equitable delivery of systems and services, not on the disadvantaged individual. NCHRP Report 710 focuses on populations that have been traditionally underserved by transportation systems and decision-making processes. The report and toolkit describe the criteria for defining—and methods for identifying—underserved populations and supply useful data sources and other tools and resources.

[a] Title 23 CFR Part 450.316(a)(1)(vii).
[b] Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.
[c] Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency.

In Pittsburgh, Pennsylvania, Mall Crawls for Transit Equity demonstrated the difficult pedestrian conditions faced by transit riders at local malls and received newspaper coverage.

persons with limited means of transportation or in zero-car households; senior populations and the graying baby boomers; and persons with low literacy.

NCHRP Report 710 highlights several changing patterns and trends, such as the following:

- The size of the U.S. population;
- Minority, race, and Hispanic population patterns;
- Poverty and low-income households;
- The digital divide in access to—and use of—technology;
- The rising share of transportation costs in household budgets; and
- The so-called "tipping-point" year in which minorities are projected to become the majority in the U.S. population.

Agency leaders and practitioners need to adapt to and prepare for these emerging trends; the changes will require reconsideration of outreach strategies, resource allocation, and priorities. For example, metropolitan areas in the Southeast—not traditionally chosen by immigrants in recent decades—have become more popular settlement destinations for the foreign-born since 2000. Several older industrial metropolitan areas also have experienced an infusion of foreign-born arrivals. The report reviews the challenges and considerations for working with the foreign born, as with various other traditionally underserved populations.

Practical Approaches

Practical approaches for involving traditionally underserved populations can be pursued at every stage of transportation decision making. Identifying and engaging the traditionally underserved can take many different forms and can be expressed in many different activities in transportation. No one-size-fits-all approach applies.

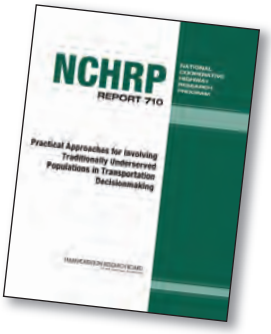
NCHRP Report 710 categorizes 53 practical approaches according to seven nonsequential—but often interrelated—task objectives, reflecting levels of engagement, commitment, and benefit to traditionally underserved populations. Task objectives can range from identifying the location or community characteristics of traditionally underserved populations to creating opportunities for meaningful two-way interactions or for more intensive participation, for example, through training. Successful examples of practical approaches are highlighted, including detailed descriptions and contextual information.

Effective Practices

Analytical methods, data sources and tools, public involvement techniques and processes, and proactive strategies are effective if they improve the identification or understanding of the concerns of traditionally underserved populations or create decision-making processes that incorporate meaningful involvement. These practices seek to be *inclusive*, recognizing the needs of traditionally underserved communities in making transportation decisions, as well as *comprehensive* in assessing how the programs, plans, projects, and other activities distribute benefits and burdens across various socioeconomic groups, including traditionally underserved populations.

Effective practices include games to reach a consensus, hiring local residents as advocates to conduct outreach, holding student film competitions to highlight safety issues, conducting convenience surveys, enlisting the support of churches to connect with difficult-to-reach populations, and starting training and mentoring programs to prepare minorities for careers in transportation or to take positions on commissions and boards.

In all, 26 effective practices are presented as case studies, describing the context for each approach and exploring its effect on the decision-making process. Costs and benefits are identified, along with resources and contact information.



NCHRP Report 710, *Practical Approaches for Involving Traditionally Underserved Populations in Transportation Decision Making*, with supplemental material on CD-ROM, is available electronically at www.trb.org/Publications/Blurbs/166872.aspx or from the TRB Bookstore, http://books.trbbookstore.org/nr710.aspx.

An advocate at a senior center in Seattle. Practitioners must be familiar with the populations they serve—from seniors to immigrants.

The City of Seattle's Public Outreach Program sought trusted advocates who were bilingual and well-connected to their respective communities, with effective interpersonal skills.

Tools and Techniques

Fifty-two tools and techniques that transportation agencies and practitioners can use to identify and engage with traditionally underserved populations and communities are presented. Each activity—a tool, a strategy, or an action—and its effectiveness are described, including associated techniques and their implementation, as well as potential limitations or criticisms. The costs of implementation are also considered.

Brief examples show how agencies and organizations have used the tool or technique successfully—for example, in preparing a plan to reach people with limited English proficiency, offering assistance to hearing- and sight-impaired persons, employing visualizations, conducting field visits, supplying refreshments, assessing the effectiveness of a public involvement plan, using games to educate and to explore priorities, and partnering with churches, schools, and other organizations.

The description of each tool or technique includes resources—publications, links to reports, or project websites—as well as contact information for networking with project sponsors, practitioners, or others who are knowledgeable about the implementation.

Traditional public involvement techniques tend not to prove effective for traditionally underserved populations. Branding projects through such items as clothing makes it easier to be spotted within a community and gain a measure of acceptance as an outsider.

Data Sources and Tools

To assist in preparing a comprehensive profile of the social and economic characteristics of a community, 47 data sources and tools are provided; many are geared to identify the needs, concerns, and locations of traditionally underserved populations. Key demographic data are identified, applicable to a specific area, communities along a corridor, or a larger region. This first step in a public involvement plan ensures that the location and needs of the traditionally underserved populations are fully understood in developing practical approaches during the planning and project development stages.

Those responsible for understanding community needs and the effects of agency decisions on communities cannot depend solely on data from desktop demographic exercises. Practitioners should make visits to the field to meet with knowledgeable stakeholders in potentially affected communities. Much of the information about familial relationships, interdependencies between community members, the services that support the community, and the community's perspective on the proposed project's effects is discernible only by visiting the community and talking with residents.

The information about the data sources describes the website content, the level of detail in the data, the groups addressed in the data, how frequently the data are updated, and the pros and cons and the value of the data. Some of the non-transportation-related resources include the Modern Language Association Map and Data Center, the National Center for Education Statistics, Literacy Information and Communications Systems, the Black Church Page, the National Center for Health Statistics, and the Yearbook of Immigration Statistics.

Bridging the Gap

Although NCHRP Report 710 presents many practical approaches for agencies and practitioners, developing well-trained practitioners is critical in bridging the gap between the agency or practitioner and traditionally underserved populations. The best toolbox is of no value without someone trained to use it correctly. This guidebook can be an important element in that training.

Reference

1. Mohl, R. *The Interstates and the Cities: Highways, Housing and the Freeway Revolt*. Poverty and Race Research Action Council, Washington, D.C., 2002.

Partnering to Fill the Research Needs of an Underrepresented Highway System

Alaska and Washington State Advance Design of Ferry Berthing Structures

ANDREW METZGER

The author is Assistant Professor, Department of Civil and Environmental Engineering, College of Engineering and Mines, University of Alaska, Fairbanks.

Marine highways provide a necessary service for coastal communities in the United States. The Washington State Ferries (WSF) system, the nation's largest, provides service to more than 24 million passengers each year. Similarly, the Alaska Marine Highway System (AMHS) connects more than 33 coastal communities, most of which are accessible only by air or sea.

Problem

Marine highways are part of the U.S. highway system but often are overlooked in transportation studies. As a result, the knowledge base for this type of infrastructure is less developed than that for other modes of transportation.

For example, more needs to be known about vessel impact forces on the landing structures that receive ferry vessels. The standard of practice for the design of these structures equates the kinetic energy of the approaching vessel to the elastic potential energy of the deformed structure that receives the impact. Assumptions must be made about the approach velocity, the vessel mass, and the energy transferred to the structure. These assumptions historically have produced uncertainty in design or an intentional overdesigning of the structure, which has an adverse effect on economy of design.

Solution

To address this gap in knowledge, WSF and AMHS initiated a research project to characterize the load environment of ferry landings, studying the vessel forces on the landing structures. The objective was to collect the information needed for reliable yet eco-

Ferry berth at Seattle, Washington, terminal, with linear motion transducers—cylindrical in shape—installed on the piers, just above the surface.

Distance sensor installation at Auke Bay.

nomical structural designs.

Researchers measured the vessel approach velocity, the displacements, and the internal forces as vessels came to a stop against a landing structure. Measurements were taken each time a vessel landed. The goal was to develop probability-based design criteria for vessel berthing demands. The Auke Bay terminal in Juneau, Alaska, and the Seattle–Bremerton terminal in Seattle, Washington, were chosen for study.

Instrumentation

The instrumentation at both sites measured several parameters of interest to engineers:

◆ Acoustic distance sensors measured the distance between the dock and the vessel five times per second. This information yielded an estimate of the vessel's velocity at impact. The photograph above shows a distance sensor installation.

◆ Rubber fenders that cushion the vessel's motion against the landing were instrumented with linear motion transducers (LMTs) to measure the displacement during impact; the measurements were used to determine the force of the impact. The photographs on page 41 and below show LMTs installed to measure fender displacement.

◆ The vertical and battered support piles were instrumented with strain gauges, configured to determine the axial force in the piling.

◆ Another distance sensor oriented toward the water served as a tide gauge. Both study locations experience extreme tidal variation, which affects the elevation of the ship's sponson, the projection from the vessel that makes contact with the structure.

