

# Steering the Way Through Disruptions and Transformations

Findings from the Transportation Research Board's  
2015 State Partnership Visits Program



Developments and activities in state agencies in 2015 underscored the dual title of one of TRB's emphasis areas for the year—transformative or disruptive technologies. Technological and social developments are generating greater than ordinary uncertainty, for better or worse—or possibly both.

In every mode and in nearly every area of expertise, states are experiencing technological disruptions and transformations. Nevertheless agencies must continue planning, designing, constructing, maintaining, and operating transportation facilities, and other public- and private-sector organizations must continue developing and delivering transportation products and services.

The Internet of things and the big data it generates promise improved reliability and efficiency and the development of entirely new transportation experiences, including fully automated vehicles, but also pose new problems of privacy, safety, and security. Climate change threatens the viability of some infrastructure yet is opening previously impassable marine routes. New energy sources may reduce greenhouse gas emissions but may pose other environmental, safety, and transportation capacity issues.

Will automated cars reduce vehicle miles traveled (VMT), or will VMT increase as “zero occupancy” vehicles cruise on streets that no longer have parking spaces while the vehicle owners are busy with work or at play? Or will shared transportation services mean that most people will not own vehicles? What social impacts will these new technologies and approaches have? How will laws and regulations change? What will be the impacts for transportation agencies?

State departments of transportation (DOTs) not only are asking these questions but are actively seeking answers. Transportation agencies are using new technologies to conduct traditional activities; agencies are engaged with the federal government and with automobile manufacturers in testing and deploying automated vehicle and intelligent infrastructure technologies. State DOTs are planning for increased goods movement across transportation modes and are harnessing data to improve operations and customer services.



PHOTO: STEVE FICHT FOR CHEVROLET

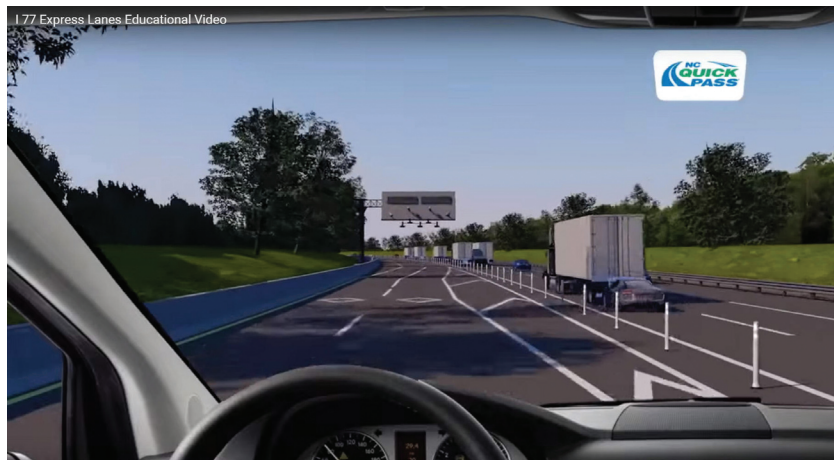
An automated Chevrolet research vehicle (*right*) demonstrates collision avoidance on a city street. New technologies such as connected-automated vehicles constitute a growing area of focus for state departments of transportation (DOTs) and for TRB.



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

tion from the public and private sectors on all modes of transportation.

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



A rendering of the I-77 Express Lanes in North Carolina. Supported by a public-private partnership, the project will help relieve increased traffic congestion in the Charlotte area.

## Institutional Issues

### *Policy, Management, and Leadership*

To address the decline in gasoline tax revenues, Oregon DOT piloted a mileage-based user fee program, OReGo. The up to 5,000 voluntary participants will pay a fee of 1.5 cents per mile instead of the historic fuel tax and will receive a tax credit for used fuel. The Oregon legislature will evaluate the results of OReGo in 2017 and decide on expanding or modifying the program.

