Smart Growth America
Making Neighborhoods Great Together

State
Smart Transportation
Initiative

The Innovative DOT

A handbook of policy and practice

January 2014

Smart Growth America
Making Neighborhoods Great Together

State
Smart Transportation
Initiative

This handbook is a product of Smart Growth America and the State Smart Transportation Initiative.

Smart Growth America is the only national organization dedicated to researching, advocating for and leading coalitions to bring smart growth practices to more communities nationwide. From providing more sidewalks to ensuring more homes are built near public transportation or that productive farms remain a part of our communities, smart growth helps make sure people across the nation can live in great neighborhoods. For additional information visit www.smartgrowthamerica.org.

The State Smart Transportation Initiative, a network of 19 state DOTs, promotes transportation policies and practices that advance environmental sustainability and equitable economic development, while maintaining high standards of governmental efficiency and transparency. Housed at the University of Wisconsin, SSTI operates in three ways: as a community of practice, where participating agencies can learn together and share experiences as they implement innovative smart transportation policies; as a source of direct technical assistance to the agencies on transformative and replicable smart transportation efforts; and as a smart transportation resource to the wider transportation community, including local, state, and federal agencies. Learn more at www.ssti.us.

This report was produced with the generous support of the Rockefeller Foundation.

The Rockefeller Foundation fosters innovative solutions to many of the world's most pressing challenges, affirming its mission, since 1913, to "promote the well-being" of humanity. Today, the Foundation works to ensure that more people can tap into the benefits of globalization while strengthening resilience to its risks. Foundation initiatives include efforts to mobilize an agricultural revolution in Sub-Saharan Africa, bolster economic security for American workers, inform equitable, sustainable transportation policies in the United States, ensure access to affordable and high-quality health systems in developing countries, accelerate the impact investing industry's evolution, and develop strategies and services that help vulnerable communities cope with the impacts of climate change. For more information, please visit www.rockefellerfoundation.org.

The Rockefeller Foundation, 420 Fifth Avenue, New York, NY 10018

This project was also supported by the U.S. Department of Transportation and the Federal Highway Administration.

Any errors and all interpretations are the responsibility of Smart Growth America and the State Smart Transportation Initiative. Please direct questions about this handbook to Roger Millar, PE, AICP, Vice President, Smart Growth America at (406) 544-1963, rmillar@smartgrowthamerica.org or Eric Sundquist, Managing Director, State Smart Transportation Initiative at the University of Wisconsin, (608) 265-6155, erics@cows.org.

Acknowledgements

This project was made possible by the following organizations and individuals.

Project Team

Geoff Anderson, President and CEO, Smart Growth America*
Rayla Bellis, Research Associate, Smart Growth America*†
Alex Dodds, Deputy Director of Communications, Smart Growth America*†
Mary Ebeling, Transportation Policy Analyst, State Smart Transportation Initiative*†
Anthony Gad, Policy Director, Center for State Innovation (University of Wisconsin)*
Ann Grodnik, Senior Associate, Center on Wisconsin Strategy (University of Wisconsin)*
Bill Holloway, Transportation Policy Analyst, State Smart Transportation Initiative*†
Lisa M. MacKinnon, Editing Services†
Tom Madrecki, Press Manager, Smart Growth America*
Chris McCahill, Senior Associate, State Smart Transportation Initiative†
Roger Millar, PE, AICP, Vice President, Smart Growth America*†
Daniel Moser, Research Assistant, State Smart Transportation Initiative†
Sam Munger, Managing Director, Center for State Innovation (University of Wisconsin)*
Eric Sundquist, Managing Director, State Smart Transportation Initiative*†
Robbie Webber, Senior Associate, State Smart Transportation Initiative*†

The following consultants provided research and writing support:

Kittelson & Associates, Inc.*
Mary Raulerson, Principal Planner; Joel Mann, Senior Planner; Conor Semler, Planner.

Nelson/Nygaard Consulting Associates*
Karina Ricks, Principal; Stephanie Wright. Senior Associate; Lisa Jacobson, Associate.

Spitfire Strategies*
Beth Kanter, Vice President; Lisa Falconer, Director; Samantha Yale, Senior Account Executive.

Project Advisors

The research design and content of this handbook benefited greatly from an advisory committee of experts. These experts provided feedback and guidance at critical stages in the project. The committee consisted of:

Allen Biehler (Chair)*†	Former Secretary, Pennsylvania Department of Transportation.
Gene Coni†	Former Secretary, North Carolina Department of Transportation.
Paul Morris*†	Deputy Secretary, North Carolina Department of Transportation.
Adetokunbo “Toks” Omishakin*	Assistant Commissioner/Chief of Environment and Planning, Tennessee Department of Transportation.
Lynn Peterson*	Secretary, Washington State Department of Transportation

In addition, Smart Growth America and The State Smart Transportation Initiative would like to thank the following individuals who provided feedback on this handbook:

Niles Annelin, Michigan Department of Transportation*
Rob Balmes, Michigan Department of Transportation*
Lina Chapman, Michigan Department of Transportation*
John Corbin, Wisconsin Department of Transportation†
Jason Clark, Michigan Department of Transportation†
Bola Delano, Illinois Department of Transportation†
Aarne Frobom, Michigan Department of Transportation*
Chris Hundt, Michigan Department of Transportation*
Polly Kent, Michigan Department of Transportation*†
Chris McNeilly, Michigan Department of Transportation*
Michelle Myers, Michigan Department of Transportation*†
Coy Peacock, Nevada Department of Transportation†
Jim Ritzman, Pennsylvania Department of Transportation*
Jennifer Toth, Arizona Department of Transportation*
Kim Young, Michigan Department of Transportation*

Additional Contributors

Smart Growth America and the State Smart Transportation Initiative would also like to acknowledge the following individuals for their contributions to this project: Allen Greenberg/U.S. Department of Transportation*; Matthew Garrett/Oregon Department of Transportation†; Philip Caruso/Institute of Transportation Engineers†; Billy Fields/Texas State University†; Kristine Absher/Atkins†; Maren Outwater/Resource Systems Group†; Erika Rush/Urban Engineers†; Debbie Kolp*; Barbara McCann/McCann Consulting*; Stefanie Seskin and Catherine Vanderwaart/The National Complete Streets Coalition*; and Nicholas Chang, Sarah Chatterson Absetz, Moira Gillick, Shelly Hazle, Jessica Holmberg, Iqbal Khaiy, Masumi Kikkawa, Ella Krivitchenko, Jeri Mintzer, Elizabeth Schilling and Zachary Smith/Smart Growth America*.

Photo Credits

Cover: “Sierra Madre Villa Station, Pasadena, California at Freeway 210.” By Prayinto via Flickr.
Focus Area 1: “Visiting the new work site - One NoMA Station.” By bankbryan via Flickr.
Focus Area 2: Perimeter Center Parkway in Atlanta. Photo by the Atlanta Regional Commission.
Focus Area 3: “Southbound I-15 past Layton Parkway.” Photo by Country Lemonade via Flickr. Focus Area 4: Ramp meters in the Minneapolis/St. Paul area. Photo by Michael Hicks via Flickr. Focus Area 5: “People Crossing the Street.” Photo by Dave Hoefler via Flickr.
Focus Area 6: “UP 5525 Crosses Washington Street in West Chicago.” Photo by vxla via Flickr.
Focus Area 7: “Community Planning.” Photo by La Citta Vita via Flickr.
Focus Area 8: “Mercer Corridor Project Aerial December 2011.” Photo by Seattle DOT via Flickr.