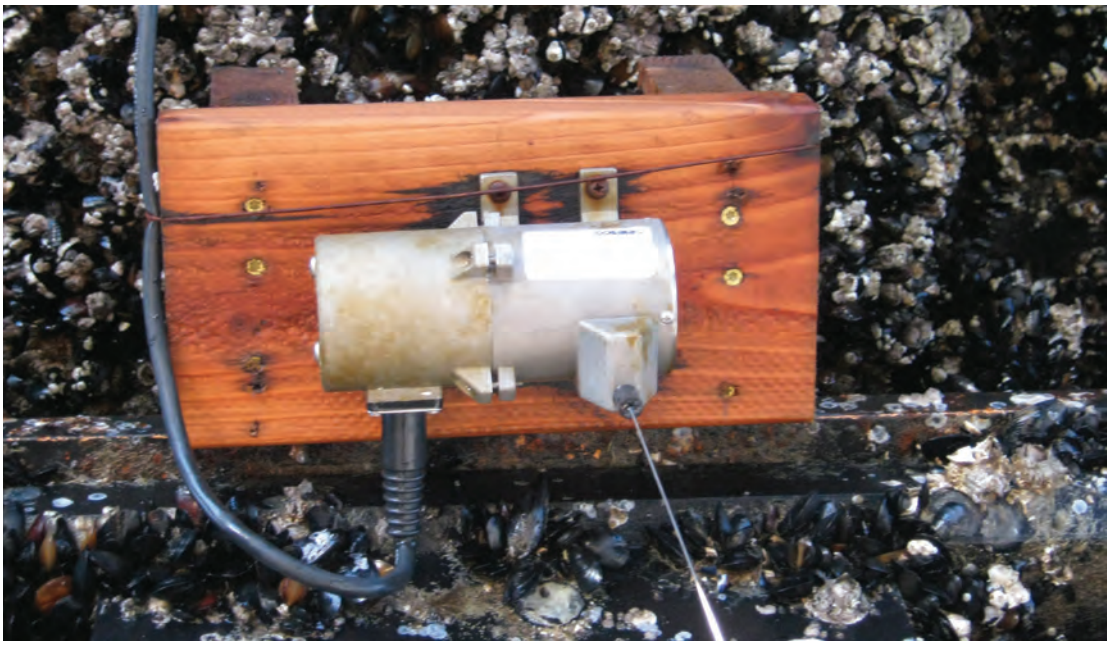
Onsite dataloggers controlled the instrumentation. Digital wireless modems connected to the dataloggers allowed remote control of the system, as well as the downloading of data over the cellular network.

Data

The Auke Bay and the Seattle–Bremerton terminal sites were monitored continuously for approximately one year. When a vessel reached a predetermined distance from the motion sensor, a programmed algorithm triggered the dataloggers to begin recording. The velocity at impact, the maximum fender displacement, and the pile force were identified and added into the database.

Histograms generated from the database were used to develop engineering design aids. Figure 1 (page 43) shows a sample histogram with a fitted probability density function.

The force imparted to the structure depends on



Closeup of linear motion transducer installed in Seattle.

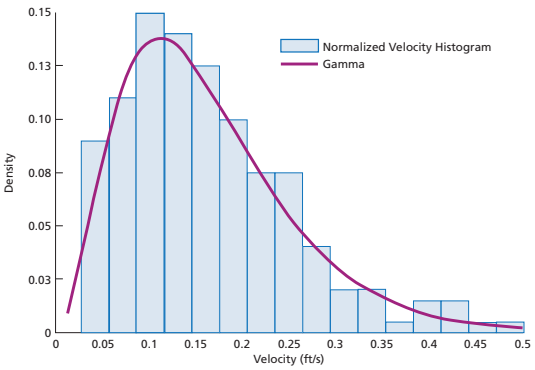


FIGURE 1 Impact velocity histogram with fitted probability density function.

the vessel's mass and impact velocity, as well as on other factors, all of which differ from berthing to berthing. A statistical analysis of the data from many berthing events, however, identified the approach velocities, forces, and impact energies that have a low probability of being exceeded. As a result, design criteria could be developed with a quantifiable degree of reliability.

Application

Engineers have applied the preliminary results from this project to reevaluate and revise internal design standards. Design charts summarize the research results, indicating parameter magnitudes and the probability that these will not be exceeded in a number of berthing events. The designer determines the number of anticipated berthing events for the design life of the structure and chooses the corresponding parameter. Figure 2 (at right) shows an example of an impact-energy design chart.

Technical Benefits

The results of this research project represent a significant advance for the design of ferry terminal structures and marine berthing structures. The monitoring system that was developed to measure the parameters associated with ferry berthing is applicable to other classes of vessels and to other berthing structures.

The project gathered the necessary data—such as impact force, approach velocity, and impact energy—for deriving statistically based engineering design criteria for the berthing demands of ferry vessels. Information derived from in situ measurements is a considerable improvement over the assumptions that support the current standard of practice.

Benefits of Partnering

AMH and WSF had similar research needs, but limited funding. At both study sites, the parameters of interest to engineers were the same. By coordinating efforts, the Washington State Department of Transportation (DOT) and the Alaska Department of Transportation and Public Facilities shared some equipment and labor costs.

The project would have cost each DOT working on its own approximately $220,000. The joint sponsorship saved each state an estimated $20,000 in labor and equipment, reducing the combined total costs to $400,000. With matching funds from the Alaska University Transportation Research Center, the cost to each DOT for this project was $100,000.

For more information, contact Andrew T. Metzger, Assistant Professor, Department of Civil and Environmental Engineering, College of Engineering and Mines, University of Alaska Fairbanks, 306 Tanana Loop, 271 Duckering Building, P.O. Box 755900, Fairbanks, Alaska 99775-5900; 907-474-6120; atmetzger@alaska.edu.

EDITOR'S NOTE: Appreciation is expressed to G. P. Jayaprakash, 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).

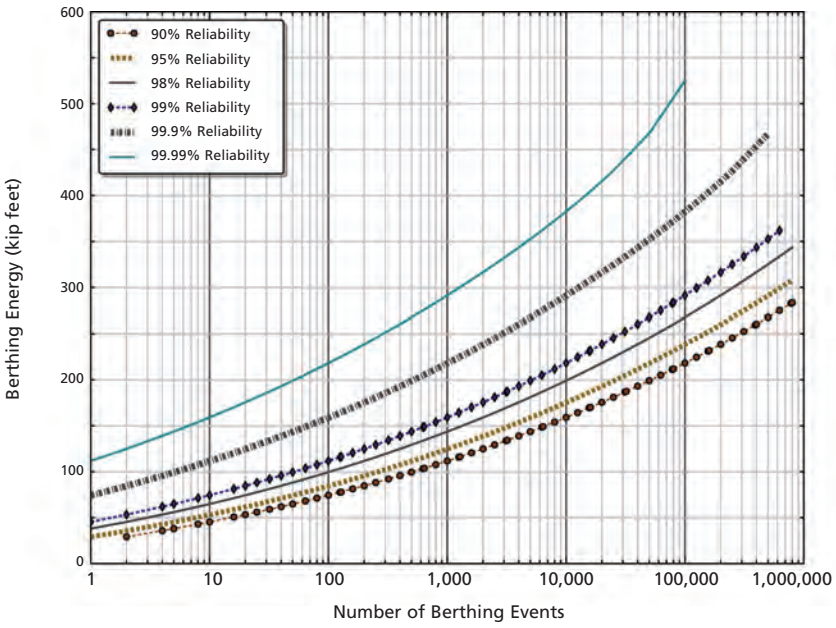


FIGURE 2 Impact energy design chart: reliability plot showing lognormal berthing energy in relation to number of berthing events.

Ram M. Pendyala

Arizona State University

Ram M. Pendyala uses his expertise in the analysis of human activity and travel patterns to model the land use, transportation, energy, and air quality impacts of sustainable mobility management strategies and multimodal transportation systems. At Arizona State University (ASU), Pendyala is professor of transportation systems in the Civil, Environmental, and Sustainable Engineering Program, senior sustainability scientist with the Global Institute of Sustainability, and a member of the Honors College faculty.

"Throughout my career, I have tried to strike a balance between pursuing fundamental behavioral research and developing new modeling tools that can be implemented or can help influence practice," Pendyala notes. His research and teaching areas include multimodal transportation systems planning, activity-based travel behavior modeling, time use and activity pattern analysis, freight and passenger travel demand forecasting, travel survey methods, microsimulation approaches, and the application of advanced econometric and statistical methods to transportation policy analysis.

"In designing the cities of tomorrow, it is critical to understand how people, businesses, and transportation providers make activity- and transportation-related decisions in a variety of scenarios."

Pendyala received a bachelor's degree in civil engineering from the Indian Institute of Technology, Madras, in Chennai, India. He received a master's degree and a Ph.D. in civil engineering, with a specialization in transportation systems, from the University of California, Davis.

Before joining ASU in 2006, Pendyala was a transportation faculty member and graduate programs coordinator in the University of South Florida's Department of Civil and Environmental Engineering. He also has taught in Vienna, Austria, and has served as consultant to the World Bank on the evaluation of infrastructure improvements to enhance access to bus rapid transit.

In the past decade, Pendyala has collaborated on international research projects analyzing passenger and freight activity travel behavior characteristics and developing state-of-the-art, integrated microsimulation-based model systems of land use, activity–travel demand, spatial behavior, and network dynamics. He also guided the development of new transit planning software for route and service planning and of geographic information systems tools for multimodal travel forecasting.

"In designing the cities of tomorrow, it is critical to understand how people, businesses, and transportation providers make activity- and transportation-related decisions in a variety of scenarios," Pendyala observes.

Recently, Pendyala's work has focused on evaluating the economic and environmental sustainability of alternative land use development patterns and built environments. He is a member of the academic steering committee of the International Symposium for Next-Generation Infrastructure and has conducted extensive research on the connection between transportation and public health, analyzing the physical activity and health outcomes associated with alternative land use and transportation development patterns. Pendyala recently completed a Federal Highway Administration Exploratory Advanced Research Program project to develop new methods for modeling land use, travel demand, and multimodal transportation networks. The model system, SimTRAVEL, integrates land use, activity–travel demand, and dynamic traffic assignment models into a single framework.

"This project has allowed us to perform fundamental research in the development of activity–travel behavior algorithms and of new open-source software tools and interfaces that will help accelerate the deployment of agent-based behavioral microsimulation models in practice," Pendyala comments. Examples of these tools include an open-source synthetic population generator, PopGen, and OpenAMOS, an activity–mobility simulator, he adds.

Internationally recognized as a pioneer in activity-based microsimulation travel behavior models, Pendyala is widely cited for his work creating and implementing new methods for modeling, understanding, and forecasting travel demand. He is coeditor of *Travel Behaviour Research in an Evolving World* and of the forthcoming *Advances in Transportation Sustainability: Towards a Greener Future*. He has published more than 100 articles. In 2011, Pendyala and coauthors Karthik Konduri, Xin Ye, and Bhargava Sana received TRB's Pyke Johnson Award for Best Paper in transportation systems planning and administration for their paper "Joint Tour-Based Model of Vehicle Type Choice and Tour Length."

Pendyala is chair of TRB's Travel Analysis Methods Section and is cochair of the Special Committee for Travel Forecasting Resources. He also is a member of the Planning and Environment Group.