North Carolina DOT launched a public-private partnership to develop the I-77 Express Lanes in the Charlotte area; the 26 miles on the Interstate are among the most congested in the state. North Carolina DOT is evaluating two other public-private partnerships for upcoming projects.

### *Planning*

Transportation planners and modelers have struggled against uncertainties since the profession emerged. Planners must deal with many complex issues: climate change, the travel behavior and location choices of the millennials and immigrants, new vehicle and infrastructure technologies, communications and information technologies, and more. Each of these challenges could dramatically change

land development patterns, travel demand, and the types of transportation infrastructure to serve the demand. In combination, these factors can amplify the uncertainties and could redirect transportation planning on an entirely new trajectory.

Improvements and developments in sophisticated analytical tools are providing the specificity to explore the environmental requirements and the behavioral and operational effects of these trends. The models have helped in understanding and forecasting the impacts of changes.

Decision makers, agency leaders, and planners are exploring scenario-planning or sketch-planning tools and approaches. The National Cooperative Highway Research Program (NCHRP) Report 750 Foresight series, *Strategic Issues Facing Transportation*,<sup>1</sup> provides a strong foundation for states interested in scenario planning. Several states are piloting the tools and approaches developed in the NCHRP projects.

### *Legal Issues*

State DOT attorneys are dealing with an array of issues associated with technology and innovation. The safety product litigation related to guardrail design and installation was a main focus. Although these issues are primarily legal, the controversies are political as well. At the summer meeting of the Legal Resources Group, attorneys from state DOTs looked into innovative techniques for settling eminent domain cases and examined issues related to pipelines in Texas.

Addressing the issues associated with connected and autonomous vehicles requires cooperation among a variety of legal disciplines. The legal studies projects of TRB's Cooperative Research Programs are addressing autonomous vehicles, with a Legal Research Digest slated for release;<sup>2</sup> another study is examining liability issues related to shared ride services.<sup>3</sup>

<sup>1</sup> [www.trb.org/Main/Blurbs/171856.aspx](http://www.trb.org/Main/Blurbs/171856.aspx).

<sup>2</sup> [http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_lrd\\_069.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_lrd_069.pdf).

<sup>3</sup> [www.trb.org/Publications/Blurbs/154565.aspx](http://www.trb.org/Publications/Blurbs/154565.aspx).

The National Cooperative Highway Research Program Report 750 Foresight series, *Strategic Issues Facing Transportation*, addresses topics from shifts in demographics to future energy scenarios.







Wind turbine blades often need oversize load permits for transport. Agencies are working to mitigate the impacts of domestic energy production on roads and freight systems.

Several topics loom large for environmental attorneys:

- ◆ In completing National Environmental Protection Act (NEPA) documents, how should agencies analyze the greenhouse gas emissions from proposed projects?

- ◆ What administrative records should agencies compile for responses to NEPA or other Administrative Procedure Act challenges?

- ◆ What effects will the proposed definition of “waters of the United States” in the final rule from the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers have on project permitting?

- ◆ What legal issues will arise as more states take advantage of the NEPA assignment provision in the Moving Ahead for Progress in the 21st Century Act (MAP-21)?

- ◆ How will the streamlining provisions in MAP-21 and proposed highway reauthorization legislation affect the project development process?

heavy-duty vehicles and from the manufacture of transportation-related construction materials.

### Resilience

Providing “a safe and resilient transportation system in an environmentally responsible manner” is a strategic goal of the Vermont Agency of Transportation, which is developing methods and tools for resilience planning. The final product will identify vulnerabilities in the road networks in several watersheds and project their impacts.

Transportation agencies in several states, including Alaska, Arizona, California, Connecticut, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, New York State, Tennessee, and Washington State, participated in Climate Change Resilience Pilots sponsored by FHWA. A series of webinars disseminated the results and lessons learned. The pilots focused on assessing the vulnerability of transportation infrastructure to extreme weather events and on analyzing options for enhancing the resilience of vulnerable locations.

Bridge 19 in Rochester, Vermont, after Tropical Storm Irene. The Vermont Agency of Transportation is developing strategic resilience plans.