* First edition
† Second edition

The Innovative DOT

A handbook of policy and practice

Smart Growth America and the
State Smart Transportation Initiative

January 2014

Contents

1 Introduction
5 User's Guide to This Handbook
8 Focus Area 1: Revenue Sources
10 Identify Mechanisms for Funding Non-Roadway Transportation
19 Implement Value Capture
26 Establish a Next-Generation User Fee

32 Focus Area 2: Revenue Allocation and Project Selection
34 Establish Revenue and Funding Flexibility: Mode-Neutral Evaluation and Funding Distribution
40 Incorporate Asset Management
47 Develop a Performance- and Outcome-Focused Project Selection Process
56 Remove Barriers to Off-System Investments
59 Update Funding Formulas and Implement Competitive Fund Distribution for Smart Transportation

66 Focus Area 3: Pricing
68 Use Variable Tolling to Manage Demand
76 Implement Pay-As-You-Drive Insurance

81 Focus Area 4: Increasing Transportation System Efficiency
83 Reform Level of Service
89 Use Practical Design and Context Sensitive Solutions
100 Improve Street Connectivity
106 Modernize Access Management Standards
112 Use Transportation Demand Management
117 Invest in System Management

123 Focus Area 5: Improving Options for Mobility and Access
125 Make Urban and Metropolitan Transit a Key Partner
130 Support Statewide Transit for Job Access and Economic Growth
134 Enact Policies That Support Complete Streets
141 Provide Leadership in Promoting Bicycle and Pedestrian Travel
150 Update Design Policies and Standards

157 Focus Area 6: Providing Efficient, Safe Freight Access
159 Support Freight Rail Service
166 Support Intermodal Freight Connections
171 Foster Win-Win Outcomes for Freight and Passenger Rail
177 Encourage Innovative Freight Delivery

183 Focus Area 7: Integrating Transportation and Land Use Decision-Making
185 Pursue Policies That Integrate Transportation and Land Use Decision-Making
191 Conduct Scenario Planning
198 Improve Public Facility Siting
203 Coordinate Infrastructure Investments Across Agencies
208 Promote Transit-Oriented Development
213 Incorporate Climate Change Resilience into Long-Range Planning

217 Focus Area 8: Improving DOT Processes
219 Set and Achieve Comprehensive Goals for Transportation Investments
224 Streamline Project Development and Delivery Processes
230 Improve Agency Organization and Initiate Cultural Change

Introduction

State officials across the country are facing the same challenges. Revenues are falling and budgets are shrinking while transportation demands grow. The traditional means of funding and delivering transportation services are no longer adequate, jeopardizing the path to tomorrow's economy. The only answer is innovation.

Forward-thinking state and agency leaders know that to remain competitive, we must make changes to our transportation systems and update the transportation decision-making process. Though change can be intimidating, it is both possible and essential — as many officials across the country can attest.

States and their departments of transportation (DOTs) are rising to and overcoming the challenges they face. They are improving existing services in the short term and planning effectively for the long term. They are adopting innovative yet pragmatic reforms. They are reevaluating and retooling traditional practices to ensure that those practices continue to provide users with a robust, economically beneficial transportation network. These leaders and agencies are better meeting the needs of their residents, galvanizing political support for their work, and supporting the future prosperity of their state. Their success offers a model for others to follow.

A call to action for transportation officials

Transportation is at the center of the economy and greatly influences our quality of life. It determines how our states, cities, towns, and neighborhoods function, both now and in the future. Americans spend almost 20 percent of their personal income every year just to get around, and transportation plays a major role in people's choices about where to live and work.

Most state DOTs' goals are ambitious: improve safety, reduce congestion, enhance economic opportunity, improve reliability, preserve system assets, accelerate project delivery, and help to create healthier, more livable neighborhoods, just to name a few. These goals would be daunting even if money were no object, but dwindling conventional federal and state transportation funding makes these goals even harder to achieve.

Smarter transportation investments are both possible and popular: the challenge is determining where to begin.

As a result, DOTs across the country are changing the way they do business. Knowing that America's transportation network is crucial to economic growth and our everyday lives, agencies are taking new approaches to transportation that fit the unique demands of their states and that provide greater benefits at less cost. Each DOT is doing this in its own way: some are focusing solely on increasing revenues; others are maximizing efficiency; many are doing both. And they are working together; state leaders are building coalitions with their peers to keep up with best practices and learn from one another.

About this handbook

This handbook collects the innovative approaches that state transportation leaders are already using to make systems more efficient and effective in today's challenging economy. Smarter transportation

investments are both possible and popular; the challenge is determining where to begin and to whom to reach out for support and guidance.

Every state is different, from the political climate to the age and condition of its existing transportation systems. There is no silver bullet transportation recommendation that fits all 50 states. However, state officials can learn from other DOTs that have successfully charted a new course for transportation in their state. A few common keys to success include:

- **Create a collaborative atmosphere and culture within the organization.** Leaders set the tone for an organization, but the best ideas often come from lower down in the ranks. Successful transportation reform hinges on encouraging and rewarding ideas, innovation, and initiative. This often means breaking down the rigid hierarchy that is endemic to many DOTs at state, county, and municipal levels. Changing this culture can be as simple as inviting employees to converse with leadership, or recognizing good work among peers. Internal champions are vital to advancing reform.

- **Include stakeholders and partners beyond the agency.** Transportation is no minor issue; it affects housing choice, provides access to education, supports commerce, and ultimately is a key determinant in the long-term strength of a region and its ability to attract and sustain growth. State DOTs, therefore, have a strong incentive to work with other state agencies and outside bodies to extract the greatest possible benefit from their combined efforts. Legislators and executives can help state agencies work more efficiently and effectively by finding common ground between them and supporting the reforms necessary to sustain and improve these vital systems. Housing, development, environment, and other agencies can leverage the resources of each other to accomplish shared goals. This not only builds support across agencies, but also builds trust with voters in the ability of government to collaborate and to coordinate efforts.

- **Break down silos between DOT administrations and across agencies.** States, their transportation agencies, and the leaders within them are all working toward the same objective—a safe system that supports a vital economy and a healthy community. Breaking down silos and establishing a true team dynamic directs resources and energy toward the same end, saving time and money while engineering more innovative solutions.

- **Understand how decisions are made within the agency.** To implement reforms successfully, there must be a commitment to proposed changes that extends beyond the agency leadership level. Making the decision-making processes more transparent and understandable can engender trust among staff and management and promote a greater commitment to accomplishing reforms.

- **Prioritize solutions for reform.** This handbook highlights many strategies for reform and improvement, and it might be tempting to launch several new initiatives at once. This is not advised. Rather, consult with both internal and external stakeholders to strategically choose the challenges/reforms to tackle and the solutions to pursue. Remain focused, and provide the support staff required to implement and deliver the desired results. Remain engaged, celebrate successes, and keep the momentum going—even when reforms must be abandoned and new attempts begun.

A word from Al Biehler, former Secretary of the Pennsylvania Department of Transportation

As Secretary of the Pennsylvania Department of Transportation for eight years, I was responsible for a $7 billion annual budget, 40,000 miles of roads, 25,000 bridges, and 11,000 employees. Our actions affected not only the DOT, but the entire state. As DOTs across the country face shrinking budgets and higher expectations, I understand the challenges you face and the difficult decisions you must make.