Maryvonne Plessis-Fraissard

Consultant

In three decades of working in transportation development, Maryvonne Plessis-Fraissard has managed extensive investment portfolios and has traveled to more than 70 countries. She has presided over innovations in project development, job creation and social impacts. She observes, however, that the signs of the most enduring progress often are subtle: in countries such as India or Ecuador, she notes, job opportunities for women, secure communities, and efficient public works may be the tangible results of effective development.

"Success is measured by the repeated stories of modest achievement, such as the farmer in Guinea who used to walk to the market—onions on his head—and arrive late and dirty, making poor sales and taking dealers' half-price offers at the end of the day. With a newly built road, he pays for his truck trip, arrives early and fresh at the market, and sells everything at a fair price—with time to buy things before returning home. Soon he doubles his onion production," she explains.

"The overall strategic and political attention given to the transportation sector is almost universally small compared to its economic or social weight."

A consultant since 2008, Plessis-Fraissard advises on transportation issues related to safe, equitable, and sustainable development for the World Bank, the Africa Development Bank, the World Health Organization, the U.S. Department of Transportation, and other organizations. She conducts quality assurance reviews for the World Bank for projects all over the world. She designed, facilitated, and helped launch a Partnership for Road Safety in Africa between the Total petroleum company and the World Bank—a project she supervised as it grew to include partners in progressively more countries along international transit corridors. She also served on a panel of experts for the Programme for Infrastructure Development in Africa, a high-profile project of the African Union Commission.

In 1972, Plessis-Fraissard received a master's degree from the Sorbonne in Paris and, in 1978, a Ph.D. in geography from the University of Leeds, United Kingdom. She joined the World Bank in 1981, working on economic and institutional project design, preparation, and execution in more than 30 countries throughout the Middle East, Latin America, the Caribbean, and West Africa.

From 1993 to 2003, Plessis-Fraissard held management positions in infrastructure and transportation in the World Bank's Africa Vice Presidency, ultimately leading the Regional Transport Unit. When infrastructure was deemed a low priority, she doubled transportation lending in Africa to a portfolio of $4 billion, by helping client countries appreciate the value of the transportation sector and by reviving a transportation partnership that documented African good practices, effective public–private partnerships, and innovative peer support. Transportation's role in alleviating poverty and contributions to economic growth were better recognized. She also provided oversight for risky, high-profile interventions, such as emergency rehabilitation and post-conflict recovery programs. In 1997, Plessis-Fraissard participated in the World Bank Executive Development Program at Harvard Business School.

In 2003, Plessis-Fraissard became director for Transport and Urban Development in the Sustainable Development Vice Presidency. She guided policy, staffing, and portfolio quality for more than 25 percent of the World Bank's global lending and presided over the creation of the Global Fund for Road Safety Facility and the Global Facility for Disaster Reduction and Recovery; she also led the development of a $2 billion air transportation portfolio and established the Transport Notes Series, which disseminates transportation research and innovation.

Plessis-Fraissard recognizes the need for transportation research. "The overall strategic and political attention given to the transportation sector is almost universally small compared to its economic or social weight," she comments. In the United States, for example, it is difficult to incorporate long-term transportation policy and financing; in Europe, the consolidation of the transportation, energy, and climate change agendas has weakened the sector's focus. "Except in rapidly growing East Asia, research dedicated to transportation has become more limited and is often driven from the outside by energy or environmental agendas," notes Plessis-Fraissard. "This speaks to the critical relevance of transportation, yet it is associated with a poor strategic positioning of the sector, and, ultimately, underfunding for transportation research and development."

Until recently, Plessis-Fraissard served as vice-chair of the TRB International Activities Committee. She also is a member of the Transportation in the Developing Countries Committee and the Women's Issues in Transportation Committee. From 2008 to 2011, she served on the Committee on Women's Issues in Transportation: Fourth International Conference and now leads the preparation of the policy pillar of the Fifth International Conference, which will be held in Paris in April 2014.

A Chronicle of Research and TRB Turns 50

Highlighting the Fifth Decade of TR News

JAVY AWAN

The author is editor, TR News, *and Director of Publications, TRB.*

Feature articles in the November–December 2012 *TR News* chronicled the visionary momentum that was at work in 1962 in U.S. transportation policy, with the launch of metropolitan transportation planning, and at the Highway Research Board, with the start-up of the National Cooperative Highway Research Program (NCHRP). TRB's bimonthly magazine itself had its origins in the same era—*Highway Research News* first rolled off the presses 50 years ago, in February 1963, to report on developments in research and policy nationwide and on activities at the Board.

Highlights of the past 10 years of the magazine—an article in the January–February 2003 issue covered the first 40 years in detail[1]—include two theme issues on transportation and climate change and others on security, environment, asset management, and highway safety; feature articles on TRB and transportation history, international initiatives, and technology transfer; editorial insights from transportation leaders; expanded photographic coverage of the Annual Meeting; a milestone for the Research Pays Off series; and some surprising cover images.

In addition, the web edition of the magazine converted to full color on the inside pages with the March–April 2010 issue, although the print edition continued to run photographs in black and white until moving to full color, cover to cover, with the March–April 2012 edition.

The web edition of *TR News* converted to full color in the March–April 2010 issue, and the print edition went full-color in March–April 2012. Photo coverage of the Annual Meeting expanded in 2006.

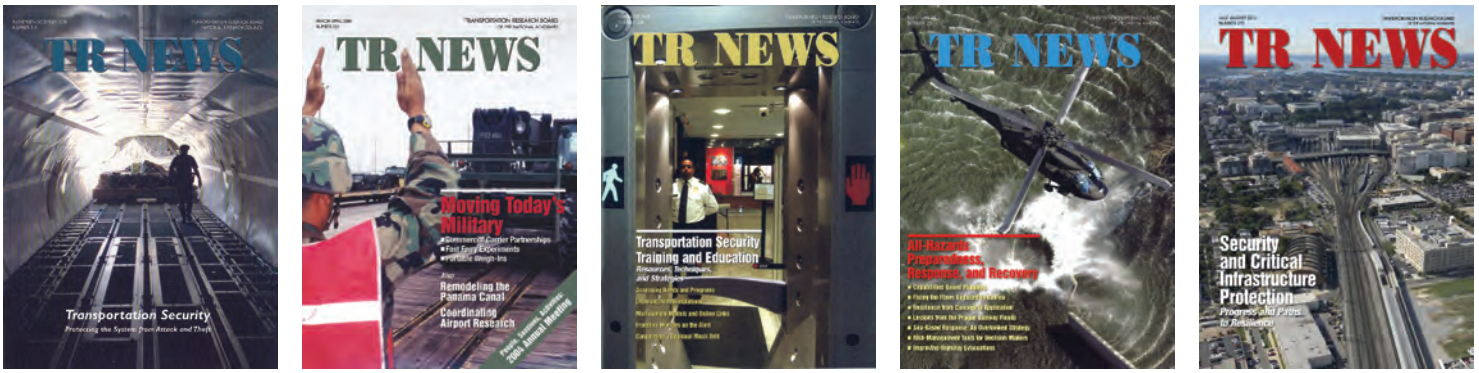
[1]http://onlinepubs.trb.org/onlinepubs/trnews/trnews224.pdf—pages 43–45.

Playing Our Theme

Theme issues—collections of feature and sidebar articles focused on a topic—remained a mainstay of *TR News*, usually drawing on the vision and expert contributions of a Technical Activities committee or group. The Special Task Force on Climate Change and Energy produced two theme issues—the first, May–June 2010, presenting ways to curb transportation's contributions to climate change, and the second, July–August 2012, documenting exemplary transportation agency programs to adapt to the effects of climate change.

Three other theme issues examined environmental concerns: air quality, July–August 2003; measures and countermeasures for noise, September–October 2005; and the "mutual enhancements" of transportation and the environment, May–June 2009, with articles addressing the "goal of 'making [both] better than before,'" according to the introduction by Mark S. Kross.

Transportation security also generated material for three theme issues: security training and education, May–June 2005; all-hazards preparedness, response, and recovery, May–June 2007, with a special foldout timeline of "major focusing events" between 1978 and 2006; and security and critical infrastructure protection,



July–August 2011. Innovative approaches to transportation financing received theme issue treatments in July–August 2009, on pricing road use to address congestion, and in May–June 2011, on public–private partnerships. Technical and engineering advances were highlighted with theme issues on preserving highway infrastructure, September–October 2003; visualization, September–October 2007; a "2020 vision" of highway design and construction, November–December 2007; and "Anatomy of Change in Winter Maintenance," on the developing science of surface transportation weather and its applications, November–December 2009.

Several topics received first-ever theme issue coverage: aviation, in September–October 2011, and pedestrians and bicycles, or active transportation, in May–June 2012. The intermodal container era, theme of the September–October 2006 issue, offered an exemplary mix of history, with an article on pioneer Malcom McLean; current issues, with articles on the global economy and security; and trends and challenges.

History Themes

History was the focus of the theme issue celebrating one of the major events of 2006—the 50th anniversary of the Interstate Highway System. "The Interstate Achievement: Getting There and Beyond" featured a vintage cover photograph of a family driving in a convertible on an overpass with a view of an Interstate below and offered "retrospects and prospects" under many distinguished bylines, including one of the last pieces written by the late, renowned transportation planner and engineer Alan M. Voorhees.

Transportation historians Bruce E. Seely and Jonathan Gifford wrote "How the Interstate System Came to Be: Tracing the Historical Process" and "The Exceptional Interstate Highway System: Will a Compelling New Vision Emerge?" respectively. Distinguished professor Lester A. Hoel examined "The Engineering of the Interstate Highway System: A 50-Year Retrospective of Advances and Contributions," with coauthor Andrew J. Short. Other contributors included Joseph M. Sussman of the Massachusetts Institute of Technology, past FHWA Executive Director E. Dean Carlson, former Assistant Executive Director of the Port Authority of New York and New Jersey Lillian C. Borrone, and past Executive Director Thomas B. Deen. Alan E. Pisarski provided an introduction and conclusion.