### Environment, Energy, and Climate Change

Several state DOTs began developing and updating agreements with the Federal Highway Administration (FHWA) for administering categorical exclusions under NEPA. The agreements must be established or revised by 2019, according to the most recent regulatory update. Agencies also are working to comply with changes in the air quality model guidance and to improve understanding of roadside ecological habitats, as well as mitigation strategies for threatened species.

The transport of oil, natural gas, coal, and other energy resources is a focus as states address the requirements and implications of the various modes of delivery—for example, by road, rail, marine vessel, or pipeline. With increases in freight movement and construction, agencies are working to reduce the environmental and climate change effects of







PHOTO: UNIVERSITY OF MISSOURI-KANSAS CITY



Researchers use an unmanned aircraft system (UAS) to conduct a bridge inspection in Missouri. New technologies present both opportunities and challenges to state DOTs and other agencies.

### Data

With the increased demand for transportation data, states are integrating and deploying data assets and tools to meet customer needs and to inform key decisions. This often requires communicating the data in easily understandable formats. Many states have taken a storytelling approach to present data from geographic information systems (GIS) applications.

- ◆ Maryland generates an annual mobility report integrating traffic count, signal system, vehicle probe, and construction project data to assess network mobility and to identify and resolve bottlenecks.

- ◆ Washington State DOT has integrated roadway inventory and highway operations activities with crash, collision, and ticketing information to provide information to law enforcement and local agencies and to the public.

- ◆ Illinois and Montana have used their roadway inventory information assets to develop a web-enabled permitting process, including route generation, mapping, and instructions, for overdimensioned and overweight vehicles.

Effective governance, management, and business planning processes are key to data programs. Alaska,

California, Colorado, Idaho, Maryland, Minnesota, Ohio, Oregon, Texas, Utah, Virginia, and Washington are leading initiatives in safety data governance. NCHRP Report 814, *Data to Support Transportation Agency Business Needs: A Self-Assessment Guide*, describes approaches for evaluating data programs agencywide and at the program-specific level.<sup>4</sup>

States are obtaining key data through new technologies. Florida and Ohio have used unmanned aerial vehicles to collect data on traffic patterns, and Michigan and Minnesota have used the technology for inspecting assets, such as unpaved roads.

Probe-based data have provided states with a valuable tool for measuring performance; as the coverage and quality improve, the results can help meet the data requirements associated with FHWA's Highway Performance Monitoring System.

Lidar technologies have proved valuable in assembling asset inventories. Utah and Florida have effective statewide programs.

### Aviation

Regulation of unmanned aircraft systems (UAS) continues as a dominant topic in the industry. The Federal Aviation Administration (FAA) has worked with commercial UAS operators, but more needs to be done as UAS use by the general public becomes more common.

Security remains a major focus. Cybersecurity gained emphasis this year, particularly in relation to the deployment of new airspace management technologies under the NextGen initiative to change air traffic control from radar to satellite-based GPS.

Other issues include the pros and cons of transitioning the U.S. air traffic control system to private or quasi-private management; the effects of airline industry consolidation on regional transportation options; and the results of updated research on the community impacts of aviation-related noise.

<sup>4</sup> [www.trb.org/Main/Blurbs/173470.aspx](http://www.trb.org/Main/Blurbs/173470.aspx).

San Diego International Airport is close to many residential neighborhoods. Recent research in the aviation industry has examined the community impacts of aircraft noise.



PHOTO: JOHN PERRY, FLICKR



Through the Missouri River Freight Corridor Development program, Missouri DOT is investing in the river as a major freight passage.

## Freight

TRB highlighted the importance of the U.S. inland waterways freight system in 2015 with the release of Special Report 315, *Funding and Managing the U.S. Inland Waterways System: What Policy Makers Need to Know*. Agencies are supporting economic development and multimodal connectivity projects to stimulate commerce in states that rely on river traffic to convey products for overseas markets.