When I became DOT Secretary in 2003, Pennsylvania was in the process of updating its capital improvement program. We had 26 expansion projects with a $5 billion price tag. At the same time, our roads and bridges were crumbling and we couldn't maintain our infrastructure. After an honest evaluation, we came to a stark realization—we couldn't keep spending money we didn't have on projects that didn't protect our assets. In short, revenue constraints, system conditions, and the changing demands of our economy meant we had to change the way we did business.

Many states have come to this same conclusion: DOTs must change their strategic approach to make smarter investments, to wring more and better performance out of their existing systems, and to critically evaluate the full range of possible future investments. We must focus on those projects that do the most good for the least money.

Through our demonstrated ingenuity and accountability, we must build the trust of our constituents to provide funding levels that meet the transportation needs of our future economies and communities. Accomplishing such a lofty goal starts with adopting innovative solutions and staying up-to-date about best practices nationally. That is why Smart Growth American (SGA) and the State Smart Transportation Initiative (SSTI) created this handbook.

This handbook provides a comprehensive list of reforms that will make a significant difference in your state's transportation system. It gives examples of states that have put these ideas into practice effectively and tells you what you need to do to achieve success. And when you are ready to implement these strategies, SGA and SSTI have resources to assist you.

With 34 reforms outlined in this handbook, where should you start? The short answer: anywhere. The handbook is intended as a guide, not a checklist. Identify and prioritize the reforms that make the most sense for you, based on your goals and desired outcomes. Don't try to take on too many all at once. In Pennsylvania, once we eliminated or reconfigured expansion projects, our first priority was preserving and repairing the roads and bridges we already had. After we addressed those issues, we broadened our focus to include transit, biking, and walking. We took chances and implemented pilot programs to encourage municipalities and metropolitan planning organizations (MPOs) to experiment with smart transportation projects, and I'm confident our state is better for it.

I encourage you to use this handbook to examine your state's transportation needs and better prioritize solutions moving forward. Some questions to ask yourself along the way:

- How can my department work with other agencies to be most effective?
- What opportunities can I pursue that will help my state create jobs and improve the economy?
- How can I integrate transportation, land use, and economic development decisions in order to maximize the benefit from all three?

- How can I provide travelers and shippers the best access to destinations, at the least cost in terms of dollars, time, and environmental/community impact?

This handbook's ideas will help you answer these questions and many more. It will allow you to transform your transportation system, even in a challenging economy, and add the value your users demand.

Make no mistake, the changes we made in Pennsylvania took time and patience, and—perhaps most important—the input and support of staff and policymakers, but the results were more than worth the effort. Because PennDOT was willing to refocus its priorities, we were able to clearly demonstrate the positive impact that smart transportation can have on economic development, jobs, and sustainability.

I wish you the same success.

Sincerely,

Al Biehler
Former Secretary
Pennsylvania Department of Transportation

A personal postscript: I tip my hat to previous Secretaries Tom Larson, Howard Yerusalem, and Brad Mallory as well as current Secretary Barry Schoch for setting the stage and continuing to make PennDOT a practice leader.

Note from the authors

We hope this handbook will be a living document, updated periodically with new and improved policies and practices. We invite reader comments, suggestions and ideas for additional case studies. Direct comments to Roger Millar, PE, AICP, at (406) 544-1963, rmillar@smartgrowthamerica.org or Eric Sundquist, at (608) 265-6155, erics@cows.org.

User's Guide to This Handbook

Where to start
This handbook is divided into eight focus areas. You may want to start with an area that addresses your agency's most pressing needs. You can also use the handbook's online capabilities to explore how these reform initiatives can work together, as well as how certain strategies can help to address multiple issues.

Focus Area 1: Revenue Sources
The era when fuel taxes alone could cover robust construction and maintenance programs is over, and funding transportation out of general revenue is equally problematic. DOTs need new sources of dedicated revenues, preferably tied to user fees.

Common DOT challenges addresses in this focus area:

- State DOT revenues depend on gas tax revenue, which is not keeping up with capital needs.
- Non-highway modes may be highly efficient, both for direct users and those traveling on congested roads, but dedicated revenues for these modes, especially for their ongoing operation, need to be identified.

Focus Area 2: Revenue Allocation and Project Selection
Scarce transportation dollars need to be spent where they do the most good. Many agencies have reformed project selection and formula funding processes for sub-state units of government, often tying proposed spending to state, departmental, and/or local goals and objectives. Such changes can save money and get needed projects off the ground faster.

Common DOT challenges addresses in this focus area:

- Transportation dollars are siloed, and it is hard to pursue some very cost-effective projects because of internal funding complexities.
- Political pressure dictates project selection and spending.
- Performance measures often focus on vehicle mobility rather than access, and they don't allow for easy comparison to other modes or demand-management solutions.

Focus Area 3: Pricing
Appropriate pricing strategies can raise revenues and manage demand, keeping costs down. On the other hand, when users do not see appropriate price signals, demand is artificially increased, resulting in more congestion and pressure for new capacity.

Common DOT challenges addresses in this focus area:

- States are unable to easily raise needed revenue through the traditional user fee, taxation of motor fuels.
- Pricing tools can help replace those revenues and provide appropriate price signals, but will involve new partnerships between DOTs and other stakeholders in many cases.

Focus Area 4: Increasing Transportation System Efficiency

It is often prohibitively expensive to add lane-miles to relieve congestion. Where dollars for capacity are available, expansions may run counter to community development and environmental goals, and may only induce more traffic. Faced with this challenge, agencies have come up with operational improvements and other ways to improve the efficiency of existing systems without major new capital investments.

Common DOT challenges addresses in this focus area:

- Uni-modal standards aimed at creating free-flowing traffic at peak times may require unrealistically big projects and, if used in isolation to determine priorities, may prompt projects that undercut economic and community development and other goals.
- Local street networks and state-owned arterials and freeways can work synergistically, or they can work at cross-purposes.
- Managing travel demand may be the most cost-effective and sustainable option, but DOTs traditionally do not have this capability.

Focus Area 5: Improving Options for Mobility and Access

State transportation departments are tasked with improving travel options and experiences for everyone, not just drivers. Sometimes walking, cycling, or public transportation can provide access to destinations more efficiently and cost-effectively than automobiles. These modes are critical to providing access to jobs, school, and other destinations for those who cannot drive.

Common DOT challenges addresses in this focus area:

- Transit makes sense in key corridors or parts of an urban area, but generally state DOTs do not operate transit systems or have a dedicated funding source to support locally owned systems;
- Walking and biking facilities can be very inexpensive, but they also require new ways of understanding land-use connections as well as cooperation with local units of government.

Focus Area 6: Providing Efficient, Safe Freight Access

With the emergence of just-in-time manufacturing and highly dispersed activity centers and markets, trucking has become a dominant freight mode. Increased truck traffic, in turn, adds wear and tear on infrastructure and can be a source of congestion and emissions. State DOTs with limited budgets cannot simply build and re-build highway capacity to cope with these problems. Many DOTs are responding to this reality by looking for innovative ways to help shippers move freight more efficiently and with less impact on infrastructure and communities.

Common DOT challenges addresses in this focus area:

- Shipping by rail often is cheaper and has lower impact on communities than does trucking, but most railroads are privately owned and may not cooperate with DOTs.
- Cities both present a bottleneck for through freight, whether on highways or by rail, and create a difficult environment for local pickup and delivery, with trucks competing with cars for scarce roadway and parking capacity.