Two smaller theme issues explored TRB's history with a similar combination of features and brief articles by first-hand participants. Marking TRB's 90th anniversary, Executive Director Robert E. Skinner, Jr., offered insights on "Trends and Fundamentals: Guiding TRB to Its 2020 Centennial—and Beyond," in the November–December 2010 issue. Featured alongside was an article by Deen, "The Transportation Research Board at 90: Everyone Loves It, but No One Can Explain Why," tracing the uniqueness of the organization, plus a timeline of TRB's evolution, a list of significant policy studies, and a collection of testimonials from leaders.

NCHRP's 50th anniversary was commemorated in the November–December 2012 magazine with feature articles by Senior Program Officer Christopher Hedges on the program's origins and Cooperative Research Programs Associate Director Crawford Jencks on the program's substantive legacy, supplemented with testimonials from leading participants and volunteers.

History as Hallmark

Largely through the efforts and example of Gifford, Pisarski, and their colleagues on the TRB Transportation History Committee, feature articles on transportation history have become a hallmark of the nontheme magazines. The AASHO Road Test was the subject of two features in succeeding years; the first, by Kurt D. Smith, Kathryn A. Zimmerman,

Five theme issues have highlighted transportation security topics, starting in November–December 2000, all coordinated by Senior Program Officer Joedy Cambridge; Senior Program Officer Stephan A. Parker assisted with the three at the right.

TRB's 90th anniversary and NCHRP's 50th were commemorated in the November–December 2010 and 2012 issues, respectively.

and Fred N. Finn—himself a participant in the landmark test—examined the "Living Legacy for Highway Pavements," in May–June 2004; the second, in November–December 2005, looked at the program's bridge testing and was authored by three participants: S. J. Fenves, J. W. Fisher, and I. M. Viest.

Thomas R. Jablonski of New York City Transit wrote on "New York City's Subway Century," in January–February 2006, and an accompanying feature by Tom Malcolm traced the career of William Barclay Parsons, the "transportation engineer extraordinaire" who was pivotal in the system's development.

One history feature traveled back to Roman times—in July–August 2010, Sarah Murray wrote about the amphora containers used to ship and deliver oil throughout the ancient world; and a feature in November–December 2010 found "a distant mirror" in medieval times, as historian Alan Cooper and retired transportation executive Damian L. Kulash explored instructive parallels for the post-Interstate era in the United States from the changes in financing, building, and maintaining bridges in the Middle Ages. Another history article investigated "The Future That Never Was: Lessons from Visions of Transportation," by Christine Cosgrove and Phyllis Orrick, exploring why some inspirational predictions prove faulty.

Two history articles by Robert G. Cullen of the American Association of State Highway and Transportation Officials explored transportation's effects on society, with a biographical article in March–April 2008 on pioneer road advocate Roy Stone and the establishment of rural free delivery and a January–February 2010 examination of baseball and America's streetcars in the 19th century, including the possible derivation of the Brooklyn Dodgers' name from fans dodging the trolleys in front of the ballpark.

Features Global and Mega

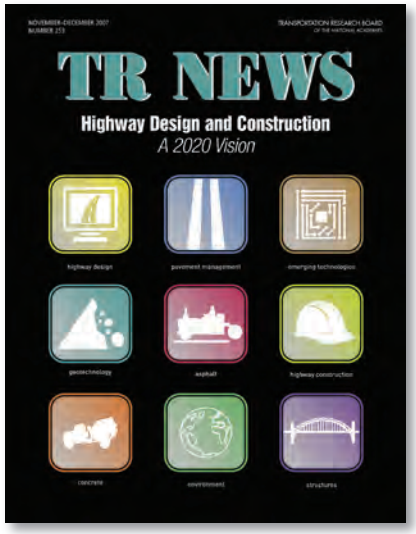
Feature articles also traced the expansion of TRB's international involvement. In a follow-up to the signing of a memorandum of agreement with the European Conference of Transportation Research Institutes (ECTRI), the magazine published a feature by two ECTRI leaders, George Giannopoulos and Pierre Médevielle on developing an international interface for innovation and another by Jorgen Christensen of the Danish Road Directorate on transport research cooperation in Europe, in the July–August 2007 issue.

Giannopoulos and coauthor O. A. Elrahman reported on a joint working group's findings about "Expanding International Research Collaboration" in March–April 2010, and Sandra Rosenbloom, Jorge Prozzi, Martine Micozzi, and Russell Houston contributed an overview titled "Research Without Borders: The Growing Role of International Cooperation and Collaboration at the Transportation Research Board."

A memorable international feature in May–June 2007 by Thomas Jilek, Antonin Fedorko, and Jiri Subrt reported on the flood protections developed for the subway system in Prague, Czech Republic, after disastrous river surges in 2002—a problem encountered in the United States in 2012 with Superstorm Sandy.

Several articles have drawn practical insights from megaprojects, particularly on communicating with the public and coordinating the components to achieve on-time, cost-effective delivery. "In This Together: Collaboration and Communication During the Marquette Interchange Project," by Joseph Schmidt, Toby Peters, Lori Bysong, and Jim Koster, in

In 2007, visualization in transportation and a 2020 vision of highway design and construction joined the list of technology topics that have received theme-issue treatment.



September–October 2008, described an $810-million project's community-sensitive design and construction approach. In March–April 2011, project engineer John R. Bowman wrote about the realignment of the I-40 Crosstown Expressway in Oklahoma City, and Linda Wilson described Missouri's approach to reconstructing an expressway "in the heart of St Louis," avoiding a predicted "carmageddon."

A Point of View editorial in March–April 2007 by Zachary M. Schrag extolled the political and financial risk taking that led to the construction of the Washington, D.C., subway system in "Thinking Big: Lessons from the Washington Metro."

Encore Authors

TRB's volunteer leaders have proved generous contributors of articles. In addition to coauthoring the article on TRB international activities, past Executive Committee Chair Sandra Rosenbloom has written features on such topics as the changing demographics of rural America and the implications for transportation providers (March–April 2003); the equity implications of financing the nation's surface transportation system (March–April 2009); and the safety and mobility patterns of older women in 2030, coauthored with Susan Herbel (September–October 2009).

Technical Activities Council Chair Katherine F. Turnbull has covered market research for transportation agencies (January–February 2004); coordinated a theme issue and contributed a feature on transportation in the national parks (July–August 2004); contributed two sidebar articles on changing demographics (September–October 2009); and revisited the topic of mobility needs in the national parks (March–April 2010).

Past Executive Committee Chair Michael D. Meyer has written on the research foundations of the Interstate Highway System (March–April 2006), the freight transportation industry roundtable (September–October 2006), and a second Strategic Highway Research Program (SHRP 2) tool for incorporating greenhouse gas impacts into decision making (July–August 2012). Other multiple-article contributors include Pisarski, Daniel Sperling, Mary R. Brooks, Jonathan Upchurch, and Richard M. Weed, who in a March–April 2008 Point of View revealed "The Most Important Question in Engineering": how good is good enough? Weed wrote: "Engineers face diverse challenges that often require striking a balance between theory and practicality….Asking the question, 'How good is good enough?' expresses a penchant for practicality that will almost always prove beneficial in the practice of engineering."

The late Thomas D. Larson, 2003 recipient of the Frank Turner Medal for Lifetime Achievement in Transportation, contributed a November–December 2004 article on what he called the Roberts Management and Leadership Model, which "can ensure the cost-effectiveness of a major investment in strategic planning." According to the model, the intersection of vision, organizational capacity, and authorizing environment is necessary to produce the working space for a plan's success.

Prolific staff writers have included SHRP 2 Director Ann Brach, who has offered insights into the then-incipient SHRP 2 renewal program (May–June 2004); described a "Framework for Stakeholder Involvement: Managing Research with a Focus on Users" (July–August 2004); analyzed surface transportation reauthorization and the outcomes and prospects for research (July–August 2005); and identified trends in federal transportation research funding (November–December 2005). SHRP 2 Senior Program Officer Kenneth L. Campbell has written about the program's safety focus area, "Developing Measures to Improve Highway Safety," with Linda Mason, in March–April 2008, and about the naturalistic driving study in September–October 2012.

The January–February 2006 *TR News* featured articles on the 100th anniversary of the New York City subway system and on transportation engineer William Barclay Parsons. New York City Mayor Michael Bloomberg appears in the cover photograph in the center window, at the right.

Standards and Departments

The first issue of each year regularly includes a report from the Technical Activities Division summarizing findings from the annual field visits to state departments of transportation (DOTs) and other transportation agencies; these were renamed state partnership visits in the 2011 installment. Headline phrases tell the ongoing stories, as transportation agencies "meet fiscal challenges" (2004); "test out solutions" as "laboratories for addressing critical issues" (2006); transform "transportation institutions, finance, and workforce" to "meet the needs of the 21st century" (2007); form "partnerships for progress" (2008); "enhance customer service despite cutbacks" (2011); "lead in lean times" (2012); and serve as "implementers of innovation" (2013). The 2006 state visits article introduced the "Did You Know?" sidebar, harvesting unique items of interest about state agency endeavors.

The Profiles column, a regular feature since the magazine's early years, traces the career paths and professional contributions of volunteer leaders in TRB. Many selections proved prescient—for example, Robert M. Johns, profiled in November–Decem-

The first Research Pays Off article appeared in the January–February 1983 issue of *TR News*; the 150th article of the series ran in the March–April 2011 issue.

ber 2005, later chaired the TRB Technical Activities Council and became head of the U.S. DOT's John A. Volpe National Transportation Systems Center; Susan Hanson, profiled in March–April 2008, rejoined the TRB Executive Committee in January 2013 as Division Chair for National Research Council Oversight; May–June 2008 profilee John Broomfield delivered the Thomas B. Deen Distinguished Lecture in January 2013; and Joseph L. Schofer, who became the rare two-time Profile subject in March–April 2011, received the Roy W. Crum Distinguished Service Award in January 2012; his first Profile appeared in the January–February 1983 issue.

The coverage of the TRB Annual Meetings, a staple of the March–April issues, switched to a new format in 2006, emphasizing photographs to convey the energy, interchanges, and presentations at the five-day event.