The Missouri River Freight Corridor Development effort serves as a premier example. The Missouri DOT program is “redeveloping the river as a freight corridor with logical market nodes and reliable service that supports a sustainable market and logistics system.” Focus areas include expanding freight markets, identifying the port infrastructure and equipment requirements to initiate and support river freight services, evaluating potential markets and strategies for expansion, and identifying river management techniques to optimize freight movement.

State DOTs play an important role in the fluidity of the national freight system. Interstate 80, one of the busiest U.S. truck corridors, crosses the continental divide in Wyoming, and the state DOT concentrates resources to keep the Interstate open throughout the winter; nevertheless, closures are sometimes necessary, with a cost of hundreds of thousands of dollars per day to the national economy. With support from U.S. DOT’s Connected Vehicle Pilot Deployment Program, Wyoming DOT is developing applications that will use vehicle-to-vehicle and vehicle-to-infrastructure connectivity to provide travel advisories, roadside alerts, and parking information to minimize the costs.

## Highways

### Design

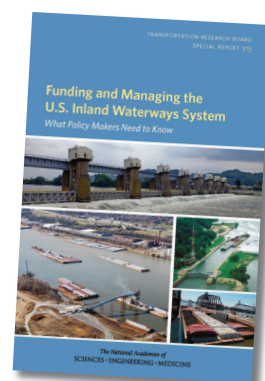
Many state DOTs are working to update their design manuals and practices to produce more sustainable transportation products; the Washington State DOT *Design Manual* and the New York State DOT GreenLITES initiative are examples. These approaches provide functionality for the present without depleting the resources available to future generations. The goals are to protect the environment, manage finances responsibly, and address other societal needs, such as livable communities.

The approach affects the design of stormwater facilities, pavements, bridges, and other structures. The designs consider the materials, the emissions generated, and the life-cycle costs. In addition to the impact on available resources, considerations include the project’s fit in the context of a corridor or community and the safe accommodation of bicycles and pedestrians.

Performance-based seismic design (PBSD) of bridges is an emerging area of research. Developed to determine the reliability of buildings in earthquakes, PBSD can provide a probabilistic, quantifiable method to determine the exceedance of varied and multiple performance objectives. Research is under way to develop the bases for the codes and specifications for applying PBSD to bridge design.

### Construction and Materials

State transportation agencies continue to explore alternative contracting for project delivery, after gaining experience with the processes of preaward procurement and project delivery decision making. States are seeking guidance in administering alternative contracts.



More information on Special Report 315, *Funding and Managing the U.S. Inland Waterways System: What Policy Makers Need to Know*, is available at [www.trb.org/Publications/Blurbs/172741.aspx](http://www.trb.org/Publications/Blurbs/172741.aspx).





PHOTO: WYOMING DOT/WYOMING HIGHWAY PATROL



A crash involving many freight vehicles in Wyoming closes I-80, one of the nation's busiest truck corridors. Wyoming DOT is focusing efforts on developing technology and connected infrastructure to enhance freight fluidity.

Some states have tried alternate design–alternate bid for pavement construction projects, allowing contractor input into the selection of pavement type. An NCHRP synthesis project is under way to document the state of the practice.

Most state agencies lack staff for construction program oversight. In-house staff reductions, coupled with the requirements for documentation beyond construction inspection, have forced agencies to out-source some of the work and to look to new technologies in meeting the responsibilities.

State agencies continue to specify the use of reclaimed asphalt pavement (RAP). Some states are trying to optimize the quantity of RAP as a cost-saving measure while maintaining performance. A few states have allowed reclaimed asphalt shingles as a partial replacement for asphalt binder.

Concern about the age properties of reclaimed materials has led to the development and testing of rejuvenators. An NCHRP synthesis on the use of

RAP and recycled asphalt shingles in asphalt mixtures will provide guidance to agencies,<sup>5</sup> and efforts are under way to refine the American Association of State Highway and Transportation Officials specifications for the use of reclaimed materials in asphalt mixes.