Focus Area 7: Integrating Transportation and Land Use Decision-Making

A century ago, developers paid for streetcar lines when they developed new housing and commercial areas, so land use and transportation were by necessity considered together. As government took over transportation responsibilities, agencies wound up trying to respond as best they could to new development. At the same time, local zoning authorities increasingly separated commercial and residential areas, increasing the need for travel over longer distances. State DOTs' highway infrastructure, originally intended for intercity travel, became clogged with local travel. All of these trends have pushed transportation costs up significantly. Today, DOTs are working to reconnect land use and transportation in order to lower costs and improve community and economic development.

Common DOT challenges addresses in this focus area:

- DOTs lack authority over land use, and must work with local partners.
- Common practices by both transportation agencies and land use authorities, such as providing highways that induce inefficient development and requiring separation of uses, can lead to increased infrastructure and travel costs.
- Commonly employed mobility-related metrics ignore land use considerations and may result in decisions that run counter to community development goals.

Focus Area 8: Improving DOT Processes

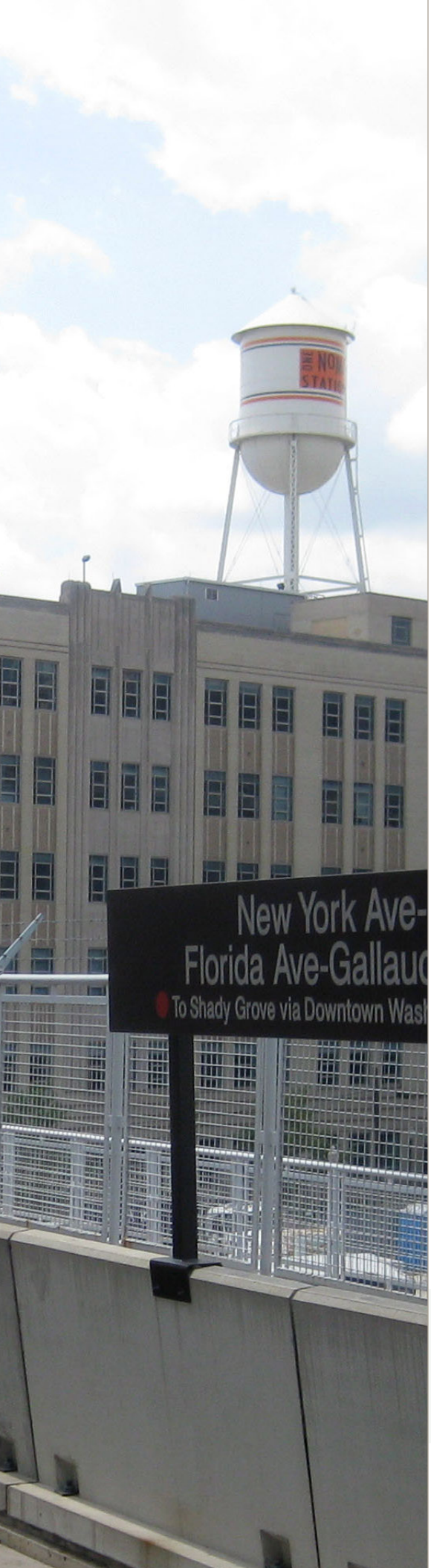
State DOTs are well served when they work together to tap into their ingenuity and talent, pool resources, and identify affordable solutions to meet transportation needs. Setting appropriate goals and then working together to achieve them is vital to reforming processes, cutting costs, and strengthening state economies with innovative transportation projects.

Common DOT challenges addresses in this focus area:

- DOTs can support state priorities by setting meaningful goals that are measurable and useful for enacting policies and making day-to-day decisions, but many DOTs lack the technical resources or the decision-making authority to explore the connection between transportation and land use, economic development, and other state concerns in a meaningful way.
- Transportation agencies are expected to deliver more projects than ever before, and the environment in which projects must be delivered is increasingly challenging. The project development process used by many state agencies today is inefficient and unpredictable.

THE INNOVATIVE DOT

Focus Area 1: Revenue Sources



Focus Area 1: Revenue Sources

The era when fuel taxes alone could cover robust highway construction and maintenance programs is over. Even then, non-highway modes often struggled for support. Funding transportation out of general revenue is problematic, both because it is subject to changing budget priorities and because it underprices transportation, creating excess demand.

State departments of transportation (DOTs) need new sources of dedicated revenues, preferably tied to user fees in cases where excess demand—which is both economically and environmentally costly—can be curtailed through the market-style discipline that such fees impose. User fees may also appeal to stakeholders' sense of fairness, making them more politically palatable than "subsidies" from general tax revenues.

In this section:

- Identify Mechanisms for Funding Non-Roadway Transportation
- Implement Value Capture
- Establish a Next-Generation User Fee

Pictured: Special assessment districts have been used to fund the new New York Avenue Metro transit station in Washington, D.C. *See "Implement Value Capture" to learn more.*

Identify Mechanisms for Funding Non-Roadway Transportation

The Opportunity

Transportation is about more than building and maintaining roads. The movement of people, goods, and services also requires substantial non-roadway facilities, including marine and river ports and waterways, airports, freight rail systems, passenger rail and public transportation systems, and bicycle and pedestrian facilities. These facilities require funding and financing sufficient to meet the expanding demands of a 21st century economy:

- The U.S. DOT projects that, between 2001 and 2020, total freight moved through U.S. ports will increase by more than 50 percent, and the volume of international container traffic will more than double.[1]
- Total mainline air carrier and regional enplanements are forecast to increase from 731 million in 2011 to 1.23 billion in 2032, an average annual rate of 2.5 percent.[2]
- Demand for freight rail transportation is projected to nearly double by 2035—from 19.3 billion tons in 2007 to 37.2 billion tons in 2035.[3]
- During Fiscal Year 2011 (October 2010-September 2011), Amtrak carried 30.2 million passengers, the largest annual total in its history and the eighth annual ridership record in the last nine years.[4]
- From 1995 through 2010, public transportation ridership increased by 31 percent—a growth rate higher than the 17 percent increase in the U.S. population and higher than the 24 percent growth in the use of the nation's highways over the same period.[5]
- The number of Americans using a bicycle as the primary means of getting to work grew 43 percent between 2000 and 2008.[6]

Partnering with other government agencies and the private sector to provide the optimal mix of transportation facilities, regardless of mode, in order to further the state's economic and quality of life goals is central to the mission of state DOTs. Funding is a part of this responsibility.

---

1 American Association of Port Authorities. (2008, July). *U.S. Public Port Facts*. Retrieved 9/12/2013 from http://www.aapa-ports.org/files/PDFs/facts.pdf.

2 Federal Aviation Administration. (2012, March). *Fact Sheet—FAA Forecast*. Retrieved 9/12/2013 from http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=13395.

3 Cambridge Systematics, Inc. (2007, September). *National Rail Freight Infrastructure Capacity & Investment Study*. Association of American Railroads. Retrieved 8/23/12 from http://www.camsys.com/pubs/AAR_Nat_%20Rail_Cap_Study.pdf.

4 Amtrak. (2012, June). "Amtrak National Fact Sheet: FY 2011." Retrieved 9/12/2013 from http://www.amtrak.com/ccurl/358/145/Amtrak-National-Fact-Sheet-FY2011-Final-v2.pdf.

5 American Public Transportation Association. (2012). "Public Transportation Benefits." Retrieved 9/12/2013 from http://www.apta.com/mediacenter/ptbenefits/Pages/default.aspx.

6 League of American Bicyclists. American Community Survey Bicycle Commuting Trends 2000-2008. Retrieved 9/1/2013 from http://www.bikeleague.org/resources/reports/pdfs/acs_commuting_trends.pdf.