The Research Pays Off series of articles, which began 30 years ago in the January–February 1983 issue at the request of then–Executive Director Deen, marked its 150th installment in March–April 2011, with an article by Khaled Ksaibati, Matt Carlson, and Don Beard on Wyoming's rural roads safety program. A task force chaired by Senior Program Officer G. P. Jayaprakash recruits and develops the articles to document the cost savings and benefits achieved by transportation agencies through the implementation of research findings. The articles are posted separately on the TRB website as a resource of exemplary practices.[2]

Covers Coverage

Photographs of animals provided unusual covers—the cover of the May–June 2009 theme issue on transportation and the environment showed a closeup of a San Joaquin kit fox, an endangered species threatened by vehicle traffic, and a herd of bison crossed Route 10–Scenic Drive in North Dakota, on the cover of January–February 2010, a photograph taken by Kimberly M. Fisher, Technical Activities Associate Director–Planning, during a state partnership visit.

A rare celebrity sighting on the cover occurred when New York City Mayor Michael Bloomberg appeared riding an early replica subway commemorating the 100th anniversary of the city's system, in January–February 2006. Other memorable cover images included a traffic signal with a satellite view of the earth in place of the red light, for the May–June 2010 issue on curbing transportation's contributions to climate change, and the May–June 2012 image of the bicycle lanes along the center of Constitution Avenue in Washington, D.C., looking toward the U.S. Capitol.

Distinctive covers have included animal subjects: a San Joaquin kit fox and a herd of bison crossing a North Dakota road.

At the Helm

Neil Hawks, appointed chair of the *TR News* editorial board in late 2000, relinquished his role at the end of 2008 to devote full attention to SHRP 2 before his retirement in January 2011. Frederick D. Hejl, Technical Activities Associate Director–Materials and Construction, succeeded Hawks as chair, heading up the oversight, development, and review of content for the magazine. A member of the editorial board since 1993, Hejl is acknowledged as the "father of the theme issue" for championing the approach and for personally coordinating the development or serving as adviser for many theme issues in the past 20 years.

[2]www.trb.org/Publications/PubsResearchPaysOff.aspx.

NEWS BRIEFS

Photo: AAA Foundation for Traffic Safety

State graduated driver licensing systems contributed to a drop in teenage driver fatalities from 2003 to 2010.

Teenage Driver Fatalities Increase

Between 2000 and 2010, traffic fatalities involving 16-year-old drivers decreased by 64 percent, and those involving 17-year-old drivers decreased by 55 percent. According to a report from the Governors Highway Safety Association (GHSA), however, passenger vehicle driver deaths of 16- and 17-year-olds increased by approximately 10 percent in the first half of 2011—from 190 to 211—compared with the same period in 2010.

This is the first time teenage driver fatalities have increased since 2002. In the first six months of 2012, teenage traffic fatalities rose 19 percent, from 202 to 240. Data show 25 states with increased teen driver death rates and 17 states with decreased rates.

According to GHSA, introduction and enforcement of state graduated driver licensing systems and the economic downturn played roles in the decrease in teenage driver deaths from 2003 to 2010.

For the full report, visit www.ghsa.org/html/publications/pdf/spotlights/spotlight_teens12.pdf.

Congestion Costs on the Rise

Congestion costs are on the rise, according to the Texas A&M Transportation Institute's *2012 Urban Mobility Report*. Researchers analyzed data from nearly 500 urban areas of all sizes to determine the cost of traffic congestion in constant 2011 dollars; the cost rose from $94 billion in 2000 to $121 billion in 2011. These figures account for fuel and the costs of lost productivity—in 2011, congestion wasted 5.5 billion hours of extra time and 2.9 billion gallons of fuel.

In many of the regions surveyed, traffic jams now occur at any daylight hour, as well as at night and on weekends. According to the report, the average commuter spent an extra 38 hours in traffic and wasted 19 gallons of fuel in 2011—compared with 16 hours and 8 gallons of wasted fuel in 1982—at a cost of $818 compared with an inflation-adjusted $342 in 1982. Fridays are the worst travel days, and approximately 37 percent of total delays occur at midday and overnight.

For urban areas with populations of more than 3 million, the Washington, D.C., metropolitan area tops the list with 67 hours of congestion delay per commuter per year, followed by Los Angeles, California, and its surrounding areas and San Francisco and Oakland, California. Nashville, Tennessee, led urban areas with populations of more than 1 million in congestion delay, with 47 hours of delay per commuter, followed by Denver, Colorado, and Orlando, Florida. For urban areas with populations between 500,000 and 1 million, Honolulu, Hawaii, had the most congestion delay per commuter—45 hours. With 33 hours per commuter, Worcester, Massachusetts, had the most congestion delay of small urban areas.

To see the entire report, visit http://mobility.tamu.edu/ums/.

INTERNATIONAL

Public Transportation Surges in Urban Australia

Between 1945 and the late 1970s, urban public transportation in Australia declined precipitously as car ownership and suburban development increased. A report from the Australian Government's Department of Transport and Infrastructure modeled urban public transportation between 1976 and 1977 and 2009 and 2010 to provide long-term forecasts to 2030.

Photo: David A. Vila

Transperth train station in Perth, Australia. After a period of decline in the middle of the 20th century, public transit use in Australia has increased rapidly in recent years.

In 1945, total metropolitan public transportation trips topped 1.9 billion. By 1979, this figure had decreased to approximately 992 million; in 2010, Australians took about 1.5 billion public transportation trips. According to the report, between 1977 and 2010 urban public transportation grew from 10.1 billion to 19.1 billion passenger kilometers traveled, an annual growth rate of nearly 2 percent. Public transportation as a share of total passenger travel grew in the cities of Brisbane, Perth, Darwin, and Canberra; in Sydney, Melbourne, and Adelaide, public transportation travel decreased at first but by 2010 had returned to its 1977 levels.

The models illustrated that from the late 1970s to 2004, urban public transportation as a share of total passenger travel stayed at approximately 10 percent. From 2005 to 2010, however, lower fares and less disposable income led to a rise in the share of passenger trips conducted on urban public transportation. According to the models, public transportation's rapid growth will slow—but even with lower growth rates, demand is likely to increase by approximately one-third between 2010 and 2030.

To see the report, visit www.bitre.gov.au/publications/2013/files/report_129.pdf.

Learning and Networking at a Virtual Conference

Communications Group Develops a Practical Model

STEPHANIE CAMAY

The author is a Transportation Planner for Parsons Brinckerhoff, New York, New York, and is Vice-Chair of the TRB Committee Communication Coordinators Council.

Social media have profoundly influenced contemporary culture. These web-based and mobile technologies have transformed electronic communication into interactive dialogue and now account for 22 percent of all time spent online in the United States.

During the recent recession, web-based, virtual events gained popularity, offering an economically and environmentally effective way to convene thousands from anywhere on the globe. Recognizing the value of these technologies in facilitating the sharing of ideas, thoughts, and messages, the Transportation Research Board's (TRB's) Committee Communications Coordinators Council (CCCC) planned and conducted a virtual social media conference in September 2011.

Building a Portfolio

The TRB Technical Activities Council created the CCCC in 2009 to provide communication assistance to TRB standing committees and to share practical information on technologies and techniques. With increasingly limited travel budgets, in-person committee meetings outside of the Annual Meeting and regular midyear meetings are not always feasible. The Technical Activities Council recognized the need to continue the productive dialogues from these in-person meetings and asked each standing committee to designate a communications coordinator to develop and maintain the committee's communication portfolio and to interact with other committees about communication tools. The CCCC, which comprises representatives from the standing committees, provides direction and priorities to the more than 250 coordinators.

The CCCC has kept abreast of new and emerging communication practices at the committee level, as well as in the transportation industry at large. Several informational webinars for coordinators, as well as TRB Annual Meeting workshops, have featured case studies on communication tools and strategies. Topics have included website development, content management, and integrating Web 2.0 technologies, such as wikis—collaborative online resources—and social media.

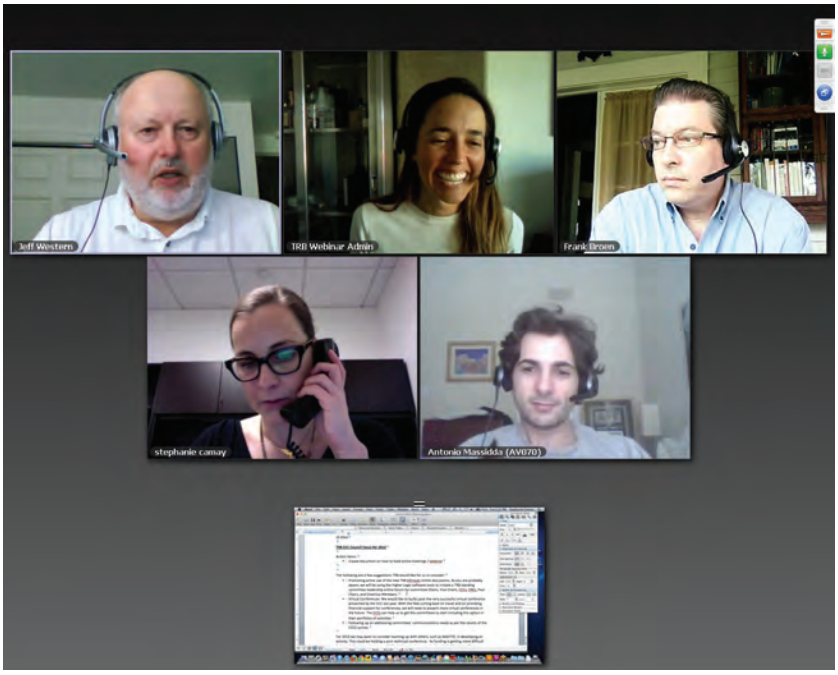
After the success of a workshop at the 2011 TRB Annual Meeting, CCCC Chair Jeffrey Western proposed the next step—holding an online workshop. The council agreed, and planning began for TRB's first-ever virtual conference, addressing the use of social media.

Doing the Research

The council began by researching virtual conference platforms. After demonstrations of several platforms and calculations of the associated costs, the council decided on the GoToWebinar and GoToMeeting software. Although other platforms offered more customization, including such features as webcasts, discussion forums, and virtual poster sessions, a readily available web-based tool was more practical for the scale of TRB's virtual conference. In addition, TRB staff had training in and experience with both GoToWebinar and GoToMeeting.