Slide-in bridge construction is gaining popularity, to save construction time, reduce the impacts on traffic, and provide a safer work environment. The second Strategic Highway Research Program Project R04, Innovative Bridge Designs for Rapid Renewal, produced an accelerated bridge construction toolkit<sup>6</sup> that included standard concepts for lateral slide technology, in use by several states.

### Geotechnical Engineering

In 2015, increased precipitation created safety problems along transportation corridors in several states. In Oklahoma pavements were flooded, rockfalls and landslides occurred, and erosion damaged bridge abutments and piers; California experienced a mud-flow and a debris flow; and a rockfall blocked rail-road tracks in Vermont.

The frequency of microearthquakes has increased in some states that allow the use of fracking technology to tap energy resources; a direct link between fracking and the increase in earthquakes, however, has not been found. Oklahoma DOT is developing a protocol, response plan, and postearthquake inspection manual on the seismic stability of bridge foundations.

Approximately 50 percent of all construction claims relate to geotechnical issues. NCHRP has published a synthesis on the influence of geotechnical investigation and subsurface conditions on claims, change orders, and cost overruns.<sup>7</sup>

A few state DOTs have explored geotechnical asset management to complement transportation asset management (TAM) initiatives; several states have developed a variety of management practices for geotechnical assets. A new NCHRP project is developing an implementation plan to assist transportation agencies in incorporating geotechnical asset management into TAM.<sup>8</sup>

Interest in techniques that improve data gathering has prompted some state DOTs to test thermal integrity profiling as a tool for the quality assurance and quality control of drilled shafts. The early results have been encouraging.



PHOTO: WIKIMEDIA COMMONS

A transportation agency conducts a bridge inspection. Performance-based seismic design is an emerging area of research.

<sup>5</sup> <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3794>.

<sup>6</sup> [www.trb.org/Main/Blurbs/168046.aspx](http://www.trb.org/Main/Blurbs/168046.aspx).

<sup>7</sup> NCHRP Synthesis 484, [www.trb.org/Main/Blurbs/173907.aspx](http://www.trb.org/Main/Blurbs/173907.aspx).

<sup>8</sup> <http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4065>.

## Maintenance and Preservation

State DOTs continue to develop maintenance-related performance measures, not only for pavements and bridges but for many auxiliary assets, with a focus on linking maintenance and preservation activities with asset management systems. The link is essential for determining the return on investment from preservation and maintenance activities both in cost savings and in extending the service life of assets.

Agencies are expanding the use of automated data collection to measure the condition of roadside assets such as signs, guardrails, and striping. Advances in technology allow agencies to equip maintenance field personnel with handheld devices for planning work based on location-specific asset condition and treatment.

Many maintenance departments face challenges in recruiting and retaining a well-trained workforce. Utah DOT has developed a transportation technician qualification program to address workforce training and development. The program combined the construction and maintenance technicians into a single pool and defined a process for linking training requirements and levels of pay.

## Highway Operations

Connected-automated vehicle technologies and issues are emerging quickly and have the potential to spur revolutionary change, not only for highways but across all modes. The impacts affect transportation operations, land use, safety, roadway geometric design, pavements, bridge design, transit and transit operations, freight and goods movements, and more.

The next generation of vehicle automation is arriving soon, as automobile manufacturers and suppliers are advancing and testing the ability of vehicles to drive themselves under certain conditions—for example, in stop-and-go congestion, on freeways, and on low-speed local roads. Because of this technology shift, consumer technology companies, such as Apple, are considering entry into the transportation market.

Vehicle automation is expected to advance the sharing economy, perhaps to offer new travel alternatives, such as automated rideshare and carshare options. Some forecasts project declines in private car ownership and in per capita driving.

Public agencies are exploring the possible impacts of the multiplying technologies related to automated vehicles. Some state DOTs are developing strategies to prepare for implementation.