Funding Mechanisms

States use a wide range of tools to fund non-roadway improvements. The funding sources and mechanisms can be grouped into five primary categories:

- **General Income/Consumption Taxes:** Revenues from broad-based taxes on residents and business. These include:
  - Payroll tax
  - Sales tax
  - Property tax
  - Income tax
  - "Sin" tax (tobacco, alcohol, lottery revenue)
  - Capital gains infrastructure tax
  - Real estate transfer tax

- **Activity-Based User Fees:** Revenues from charges on the users of transportation facilities and services, including:
  - Gas and other fuel taxes
  - Fare-box revenue
  - Tolling
  - Carbon fees/taxes
  - Weight-mile fees
  - Vehicle miles traveled (VMT) fees
  - Tire and battery fees
  - Passenger facility charges
  - Facility or right-of-way leasing
  - Terminal use fees (land fees, berthing fees)
  - Parking space taxes
  - Energy use taxes
  - Hotel/motel taxes
  - Rental car taxes
  - Bicycle user fees
  - Mobile source emission credits

- **Administrative Fees/Fines:** Revenues derived by public agencies (e.g., states or cities) through their authorization, administration, and enforcement activities. These include:
  - Motor vehicle registration fees
  - Driver's license fees
  - Vehicle transfer fees
  - Identification card (non-license) fees
  - Dedicated traffic violation revenue
  - Utility or franchise fees

- **Value Capture:** Revenue derived by mechanisms that capture the value created by transportation facilities and services. Value capture mechanisms include:
  - Land value tax
  - Tax increment financing
  - Benefit assessment districts
  - Transportation utility fees
  - Sponsorships, advertising, and naming rights
  - Systems development charges

- **Joint Participation/Public-Private Partnerships:** Contractual agreements between public and private entities for the direct provision of transportation facilities or services. These include:
  - Business improvement districts
  - Joint development
  - Negotiated exactions
  - Urban service boundary expansion windfall taxes

Transportation for America[7] and the AASHTO Center for Excellence in Project Finance[8] each tracked recent proposals in a total of more 20 states. In 2013, Maryland and Virginia both approved inflation-adjusted fuel tax increases (not restricted to highway funding). Virginia also approved additional fees on hybrid vehicles and raised its sales tax, committing a portion to transit. Both states will commit Internet sales tax revenues to transportation projects if Congress passes the necessary provisions. The Pennsylvania Senate Transportation Committee recommends additional fees on vehicle registration, licensing, and traffic violations, while committing 25 percent of revenues to transit and multimodal programs. The Wisconsin Transportation Finance and Policy Commission recommends mileage-based registration fees, among many other measures, and the State of Washington is considering legislation that would impose a $25 fee on premium bicycles to help fund its complete streets program.

Implementation

In pursuing new funding sources on specific projects, an agency must take early steps to align all interested stakeholders. For example, North Carolina has pursued a promising value capture approach for funding extensions to Charlotte's Red Line commuter rail, but faced resistance from some municipalities and encountered logistical issues related to using existing freight lines. A transit funding working group continues to explore a range of funding options for the project.

When considering funding sources, the following evaluation metrics can be applied as a basis for further screening and prioritization:

- **Funding Potential:** How large is the funding base? Is it expanding or declining? Is it stable or volatile?

- **Ease of Implementation:** Does it require a new entity? Is it flexible across modes? Are collection and enforcement easy?

- **Economic Effects:** How does it affect behavior in target sectors? Is there a strong nexus between the funding source and the type of projects it supports? Is it equitable (i.e., by income, geography, and sector)?

- **Political Feasibility:** Are key stakeholders, or the public at large, likely to support or oppose it? Does it require a popular vote? Representative vote? Administrative action? Constitutional change? Are "champions" in place?

---

7 Transportation for America. *Tracking State Transportation Funding Plans*. Retrieved 11/14/13 from http://t4america.org/resources/state-plans-tracker/.

8 AASHTO Center for Excellence in Project Finance. (2013). "State Transportation Funding Proposals in 2013." Retrieved 12/10/13 from http://www.transportation-finance.org/pdf/featured_documents/state%20transportation%20funding%20proposals%202013_11_25.pdf.

A typical initiative to implement a new or expanded funding source would include the following elements:

1. **Educate the public.** As with any other new initiative, messaging and transparency are key to winning support. People want to know how the new burden will expand economic growth, serve existing and future populations, stabilize their households and protect them from unanticipated risk. The public wants to see communities that support economic development, accommodate older adults, help its children thrive, and promote public health.

2. **Build alliances.** In times of contracting budgets, there is fierce competition for funds and great need from other public goods such as education, health services, and economic stimulus. These are natural allies of transportation advocates, and caution is necessary to ensure that competition for funds and activism to establish new revenue sources do not alienate these crucial partners.

3. **Create a fiscal impact statement.** Voters want to know what they are getting for their additional dollars, and legislators want to see the full costs of administering any new fees compared to the proceeds expected. Fiscal impact statements lay bare the effect of any new measure on the state's bottom line and across related programs.

4. **Obtain legislative approval and/or enabling legislation.** New funding sources, such as a local sales tax or a new fee, often require state approval. Investigation of a new tool, such as the mobility fees in Florida, by a DOT typically requires legislative approval in order to spend staff time and money on research. Some tools, such as parking pricing, do not require state approval if executed at the municipal level.

   In many cases, strategies that increase the dedication of existing revenues or seek out new funding sources also require state-level legislation. The authority to increase the sales tax at the city or county level, for example, requires legislation granting that power to localities. Some states, like North Carolina[9], already have such legislation in place, but others do not. Even in states that have enabling legislation, wording might limit that legislation to a county or a transit district. Access to larger pots of money, such as casino funds, or a tool affecting residents statewide, such as an increase on vehicle registration fees, also requires state approval.

   To be successful, proposals to change fee or tax rates must be transparent about the purpose of the change and about which projects will be funded. Efforts that make processes easier for planners and developers, such as replacing San Francisco's transit impact development fee with a sustainability fee, which involves less paperwork, tend to be looked upon favorably.[10]

   Funding sources like sales taxes have the benefit of being relatively stable—they may increase and decrease with economic conditions, but they are not prone to the more volatile ups and downs of sources like casino spending, which people are quick to cut when budgets are tight.

5. **Ensure reporting and accountability.** The value of a dedicated funding stream lies in the fact that it is typically more difficult to poach from than a fee that goes into the general fund. The agency must be able to show that it achieved the projects promised by the fiscal impact

9 North Carolina State Legislature (2009 April). *House Bill 148 (DRH50064-LBx-22G)*, Retrieved 9/12/2013 from http://www.ncleg.net/Sessions/2009/Bills/House/HTML/H148v0.html.

10 San Francisco Planning Department. *Transportation Sustainability Program* website. (Updated 2012, June 21). Retrieved 8/1/12 from http://www.sf-planning.org/index.aspx?page=3035#tsf.

statement. Los Angeles, for example, maintains a web site that tracks the progress of all the projects promised when its sales tax was increased.[11]

Case Studies

Los Angeles County: Measure R

California law allows counties and cities to levy an additional one percent sales tax with local voter approval, a very common method of raising funds throughout the state's jurisdictions. Los Angeles County has used this taxing authority to embark on a major transformation of its infrastructure through investments in numerous rail and busway projects.