The planning team then began to develop the conference agenda. Throughout March and April, the team conducted research into the ways that the transportation industry was deploying social media. A 2011 survey of transportation agencies indicated that many organizations were using social media. Among the most popular tools, according to the survey results, were Twitter (82 percent), Facebook (68 percent), and

Council members from locations across the country gather at a virtual meeting of the Committee Communication Coordinators Council (CCCC).



(*Top row, left to right:*) CCCC Chair Jeffrey Western, Brie Schwartz of TRB, and CCCC members Frank Broen, (*bottom row:*) Stephanie Camay, and Antonio Massida.

YouTube (57 percent).

The transportation organizations responding to the survey recognized the importance of these new communication tools, rating social media as more effective than newsletters and only slightly less effective than radio, television, and websites. The results confirmed that many transportation organizations were using social media and that several successful efforts could serve as models and provide guidance for agencies less experienced with the new media. In addition, the social media issues and challenges faced by transportation agencies could serve as lessons learned.

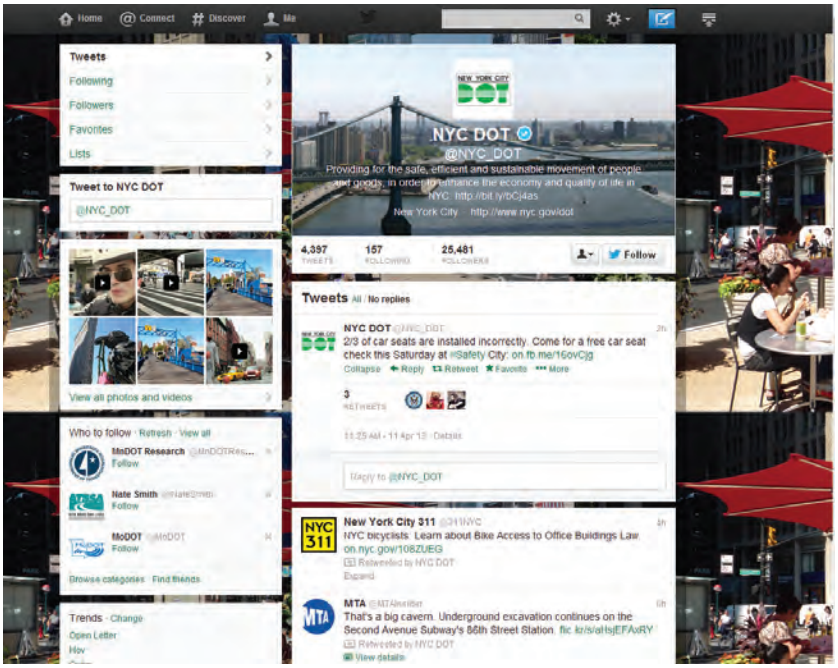
Goals and Programming

The literature reconnaissance and the survey results helped in formulating the goals for the virtual conference:

- To understand how various transportation organizations are using social media and
- To provide assistance and support for improving the use of social media within transportation organizations.

Throughout June 2011, the planning team contacted potential speakers, canvassing their interest, availability, and suggested topics. With this information, the team organized a program with a morning panel discussion on planning and strategizing for a social media portfolio, four concurrent breakout discussions related to the process of establishing a portfolio, four concurrent breakout discussions related to policies, and an afternoon panel discussion on engaging an audience.

After the list of speakers was finalized, the planners scheduled two webinars—one in July and one in August—to discuss conference goals and to provide technology training for the speakers. A Facebook



New York City DOT's Twitter feed is a dynamic, effective use of social media by a department of transportation.

TRB's Webinar Program Nets Success

LISA BERARDI MARFLAK

TRB's webinar program enables transportation professionals to learn online about the latest research findings and applications while participating in a conference-like atmosphere from their own offices. Since 2009, TRB has hosted three to four webinars each month—or approximately 30 to 40 a year. The webinars share information about TRB reports, significant Annual Meeting and other conference sessions, and key subjects requested by standing committees.[a]

Webinar topics are open for nominations; suggestions related to TRB publications or identified by standing committees or project panels receive priority. Webinars run from 90 minutes to two hours in length and include presentations by an expert speaker or panelists, followed by a question-and-answer session with the audience.

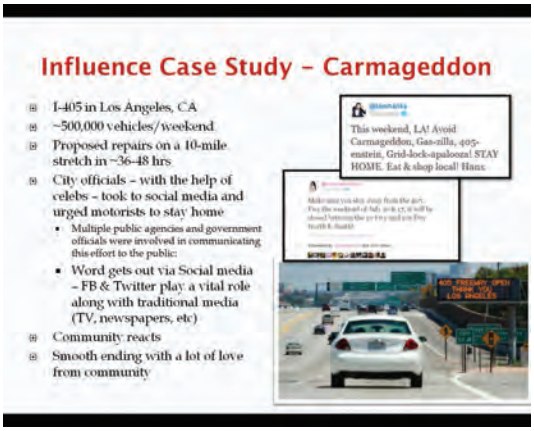
Attendees who maintain professional licenses may be able to meet continuing education requirements by attending select TRB webinars. TRB is authorized to issue professional development hours for live webinars to professional engineers through the Registered Continuing Education Program (RCEP). TRB supplies a certificate of completion to each attendee and reports webinar participation to the RCEP.

TRB also is registered with the American Institute of Certified Planners, the American Planning Association's professional organization, to provide Certification Maintenance credits for certified planners. In addition, the American Association of Airport Executives has approved select TRB webinars as continuing education units for Accredited Airport Executives.

Transportation professionals interested in receiving notices about TRB webinars may subscribe free-of-charge to the weekly *TRB Transportation Research E-Newsletter*. To submit webinar ideas or to ask questions about scheduled webinars, contact Lisa Berardi Marflak at LMarflak@nas.edu, or 202-334-3134.

[a] www.trb.org/webinars.

The author is Program Officer, Electronic Dissemination, TRB.



Presentations at the virtual conference covered topics including the use of social media as an influence builder for transportation projects.

group was created to advertise the conference and to serve as a venue for discussions before the sessions and in followups.[1]

Learning and Networking

After more than eight months of planning, the virtual conference, Keeping Up with Communication Technology: An Online Workshop on the Practical Use of Social Media, was held on Wednesday, September 21, 2011, from 10:00 a.m. to 4:00 p.m. (EST). More than 750 attendees learned about new social media communication tools from transportation industry experts and had the opportunity to network with their peers—just as in a so-called brick-and-mortar or on-site meeting.

The morning and afternoon plenary sessions were open to all attendees, and during the concurrent sessions, attendees broke into smaller groups to discuss topics generated through research and from the survey of transportation practitioners. Each breakout group had a facilitator, a notetaker, and TRB staff technology support. Facilitators used previously developed talking points to guide—but not restrict—the discussions, allowing for open and unstructured explorations with participants.

Continuing the Conversation

The virtual conference proved an overwhelming success. Attendees commented that the program was well organized and well executed and that they liked the variety of speakers and the capability of interacting with the presenters. Participants were able to send live messages or tweets via Twitter during the program, using the conference's hashtag (#TRB-SMC); the conversation has continued and has grown through the Transportation Social Media Facebook Group. Live recordings of all sessions, as well as prerecorded case studies and tutorials, are available online.[2]

With the success of the September 2011 social media conference, TRB is researching virtual conference providers capable of implementing more robust networking options. The CCCC is planning a second virtual conference for 2014 to focus on best practices for web-based conferences and for use of the new tool. As virtual events become more prevalent, transportation practitioners will benefit from learning how to plan for and participate in online conference programs.

[1]https://www.facebook.com/groups/transportationsocialmedia.

[2]www.trb.org/conferences/socialmediaonlineworkshop2011.aspx.

PHOTO: PORT OF TACOMA

The Port of Tacoma, Washington, hosts annual guided boat tours publicized through social media such as Facebook, Twitter, and Flickr.

SECOND STRATEGIC HIGHWAY RESEARCH PROGRAM NEWS

RELIABILITY PRODUCT PILOTS—Teams from transportation agencies in California, Florida, Minnesota, and Washington are pilot-testing core analytical research products from the second Strategic Highway Research Program (SHRP 2) on reducing travel delays caused by unexpected congestion.

On March 21, a workshop at the National Academies' Keck Center, Washington, D.C., allowed teams to demonstrate the analytical products to pilot testing teams and to answer technical questions. The pilot tests will help determine how well the products of several research projects monitor the highway system's reliability, diagnose the causes of unreliability, measure the benefits of treatments to improve reliability and identify the most effective remedies, and evaluate the process to find improvements. Pilot test findings will be available in 2014.

INTELLIGENT REVIEW—Antonio Nieves Torres (*far right*), Federal Highway Administration (FHWA), shares the federal perspective with the Intelligent Construction Systems and Technologies Committee at its first meeting, March 14 at the Keck Center. The committee will review and assess FHWA activities related to the Intelligent Construction Systems and Technologies Program, advise FHWA and the American Association of State Highway and Transportation Officials (AASHTO) on program development, and facilitate communication among researchers and practitioners.

COOPERATIVE RESEARCH PROGRAMS NEWS

Mechanistic–Empirical Model for Top-Down Cracking of Asphalt Pavement Layers

Recent studies have determined that some load-related fatigue cracks in asphalt pavement layers can start at the surface and propagate downward through the asphalt layer. This form of distress cannot be entirely explained by the fatigue mechanisms that cause cracking at the bottom of the pavement. The studies also have suggested hypotheses for top-down cracking mechanisms—bending-induced surface tension and shear-induced near-surface tension—and have developed preliminary models for predicting crack initiation and propagation. Additional research is needed, however, to address the issues associated with top-down cracking and to develop a calibrated, validated, mechanistic–empirical model to incorporate into *Mechanistic–Empirical Pavement Design Guide* procedures.

The Texas A&M Transportation Institute has received a $500,000, 36-month contract (National Cooperative Highway Research Program Project 1-52, FY 2012) to develop a mechanistic–empirical model that will help account for the effects of top-down cracking on performance and improve the analysis and design of flexible pavements.

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

Guidebook for Pedestrian Crossings for Public Transit Rail Services

A guidebook for safe and effective treatments for pedestrian crossings for rail public transit services, including light rail, commuter rail, and streetcar services, will present effective options, considering rail vehicle speed and frequency, geometry of the crossing, sight lines for pedestrians and rail vehicle operators, and operating environment; will include illustrations of treatments and cost ranges; and will provide planning and implementation guidance.