Other developments in the operations area include applications of real-time data on traffic signal phase and timing—referred to as SPaT data—that can be broadcast at signalized intersections and



PHOTO: CHRISTOPHER KOEHL/CALTANS

received by vehicles, enhancing mobility and safety. Integrated corridor management allows operational coordination between networks along a corridor, so that transportation agencies can manage the total capacity of a corridor to reduce congestion and increase travel time reliability.

## Safety

After a steady decline in the number of roadway fatalities and serious injuries for more than a decade, the United States recently experienced a troubling increase. Although evidence suggests that the improved economy is contributing to the increase, with more cars on the roadways, states continue to seek out the most effective ways of reducing the number of serious crashes, drawing on a variety of infrastructure and behavior-related countermeasures. Many states are employing new methods for identi-

A 1.5-mi mudslide on SR-58 near Bishop, California, in October 2015 stranded more than 200 vehicles. Mud flowed over the median barrier onto a railroad right-of-way below; Caltrans employees and emergency contractors cleared and reopened the highway less than one week later.

A Chevrolet vehicle demonstrates pedestrian crash-avoidance technology.



PHOTO: STEVE FEGHT/CHEVROLET





Florida DOT's "Alert Today, Alive Tomorrow" is part of a comprehensive effort to improve safety for vulnerable road users.

fying solutions with the greatest potential to reduce fatalities and serious injuries.

The Idaho Transportation Department (ITD) uses an innovative, data-driven program for the safety analysis of highway corridors to set priorities for funding safety improvement projects that can greatly reduce fatalities and injuries. Improvements include narrowing lane widths to widen shoulders, signal timing adjusted to weather conditions, and variable speed limits. ITD recently launched a program to reduce impaired driving by influencing community norms. Idaho is exploring options to apply this approach to deter other risky driving behaviors.

Florida DOT received two National Roadway Safety Awards in 2015, one for the innovative Advanced Lighting Measurement System, which addresses the significant number of nighttime crashes, and the other for the Safe Mobility for Life Coalition, which addresses the increase in crashes involving aging drivers.

To improve safety for vulnerable roadway users, Florida has taken a holistic approach to reduce pedestrian and bicycle fatalities and injuries. The initiative includes a comprehensive complete streets policy, increased enforcement, and the "Alert Today, Alive Tomorrow" educational campaign.

## Ports and Waterways

With the expanded Panama Canal locks slated to open in early 2016, East and Gulf Coast seaports and state DOTs have been preparing their infrastructure for the prospect of increased capacity demands on freight transportation networks. The expansion project creates an additional lane for larger vessels through the Panama Canal, effectively doubling the waterway's capacity.

Many ports, such as the Port of Miami, have updated their infrastructure to accommodate post-Panamax vessels.

Previously the locks served vessels with a capacity of up to 5,000 twenty-foot equivalent units (TEUs) of cargo. With the expansion, larger vessel classes carrying up to 13,000 TEUs will be able to call on U.S. ports in the Gulf and along the Eastern Seaboard.

Several major U.S. projects are under way at port cities to accommodate the larger vessels and the expected surges in landside cargo. The Port of Miami has invested in new cranes, a direct rail link, a tunnel for highway access, and a harbor dredging project to increase capacity. A project to raise the deck of the Bayonne Bridge in the Port of New York and New Jersey will allow larger ships to access modernized, rail-connected terminal facilities and is due for completion in 2017.

Seaports from Houston to Boston are making investments in terminals and pressing for federal dredging projects to increase the channel dimensions to accommodate larger ships. States have leveraged U.S. DOT's Transportation Investments Generating Economic Recovery—or TIGER—grant program to bolster intermodal highway connections and rail access to seaports.

## Rail

### Passenger Rail

Increases in state support of medium-distance rail corridors—less than 750 miles long—continued in 2015. The legislation mandating the additional support allows state DOTs to contract for services from vendors besides Amtrak. Indiana DOT exercised that option this year in contracting part of the operation of the Hoosier State service between Indianapolis and Chicago. Other states are looking for alternative providers to improve service and save money.