In 2008, the county approved the third tax increase for transit in the last 20 years. Measure R passed by a super majority (required for tax increases), with 67 percent. This half-cent increase in the sales tax, from 8.25 to 8.75 percent, is expected to raise $40 billion over the next 30 years for transit and highway projects and create 210,000 new jobs. These funds for Metro (the operating name of the Los Angeles Metropolitan Transportation Authority) will be used as follows: 35 percent for new rail and bus rapid transit, 20 percent for carpool lanes and highway improvements, 20 percent for bus operations, 15 percent for local projects, five percent for rail operations, three percent for Metrolink, and two percent for Metro Rail. The tax is expected to cost the average person $25 per year, according to the Los Angeles Economic Development Corporation.[12]

This tax increase builds upon Proposition A, passed in 1982, which was the first dedicated sales tax in the county for transit and rail line construction,[13] and Proposition C a decade later, which provided an additional half-cent tax for transportation. Metro is unique in that it plans and builds highways as well as transit, and Proposition C included rubber-tired projects and highway projects in the funding.[14]

The need for accountability has increased over time. Propositions A and C needed just a simple majority to pass; in contrast, 2008's Measure R required 66 percent. For Proposition A, Metro simply proposed building transit. By the time Proposition C appeared on the ballot, people were more watchful and Metro had to promise specific projects. To pass Measure R, Metro had to tell voters exactly what they were going to get. Investments had to be spread out over the entire county, which encompasses 86 cities besides Los Angeles. In fact, some of the opposition to Measure R came from Metro board members, who felt Los Angeles was dominating the future revenue streams, so Metro staff had to work carefully to include projects throughout the county in the Measure R package. Metro created a very specific project budget, then enhanced transparency through a website tracking tool and an independent oversight panel of retired judges.

In some ways, Measure R also allowed more flexibility. Legislators and the public recognized that a growing system needs operating money as well, and Measure R is the first to allow revenues to go toward operations, too. Given the chronic congestion and pollution, "If you promise to fix transportation, people will vote for it," stated Doug Failing, Executive Director of Highway Project Delivery at Metro.

11 Los Angeles County Metropolitan Transportation Authority (2012, August). "Measure R Project Tracker" website. Retrieved 8/20/12 from http://www.metro.net/projects/progress_tracker/.

12 Los Angeles County Metropolitan Transportation Authority (2012, August). "Measure R." Retrieved 8/5/12, from http://www.metro.net/projects/measurer/.

13 Los Angeles County Metropolitan Transportation Authority (2012, August). "Proposition A: Proposition A Answered Mobility Challenges in LA." Retrieved 8/5/12 from http://www.metro.net/projects/measurer/proposition_a/.

14 Los Angeles County Metropolitan Transportation Authority (2012, August). "Proposition C: The Impact of Proposition C." Retrieved 8/5/12 from http://www.metro.net/projects/measurer/proposition-c/.

Neither Metro nor California's state DOT, CalTrans, was allowed to advocate for a measure; they may only educate. However, it was significant that the state did not oppose Measure R. The support of the Chamber of Commerce and labor unions representing unemployed and underemployed construction workers was crucial in passing Measure R, as was clear messaging.

The 30/10 plan requires an enormous infusion of cash and relies on two primary federal programs: the Transportation Infrastructure and Financial Innovation Act (TIFIA) and qualified transportation infrastructure bonds. The other mechanism for funding 30/10 is qualified transportation infrastructure bonds. Existing federal law includes elements for qualified bonds in a number of areas; groups like Metro, with their own funding sources, can use that bonding authority to buy down the interest rate. Unfortunately, the recession in 2009 hurt aspects of the 30/10 plan and new estimates predict the measure will net $34-$36 billion, meaning certain elements in the plan such as planned rail stations might be cut.

In November 2012, a ballot measure to accelerate Measure R through further taxation failed narrowly by less than one percentage point short of the two-thirds approval needed. Nonetheless, the success and high level of public support for Measure R are instructive.[15] Metro built a strong coalition of support by winning over key players (business and labor representatives) and providing a detailed list of the projects that the sales tax increase would support. Metro also builds on the current momentum surrounding its transit projects, and has jumped on a huge chance to provide the voters with more immediate change. The city has reached out to and allied with many other mayors to build infrastructure, create jobs, and pump life into the economy.[16]

Oregon: Lottery-Backed Bonds for Non-Highway Projects

Oregon's constitution stipulates that gas tax funds must go to the road system. Federal highway funds in the state, meanwhile, go toward roads, and federal transit funds are distributed to transit districts. The state's funding structure thus leaves out freight and passenger rail, airports, marine facilities, and bicycle and pedestrian projects, which have historically relied on a patchwork of funding streams from federal and local sources.

A coalition of ports, railroads, and airports developed a program called Connect Oregon to create a new funding stream for non-highway projects using lottery-backed bonds that the state was already enabled to issue. This program was proposed in 2005, championed by the then-governor, and passed by the legislature, which recognized the need for new, steady funding for modes other than roads.

Oregon is currently under the fifth authorization by the legislature to use these bonds to fund air, marine, rail, transit, and multimodal projects. Phase I and II of Connect Oregon yielded $200 million, which allowed several projects to be fast-tracked. In total, 69 projects were funded. Each of the five regions of the state gets at least ten percent of the funds as long as the region proposes qualified projects.[17] The legislature approved $95 million for Connect Oregon III and $40 million for Connect Oregon IV through HB 5036.[18] In 2013, the legislature opened the program to bicycle and pedestrian projects and approved $42 million for Connect Oregon V. The Oregon DOT received 108 proposals

15 Los Angeles Times (2012, November). "Measure J, L.A. County transportation tax extension, fails." Los Angeles Time Local website. Retrieved 11/20/2013 at http://latimesblogs.latimes.com/lanow/2012/11/measure-j-la-county-transit-tax-extension-fails.html.

16 Interview with Los Angeles Metro Executive Director of Highway Projects. (2012, March).

17 Oregon Department of Transportation (2008, July). *Connect Oregon: Moving Goods, Moving People, Moving the Economy Report*. Retrieved 3/26/12, from http://www.oregon.gov/ODOT/TD/TP/docs/CO/Brochure.pdf.

18 Oregon State Legislature. (2011, July) HB 5036: Retrieved 9/12/2013 from http://legiscan.com/OR/text/HB5036/id/342957.

totaling $129 million, with bicycle and pedestrian projects accounting for $47.5 million.[19]

The enabling legislation stipulates that projects eligible for Connect Oregon funds cannot be eligible for highway funds. Projects must generally be shovel-ready, with no major barriers to implementation, as Connect Oregon is a construction grant program rather than a planning program. Also, projects need not be identified in regional or local studies for selection. In some cases, grantees have used Connect Oregon to cover local matches to leverage federal funds. For example, the Federal Aviation Administration's (FAA) Airport Improvement Program requires a ten percent local match. Many of Oregon's rural airports cannot afford to make that match, so they use Connect Oregon funds.

Stakeholders heavily drive the project selection process. Oregon DOT staff members complete an initial screening, and then a mode-specific committee evaluates the project. The committee's input is sent out to regional committees, comprised of local officials and stakeholders, who add a layer of community input, and representatives from the committees are gathered for a consensus-building process.

Since many of the projects in Connect Oregon were not included in the State Transportation Improvement Program (STIP), the Connect Oregon selection process is not specifically related to the STIP selection process. A major criterion for project selection is a proven economic benefit to the state, because the lottery program is an economic development tool. Thus, there must be a proven nexus between the lottery-backed bonds and the projects they are funding.