Texas A&M Transportation Institute has received a $250,000, 14-month contract to develop the guidebook, addressing current environments for pedestrians at rail public transit crossings, mobility and safety needs, crossings that include people with disabilities and distracted pedestrians, an inventory of best practices and recent innovations, opportunities for greater consistency of treatments, the potential safety implications of National Environmental Policy Act requirements, guidance for diagnostic field review teams, and effective community outreach and education.

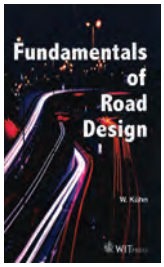
For further information, contact Dianne S. Schwager, TRB, 202-334-2969, dschwager@nas.edu.

COOPERATIVE RESEARCH ALLOCATION—Crawford F. Jencks, TRB (*second from left*), presents information on the status of the National Cooperative Highway Research Program (NCHRP) to (*left to right:*) Harold R. (Skip) Paul, Louisiana Department of Transportation and Development; John S. Halikowski, Arizona Department of Transportation (DOT); Christopher W. Jenks, TRB; Robert E. Skinner, Jr., TRB Executive Director; Frederick G. (Bud) Wright, AASHTO; and Michael F. Trentacoste, FHWA. The AASHTO Standing Committee on Research met in March at the Keck Center to allocate approximately $29.5 million of funds to NCHRP research projects for fiscal year 2014.

BOOK SHELF

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

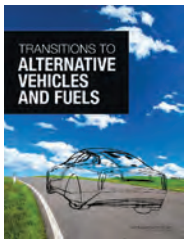
Fundamentals of Road Design



Wolfgang Kuhn. WIT Press, 2013; 327 pp.; $312; 978-18-4564-097-2.

Basic theoretical knowledge and practical requirements and experience for road planning—designing, mapping, calculating, and checking—are presented in this volume. The information integrates current research results in road design and examines development trends in the context of current rules and regulations in Germany. Rural roads are the main focus.

Transitions to Alternative Vehicles and Fuels



National Research Council. National Academies Press, 2013; 170 pp.; $59; 978-03-0926-852-3.

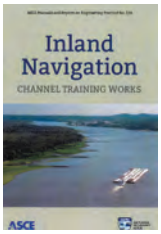
By the year 2050, the United States may be able to reduce petroleum consumption and greenhouse gas (GHG) emissions by 80 percent for light-duty vehicles, according to research from the Board on Energy and Environmental Systems, part of the National Research Council's Division on Engineering and Physical Sciences. A combination of more efficient vehicles; the use of alternative fuels such as biofuels, electricity, and hydrogen; and strong government policies to overcome high costs and to influence consumer choices can lead to deep reductions in GHG emissions.

The Impact of the IIRSA Road Infrastructure Programme on Amazonia

Pitou van Dijck. Routledge, 2013; 320 pp.; $130; 978-04-1553-108-5.

The author investigates the potential socioeconomic and environmental impacts of the Initiative for Regional Infrastructure Integration in South America (IIRSA), a continentwide program that facilitates intraregional trade and improves trade and transportation with world markets. An in-depth analysis focuses on methods to assess the probable effects of road construction in environmentally fragile territories, combines insights from economic and environmental sciences, and presents a critical review of traditional assessments and strategic environmental assessments.

Inland Navigation: Channel Training Works



American Society of Civil Engineers (ASCE), 2012; 171 pp.; ASCE members, $56.25; nonmembers, $75; 978-07-8441-253-4.

This manual of practice presents design guidance on structures that reshape a river channel to create reliable depths and widths for safe and dependable vessel transit. Included in the manual is information on sediment management in river channels, training structures, dikes, revetments, environmental design, repair techniques, and more.

TRB PUBLICATIONS

Special Mixture Design Considerations and Methods for Warm-Mix Asphalt
NCHRP Report 714

A supplement to NCHRP Report 673, *Manual for Design of Hot-Mix Asphalt with Commentary*, this report presents special mixture design considerations and methods for warm-mix asphalt.

2011; 44 pp.; TRB affiliates, $30.75; nonaffiliates, $41. Subscriber categories: highways; materials.

Highway Safety Manual Training Materials
NCHRP Report 715

This report assembles training materials to provide an overview of the *Highway Safety Manual* and its applications. Included on a CD-ROM are presentation slides, participant handouts, interactive sample problems, smart spreadsheets, and more.

2012; 18 pp.; TRB affiliates, $37.50; nonaffiliates, $50. Subscriber categories: education and training; safety and human factors.

Travel Demand Forecasting: Parameters and Techniques
NCHRP Report 716

An update to NCHRP Report 365, this manual provides guidelines on travel demand forecasting procedures and their application to common transportation problems. A range of approaches allows users to determine the level of detail and sophistication in selecting modeling and analysis techniques.

2012; 160 pp.; TRB affiliates, $50.25; nonaffiliates, $67. Subscriber categories: highways; operations and traffic management; planning and forecasting; safety and human factors.

TRB PUBLICATIONS *(continued)*

Scour at Bridge Foundations on Rock
NCHRP Report 717

This report presents a methodology, along with design and construction guidelines, for estimating the time rate of scour and the design scour depth for a bridge founded on rock.

2012; 174 pp.; TRB affiliates, $53.25; nonaffiliates, $71. Subscriber categories: bridges and other structures; geotechnology; hydraulics and hydrology.

Fatigue Loading and Design Methodology for High-Mast Lighting Towers
NCHRP Report 718

Criteria are presented for the fatigue design of high-mast lighting towers. The report also includes a series of proposed revisions to the fatigue design provisions of the American Association of State Highway and Transportation Officials (AASHTO) *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

2012; 130 pp.; TRB affiliates, $47.25; nonaffiliates, $63. Subscriber categories: highways; bridges and other structures.

Practices and Procedures for Site-Specific Evaluations of Earthquake Ground Motions
NCHRP Synthesis 428

Current practice and methods are identified for evaluating the influence of local ground conditions on earthquake ground motions for consideration in design, with a focus on the response of soil deposits to strong ground shaking.

2012; 78 pp.; TRB affiliates, $40.50; nonaffiliates, $54. Subscriber categories: construction; design; geotechnology; highways; railroads.

Geotechnical Information Practices in Design–Build Projects
NCHRP Synthesis 429

How states use geotechnical information in solicitation documents and contracts for design–build highway projects is described, including the allocation of geotechnical risk and the level of information provided with bid documents, geotechnical-related performance testing, and more.

2012; 112 pp.; TRB affiliates, $45; nonaffiliates, $60. Subscriber categories: construction; environment; geotechnology; highways.

Cost-Effective and Sustainable Road Slope Stabilization and Erosion Control
NCHRP Synthesis 430

Information on cost-effective and sustainable road slope stabilization techniques are presented in this report, focusing on shallow or near-surface slope stabilization and related erosion control methods used on low-volume roads. Topic planning, site investigation, erosion control techniques, soil bioengineering and biotechnical techniques, mechanical stabilization, and earthwork techniques are addressed.

2012; 70 pp.; TRB affiliates, $38.25; nonaffiliates, $51. Subscriber categories: environment; highways; maintenance and preservation.

Guidebook for Evaluating Fuel Purchasing Strategies for Public Transit Agencies
TCRP Report 156

This report evaluates risks and offers techniques to minimize the impact of fuel price uncertainties. Also examined are alternative purchasing strategies and steps to implement a risk management program.

2012; 125 pp.; TRB affiliates, $42.75; nonaffiliates, $57. Subscriber categories: public transportation; administration and management; finance.

State of Good Repair: Prioritizing the Rehabilitation and Replacement of Existing Capital Assets and Evaluating the Implications for Transit
TCRP Report 157

Basic steps are outlined for transit agencies to evaluate and prioritize capital asset rehabilitation and replacement investments.

2012; 124 pp.; TRB affiliates, $42.75; nonaffiliates, $57. Subscriber categories: public transportation; planning and forecasting.

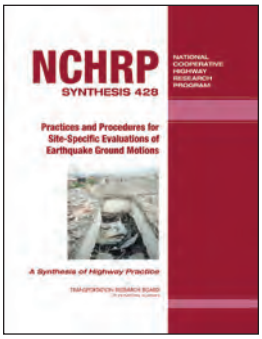
Asset and Infrastructure Management for Airports: Primer and Guidebook
ACRP Report 69

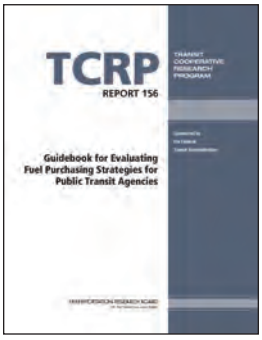
Included in this report are an overview of an asset and infrastructure management program and a study of implementation benefits and costs, with examples from various airports.

2012; 127 pp.; TRB affiliates, $47.25; nonaffiliates, $63. Subscriber categories: aviation.

Guidebook for Implementing Intelligent Transportation Systems Elements to Improve Airport Traveler Access Information
ACRP Report 70

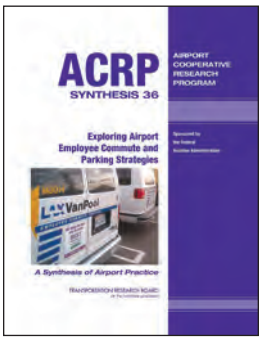
This report details how airport ground access information can be disseminated using various intelligent transportation systems (ITS) technologies. Also included are tables to help airport operators

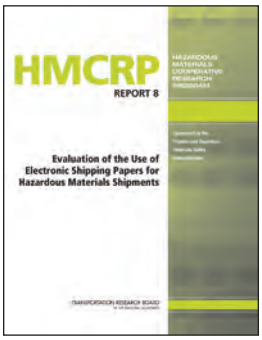


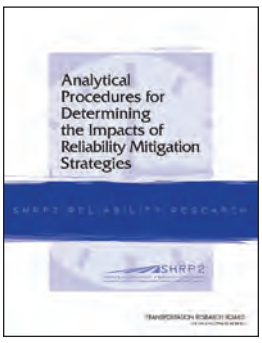


BOOK SHELF

TRB PUBLICATIONS *(continued)*







determine the applicability of certain ITS strategies according to an airport's operational needs and airport size.