Construction of the long-awaited California high-speed rail system has begun in Central Valley. The service will connect San Francisco and Los Angeles with a 520-mile system that is to be completed in 2028. This is the first new dedicated high-speed rail system to start construction in the United States; others are planned for Texas and Florida.

### Freight Rail

Amid continued concerns about the safety of shipping significant quantities of hazardous fuels by rail, state DOTs concentrated on fostering cooperation between rail carriers and emergency responders. Efforts include sharing shipment data with local authorities to help in planning for potential emergencies.

State DOTs also are participating in programs to reduce pedestrian and trespasser fatalities on rail lines. Collision fatalities at highway-rail grade crossings have declined dramatically in the past two decades, but pedestrian and trespasser fatalities have not. Rail-



PHOTO: PORT OF MIAMI CRANE MANAGEMENT, INC.

roads and states are trying to reduce these accidents through education and enforcement, but the popularity of using digital cell phone cameras on and around railroad tracks is making the effort difficult.

## Public Transportation

The effect of connected and automated vehicles on transit use and the role of public transportation in health and wellness are emerging as issues. Many transit professionals believe that automated cars could solve the problem of last-mile travel from station to destination. For example, a commuter could drive to a station, send the car home to park, and summon it later for pickup.

Medical and health organizations are opening up to partnerships with transportation providers to reduce health care costs. Missed screenings, missed appointments, and lack of access to pharmacies and grocery stores can affect wellness, and the medical community is recognizing public transportation's role in health care delivery.

Public transportation agencies are continuing to make capital investments. For instance, Houston, Texas, opened two new light rail transit (LRT) lines in May 2015, linking to the University of Houston and adding significantly to the LRT network. Hartford, Connecticut, opened a new bus rapid transit facility in spring 2015. One rider thanked the management for the improved connectivity, which allowed her to travel to medical appointments.

In November, the TRB Standing Committee on Light Rail Transit cosponsored the 13th International LRT and Streetcar Conference with the American Public Transportation Association. Themes included



PHOTO: REAPREPRESS, WIKIMEDIA COMMONS

new vehicle designs, off-wire operation, improved battery storage, and the resurgence of trolleys. On the technology front, new public transportation applications of information technology, social media, and GPS-based information systems are continually gaining introduction.

Houston MetroRail's new Purple Line conducts test runs along Rusk Street in the downtown area.

## A Time for Discoveries

As these reports show, the challenges and opportunities facing transportation require a multimodal and interdisciplinary approach. Freight movement may be the most obvious area in which multimodal impacts call for multimodal solutions; in passenger movement, the distinctions between private automobile use and public transportation are being blurred.

Information technology companies and health care providers are clearly stakeholders for transportation agencies—and vice versa. New relationships are being developed and new institutional arrangements are emerging. This is a time for discoveries in transportation.

## Did You Know?

- ◆ Ohio has the second largest number of bridges of any state in the nation, with 42,412 more than 10 feet long, and enough roadways to go around the Equator 10 times—258,773 lane miles.



PHOTO: WIKIMEDIA COMMONS

A barge on the Ohio River.

- ◆ The Ohio River carries 63 million tons of annual commodities—more cargo tonnage than the Panama Canal (see photo, left).
- ◆ The Massachusetts Bay Transportation Authority has launched an online survey that will allow customers to vote for their favorite mass transit apps.<sup>a</sup>
- ◆ In 2000, Massachusetts DOT held its first two conferences on pedestrian and bicycle travel. The programs have continued, and attendance has grown from 50 at the first conference to more than 700 at the 2015 Moving Together Conference. The conference brings together leaders in planning, public health, safety, and other fields to discuss biking and walking in Massachusetts.<sup>b</sup>

<sup>a</sup> <http://blog.mass.gov/transportation/mbta/mbta-survey-choose-your-favorite-app/>.

<sup>b</sup> [www.movingtogetherma.org/index.html](http://www.movingtogetherma.org/index.html).