Colorado: Route 36 Multimodal Corridor

Colorado DOT (CDOT) is pursuing its first public private partnership (PPP) to make improvements to US route 36 between Denver and Boulder, which include provisions for bus rapid transit (BRT), a commuter bicycle path, and at least one pedestrian overpass, in addition to roadway improvements. In 2009, the state approved the creation of a new division of the CDOT—the High Performance Transportation Enterprise—with explicit authority to enter into contracts with private entities and manage PPPs. CDOT entered a first phase of the US 36 project alone. Facing declining revenues from state and federal gas taxes and hoping to complete the project at a faster pace, the agency has entered a PPP to complete the six-mile second phase.

Key strengths of this plan include the legislation's clear intent to fund multimodal components, the alignment of state and local priorities, and the inclusion of specific performance standards for transit and bikeway elements to guide the project. The PPP agreement consists of CDOT, the Denver Regional Transit District, local governments, and a private consortium that will build, manage, and maintain the corridor infrastructure for 50 years. Each member contributed funds for construction of the project; CDOT leveraged two loans administered through the federal Transportation Infrastructure Finance and Innovation Act (TIFIA). Neither RTD nor local governments are equity stakeholders, but both will advise on the use of surplus toll revenues—those exceeding the contractually guaranteed return-on-investment plus loan repayment—which are slated for transit enhancement or transportation demand management (TDM) programs.[20]

19 Esteve, H. (2013, December 4). "Bicycle, pedestrian project vie for biggest chunk of Connect Oregon money." *The Oregonian*. Retrieved 12/10/13 from http://www.oregonlive.com/politics/index.ssf/2013/12/bicycle_pedestrian_projects_vi.html.

20 Colorado Department of Transportation. (2013). "*US 36 Managed Lane/Bus Rapid Transit Project Phase II*." . Retrieved 10/09/2013 from http://www.coloradodot.info/projects/US36ExpressLanes/88th-to-foothills-pkwy.

Georgia: Transportation Investment Act

Georgia's Transportation Investment Act (TIA), passed in 2010, designates 12 special regions throughout the state and enables them to vote for a one percent sales tax (TSPLOST) to fund local and regional transportation projects. The program took effect on January 1, 2013, and is slated to last for 10 years. In regions that voted for the TSPLOST, 75 percent of revenues go toward regional projects within each region designated by Georgia DOT (GDOT) and 25% goes toward local projects, which may include pedestrian, bicycle, transit, and other multimodal projects. During the implementation process, GDOT conducted a series of Regional Transportation Roundtable events (a minimum of two events per region) in order to educate the public about the program and build consensus around which regional projects should be included in the final approved investment list. GDOT also engaged in a public education campaign involving interviews, meetings, and media.[21]

Public opinion was largely split on the TSPLOST leading up to the referendum. The program faced opposition from both transit advocates and opponents, along with those distrustful of government spending plans.[22] Ultimately, the TSPLOST passed in three regions, while many other regions rejected the measure by fewer than 20 percentage points.[23] GDOT has launched a website providing information on all activities related to the TIA, including a program overview and details regarding collected revenues and designated projects. The funds are committed to a variety of projects including capacity improvements, bridge repairs, road maintenance, and a smaller number of transit, bicycle, and pedestrian improvements.[24] Since voting against the TSPLOST, many counties have begun to explore local options for funding transportation projects that meet their specific needs, rather than being tied to regional plans.

Resources

General

Cambridge Systematics, Inc., KFH Group, Inc., McCollom Management Consulting, Inc., & Hemily, B. (2009). Transit Cooperative Research Board Report 129: Local and Regional Funding Mechanisms for Public Transportation. Transportation Research Board of the National Academies: Washington, DC http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_129.pdf.

This report describes a number of mechanisms for funding public transportation and evaluates each against a set of criteria including revenue potential, ease of administration, volatility, and equity impacts. It also provides case studies from around the country.

Smith, G.C. (2008, December) Legal Research Digest 28:Use of Fees or Alternatives to Fund Transit. Transit Cooperative Research Program. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_lrd_28.pdf.

This report describes the legal ramifications of implementing various user fees.

21 Valdosta-Lowndes Metropolitan Planning Organization. (2013, January). "Georgia's Transportation Investment Act: Lessons Learned." Presented at Transportation Research Board annual meeting. Available at http://www.slideshare.net/VLMPO/georgias-transportation-investment-act.

22 "Voters Reject Transportation Tax." (2012, August 1). Atlanta Journal-Constitution. Retrieved 11/26/13 from http://www.ajc.com/news/news/state-regional-govt-politics/voters-reject-transportation-tax/nQXfq/.

23 "TSPLOST Results Are In." (2012, August 1). Georgia Public Broadcasting. Retrieved 11/26/13 from http://www.gpb.org/news/2012/08/01/tsplost-results-are-in.

24 Official webpage of the Transportation Investment Act of 2010: http://www.ga-tia.com/index.aspx.

Case Studies

Cambridge Systematics, Inc. (2005, May 5). Funding the Oregon Transportation Plan: Final Report. Prepared for the Oregon Department of Transportation. http://cms.oregon.gov/ODOT/TD/TP/docs/otp/funding.pdf.

This report provides an overview of various mechanisms for funding non-roadway transportation, including their advantages, disadvantages, and applicability in Oregon.

Florida Department of Transportation. (2009, December). Joint Report on the Mobility Fee Methodology Study. http://www.dot.state.fl.us/intermodal/mobility/MobilityFee.pdf

This report describes the current impact fee (concurrency), drawbacks, and ways of implementing a new mobility fee.

Oregon Rail Funding Research and Task Force. (2011). Technical Memorandum: Oregon Potential Rail Funding Sources Technical Analysis. http://cms.oregon.gov/ODOT/RAIL/docs/rail_funding_tf/oregon_potential_rail_funding_sources_technical_analysis_6-17-11.pdf

This memorandum provides an analysis of potential funding sources for rail transportation in Oregon.

Pennsylvania Transportation Funding and Reform Commission. (2006, November). Investing in Our Future: Addressing Pennsylvania's Transportation Funding Crisis. http://www.crcog.net/vertical/Sites/{6AD7E2DC-ECE4-41CD-B8E1-BAC6A6336348}/uploads/{59ECCB15-4C48-4941-B26D-99CC1B88233B}.pdf

This report analyzes the funding need for highways, bridges, and transit in Pennsylvania and provides recommendations for addressing funding gaps.

Rufolo, A. M., Bertini, R. L., Kimpel, T. (2001, September). Alternatives to the Motor Fuel Tax: Final Report SR 561. Prepared for the Oregon Department of Transportation. http://cms.oregon.gov/ODOT/hwy/oipp/docs/561report.pdf

This report provides an analysis of alternatives to reliance on motor fuel tax revenues to fund transportation.

Implement Value Capture

The Opportunity

Transportation improvements add value to adjacent lands and play an important role in location choices made by employers, employees, and—more generally—the traveling public. While transportation improvements have traditionally been provided as a public good, ever-shrinking transportation budgets have made this an unsustainable arrangement. As traditional funding methods become less tenable, DOTs can develop policies that encourage investment by the specific businesses or neighborhoods that would benefit from improved transportation facilities.

New transportation improvements such as transit stations, roadway networks, or interchanges add value to nearby properties, but while anyone can use these new facilities, all users do not share equally in the added value they produce. In addition, the value dividend is not the same for all properties. Commercial property values tend to increase more dramatically than residential, and properties closer to a transportation facility increase in value more than those farther away.