2012; 125 pp.; TRB affiliates, $50.25; nonaffiliates, $67. Subscriber category: aviation.

Guidance for Quantifying the Contribution of Airport Emissions to Local Air Quality
ACRP Report 71

Procedures are presented for using air-quality models and onsite measurement equipment to prepare a comprehensive assessment of air pollution concentrations in the vicinity of airports. Designed to help airports respond to regulatory requirements—including those of the National Environmental Policy Act—the report offers information for local communities seeking to develop detailed local air quality assessments. A CD-ROM is included.

2012; 67 pp.; TRB affiliates, $45.75; nonaffiliates, $61. Subscriber categories: aviation; environment.

Exploring Airport Employee Commute and Parking Strategies
ACRP Synthesis 36

This synthesis analyzes airport employee commuting patterns and commuting modes. Alternatives to the drive-alone commute for airport employees, the effectiveness and challenges of commute options programs, and programs offered by nonairport employers are explored.

2012; 70 pp.; TRB affiliates, $36.75; nonaffiliates, $49. Subscriber categories: administration and management; aviation.

Lessons Learned from Airport Safety Management Systems Pilot Studies
ACRP Synthesis 37

This synthesis provides airport operators with data and experience from airports involved in the safety management system (SMS) pilot study, including program management; the design, development, and deployment of SMS; and the challenges to managing and mitigating potential hazards to improve safety performance.

2012; 63 pp.; TRB affiliates, $34.50; nonaffiliates, $46. Subscriber categories: aviation; security and emergencies.

Marine Highway Transport of Toxic Inhalation Hazard Materials
NCFRP Report 18

The possibility of transporting greater volumes of chlorine and anhydrous ammonia shipments on the marine highway system is examined. The report addresses such issues as market definition, return on investment, obstacles, impacts on other modes, and environmental concerns.

2012; 59 pp.; TRB affiliates, $36; nonaffiliates, $48. Subscriber category: marine transportation.

Evaluation of the Use of Electronic Shipping Papers for Hazardous Materials Shipments
HMCRP Report 8

This report examines the challenges of advancing the use of electronic shipping papers as an alternative to the current paper-based hazardous materials communication system.

2012; 98 pp.; TRB affiliates, $42.75; nonaffiliates, $57. Subscriber categories: freight transportation; motor carriers.

Analytical Procedures for Determining the Impacts of Reliability Mitigation Strategies
SHRP 2 Report S2-L03-RR-1

Research is presented on travel time reliability and its prediction, with data collections encompassing travel times, speeds, incidents, weather, work zones, geometric conditions, and implemented improvements.

2013; 256 pp.; TRB affiliates, $58.50; nonaffiliates, $78. Subscriber categories: data and information technology; design; highways; operations and traffic management; planning and forecasting.

Institutional Architectures to Improve Systems Operations and Management
SHRP 2 Report S2-L06-RR-1

This report presents research on the institutional preconditions for effective systems operations management to reduce nonrecurring congestion. Provided is an institutional capability maturity model for culture and leadership, organization and staffing, resources, and partnerships.

2012; 86 pp.; TRB affiliates, $42; nonaffiliates, $56. Subscriber categories: administration and management; highways; law; operations and traffic management.

Incorporating Greenhouse Gas Emissions into the Collaborative Decision-Making Process
SHRP 2 Report S2-C09-RR-1

This report offers information on how greenhouse gas (GHG) emissions can be incorporated into transportation planning and decision making, incorporating background information, trends and factors, various GHG emissions reduction strategies, evaluation of cost-effectiveness, and a technical framework

TRB PUBLICATIONS *(continued)*

for application.

2013; 96 pp.; TRB affiliates, $43.50; nonaffiliates, $58. Subscriber categories: energy; environment; highways; planning and forecasting.

Sustainable Practices, Performance Measures, and Management
Transportation Research Record 2271

The seven papers in this volume explore institutionalizing sustainability, sustainable roadway design and construction, barriers to sustainable intercity transportation, aggregating highway asset performance measures, a web-based freeway and arterial performance measurement system, and enterprise risk management.

2012; 65 pp.; TRB affiliates, $40.50; nonaffiliates, $54. Subscriber categories: administration and management; planning and forecasting.

Maintenance Services and Surface Weather 2012
Transportation Research Record 2272

Presented in this volume are laboratory tests of tire–pavement noise for hot-mix asphalt, wildlife crossing structures location and design, environmentally conscious design of crest vertical curves, in-vehicle exposure to traffic-induced emissions, and more.

2012; 180 pp.; TRB affiliates, $58.50; nonaffiliates, $78. Subscriber categories: maintenance and preservation; operations and traffic management; safety and human factors.

Marine Transportation, Marine Environment, and Port Terminal Operations 2012
Transportation Research Record 2273

Mutually exclusive waterway project scheduling, optimization models for liner ship fleet planning, economic impacts of sea level rise, risk assessments of marine crude oil transportation, and maritime transport in the developing world are among the subjects addressed in this volume.

2012; 135 pp.; TRB affiliates, $51.75; nonaffiliates, $69. Subscriber categories: marine transportation; freight transportation; environment.

Transit 2012, Vol. 1
Transportation Research Record 2274

This volume contains the 2012 Thomas B. Deen Distinguished Lecture by William W. Millar on the future of public transportation, along with papers examining topics such as the distribution of federal transit funds, the travel time impact of missed transit connections, urban transit guidelines, and more.

2012; 200 pp.; TRB affiliates, $60.75; nonaffiliates, $81. Subscriber category: public transportation.

Transit 2012, Vol. 2
Transportation Research Record 2275

Authors present research on light rail turf tracks, light rail crashes, streetcar dwell time, determinants of light rail mode choice, tram–train systems in Europe, urban rail in China, commuter rail level boarding, and more.

2012; 129 pp.; TRB affiliates, $51.75; nonaffiliates, $69. Subscriber categories: public transportation; railroads.

Transit 2012, Vol. 3
Transportation Research Record 2276

Papers in this volume examine world transit research, the optimal length of a transit network, stop aggregation models, secondary benefits of transit priority, transit station parking and transit-oriented design, mobility center optimal site selection, and more.

2012; 163 pp.; TRB affiliates, $55.50; nonaffiliates, $74. Subscriber category: public transportation.

Transit 2012, Vol. 4
Transportation Research Record 2277

The emissions from bus rapid transit and conventional bus systems, spacing of transit stops, discount curbside bus operations, human services transportation, and zoning design for paratransit services are among the topics explored in this volume.

2012; 97 pp.; TRB affiliates, $46.50; nonaffiliates, $62. Subscriber category: public transportation.

Freeway Operations; Regional Systems Management and Operations; Managed Lanes 2012
Transportation Research Record 2278

Research is presented on freeway ramp controls, travel time reliability and nonrecurring congestion, the diverge bottleneck, large-scale incidents on urban freeways, route guidance, variable bridge tolls, traffic flow modeling on a managed lane facility, and other topics.

2012; 193 pp.; TRB affiliates, $58.50; nonaffiliates, $78. Subscriber category: operations and traffic management.

To order TRB titles described in Bookshelf, visit the TRB online Bookstore, at www.TRB.org/bookstore/, or contact the Business Office at 202-334-3213.

The TRR Journal Online website provides electronic access to the full text of more than 13,000 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/TRROnline.*

CALENDAR

TRB Meetings 2013

May

15–17 Road Safety on Four Continents*
Beijing, China

20–22 7th National Seismic Conference on Bridges and Highways*
Oakland, California

June

2–3 10th International Symposium on Cold Regions Development*
Anchorage, Alaska

2–6 30th International Bridge Conference*
Pittsburgh, Pennsylvania

10–12 International RILEM Symposium on Multiscale Modeling and Characterization of Infrastructure Materials*
Stockholm, Sweden

10–12 Meeting State and MPO Information Needs in a Constrained Fiscal Environment: Joint Midyear Meeting for TRB and AASHTO Committees
Washington, D.C.

17–20 7th International Driving Symposium on Human Factors in Driver Assessment Training and Vehicle Design*
Bolton Landing, New York

23–27 International Conference on Ecology and Transportation
Scottsdale, Arizona

July

9–10 National Congestion Pricing Conference*
Seattle, Washington

11–12 8th SHRP 2 Safety Symposium
Washington, D.C.

14–17 8th International Conference on Road and Airfield Pavement Technology*
Taipei, Taiwan

16–19 Workshop on the Future of Road Vehicle Automation
Palo Alto, California

17–19 20th International Symposium on Transportation and Traffic Theory*
Noordwijk, Netherlands

21–24 52nd Annual Workshop on Transportation Law
Nashville, Tennessee

22–25 Transportation: Driving a Sustainable Urban Environment
New Brunswick, New Jersey

30–Aug. 1 Workshop on the Effects of Geometric Design Decisions
Irvine, California

August

4–7 International Symposium of Climatic Effects on Pavements and Geotechnical Infrastructure*
Fairbanks, Alaska

21–23 Roadway Safety Culture Summit
Washington, D.C.

26–27 7th New York City Bridge Conference*
New York, New York

TBD Transportation, Climate Change, Energy Security, and Jobs Conference*
Pacific Grove, California

September

23–27 SmartRivers 2013*
Leige, Belgium, and Maastricht, Netherlands

October

10–11 Shared-Use Mobility Summit*
San Francisco, California

16–17 Transit GIS Conference*
Washington, D.C.

23–25 7th International Visualization in Transportation Symposium: Visualization for Big Data
Irvine, California

TBD Development of a Formalized Process for the Adoption, Development, Maintenance, and Enhancement of TransXML Schemas Workshop
Washington, D.C.

December

12–15 2nd Conference of the Transportation Research Group of India*
Agra, India

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.

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, marine, 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, security, logistics, 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.

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

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

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

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

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

SUBMISSION REQUIREMENTS: Manuscripts submitted for possible publication in *TR News* and any correspondence on editorial matters should be sent to the Director, Publications Office, Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001, telephone 202-334-2972, or e-mail jawan@nas.edu.

- 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.

NOTE: Authors are responsible for the authenticity of their articles and for obtaining written permissions from publishers or persons who own the copyright to any previously published or copyrighted material used in the articles.