Value capture offers an equitable means of recouping value from the private sector in proportion to the benefit received from transportation improvements. Applied correctly, value capture is narrow and targeted. It is generally not only palatable to, but often supported by, private property owners because they receive a direct and tangible benefit from their investment. Recapturing and reinvesting value back into the transportation system maintains and even enhances the value of local private land.[25]

Entrepreneurial state DOTs and local agencies DOTs using value capture mechanisms have been able to increase their self-sufficiency, stabilize their budgets, and reduce their demands for traditional funding resources, making them available for other public investments.

What Is It?

There are a number of ways to capture the value of transportation infrastructure and services in order to encourage reinvestment. Value capture strategies can apply to specific properties, to localized districts, or to a general area.

District-based value capture mechanisms include:

- Tax increment financing (TIF)
- Transportation benefit districts and/or special assessment districts

Common project-based value capture strategies include:

- Joint development or air rights development
- Exactions
- Development impact fees (DIF)

25 Levinson, D. M. & Istrate, E. (2011, April) "Access for Value: Financing Transportation Through Land Value Capture." Brookings Institution Metropolitan Policy Program. Retrieved 9/12/2013 from http://www.brookings.edu/research/papers/2011/04/28-transportation-funding-levinson-istrate.

General area value capture strategies include:

- Land value or split rate taxes
- Transportation utility fees (TUF)

Tax increment financing anticipates additional tax revenues from rising property values associated with new transportation infrastructure and borrows against the expected increase to provide up-front financing for the transportation project. Capturing this incremental increase is usually accomplished through the issuance of bonds at the beginning of a project. TIF districts are premised on the "but for" notion—enhanced development value, and the resulting higher tax proceeds, would not be possible "but for" the provision of the enhanced transportation. TIFs generally expire over a period of years or a few decades.

Transportation benefit districts or special assessment districts apply a special fee on properties located near a new transportation project or service based on the benefit they receive from their proximity. Special assessment districts have been used to fund modern streetcars in Portland and a new infill metro transit station in Washington, DC.[26] While special assessments can cover the whole cost of new investments, they most often cover all or part of the state or local portion of a project. A major advantage is that, unlike TIFs, these districts can run indefinitely, supporting not just construction but also operation of the system.

Joint development and air rights are publicly- or authority-controlled properties above, below, or adjacent to a piece of infrastructure or right of way that are sold or leased to developers; proceeds are reinvested in the transit or transportation system. Some states or transit authorities have created special accounts to manage revenues from these properties to ensure they are used for asset maintenance or alternative transportation investments. Many large fixed rail transit systems such as Metro in Washington, D.C. or BART in San Francisco have well-established joint development programs, and Boston's central artery project ("The Big Dig") resulted in several air rights projects.[27]

Exactions are contributions negotiated with individual development projects. They are typically used for specific on-site improvements to an area being developed, such as the dedication of rights of way and the construction of new roadway networks, new traffic signals, sidewalks, and intermodal stations. Exactions are often in-kind contributions, but may be fees or contributions paid to the locality.

Development impact fees, sometimes known as development excise taxes, are fees to pay for the new or expanded transportation facilities or services necessary to support a new development. They are often used with Adequate Public Facility Ordinances (APFOs) or concurrency requirements, but do not require them. More than half of U.S. states use DIFs,[28] but they are most prevalent in fast-growing areas and have been utilized extensively in California, Texas, and Florida. DIFs are generally applied at the county or municipal level. They are similar to development exactions, except that the transportation improvements they support are commonly located outside of the specific property.

Land value taxes are a different way of calculating property taxes. Whereas typical property taxes lump together the value of both land and buildings, land value taxes focus only on the value of the

26 American Association of State Highway and Transportation Officials. Center for Excellence in Project Finance. "New York Avenue-Florida Avenue-Galludet University Metro Station: A Case Study." Retrieved 8/2/12 from http://www.transportation-finance.org/pdf/funding_financing/funding/local_funding/New_York_Avenue_Case_Study.pdf.

27 Bechtel Corporation (2008, January). "Boston Central Artery/Tunnel." Archived signature projects webpage. Retrieved 9/12/2013 from http://www.bechtel.com/boston_central_artery.html.

28 Transportation Cooperative Research Program. (2008, December). *Legal Research Digest 28: Use of Fees or Alternatives to Fund Transit*. Retrieved 8/2/12 from http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_lrd_28.pdf.

land's location. A related method, known as a split rate tax, provides separate taxing rates for the land and the buildings on it. The value of the land is determined primarily by its access to transportation and proximity to major destinations and amenities, regardless of whether the property is occupied by a small one-story retail establishment or a multi-story mixed-use development. This tax structure encourages land owners to develop the land. Land value taxes are calculated based on the benefit provided by the transportation network, whether the property actually uses the transport amenity or not. Although in wide use in several Asian and Eastern European nations, Pennsylvania is the only U.S. state with extensive experience using a split rate tax formula.

Transportation utility fees. For most states, fuel taxes alone are insufficient to fully fund state transportation budgets, so many states also tap into general revenue to provide and maintain transportation services and assets. Transportation utility fees replace this general revenue drawdown with a "utility fee," a fee for service based on estimated use. This approach treats transportation the same as any other public utility—water, gas or electric, or sewer. Widely used in Oregon, transportation utility fees are deposited in a unique and protected account separate from general revenue funds. TUFs are based on use; because commercial uses tend to impose greater impacts on transportation networks than residential uses, TUFs shift the burden of supporting the transportation network from the residential base to commercial and industrial businesses. All properties that are transportation users—including nontaxable properties such as nonprofit institutions—must pay the utility fee.

Implementation

There are several important factors to consider when evaluating which value capture methods to use. Many methods involve one-time-only payments and thus may not be appropriate for long-term support of transportation infrastructure or transit services. Land value taxes and transportation utility fees are applied area-wide and thus create the largest base, but because they involve structural changes, it can be more difficult to gain support for them. Transportation benefit districts, TIF districts, and air rights are geographically narrower in area, but benefit districts and TIFs provide important project-specific funding and air rights can be a long-lasting source of funding.

Because these tools work in direct proportion to land uses and development decisions controlled at the local level, value capture mechanisms are typically applied by local rather than state governments. State enabling statutes, however, are generally required.

Some value capture tools can be used as capital financing to develop a new transportation asset, while others are only applicable after the transportation service—and its associated benefits—are in place. More than one value capture tool can be used, even for the same property. Parcel-based, district-based, and generally-applied value capture mechanisms each have their own unique implementation requirements, but all must follow some general implementation steps:

1. **Pass or modify authorizing legislation.** Most financing strategies require specific authorizing legislation that articulates who can implement such tools and for what purposes. Many states have already adopted legislation authorizing value capture tools, but the majority of them have not specifically authorized DOTs or transit authorities to levy such taxes or fees to fund transportation. Furthermore, some state authorizing legislation specifically precludes transportation as an authorized use of such proceeds, so it may be necessary to carefully review state authorizing legislation and make the appropriate changes.

2. **Identify a taxing authority.** Any tax requires separate oversight and accountability in order to protect it from abuse and maintain public trust. Authorizing legislation typically identifies the specific taxing authority that will oversee the tax and distribute funds, but it is important to

review existing taxing structures and determine the most effective taxing authority.

3. **Demonstrate the logical/rational nexus.** Rational nexus is a legal term for the link that is required between the services provided to a property and development and the fee rate. It is a significant consideration for development impact fees and exactions, but important to other value capture tools as well.

4. **Develop partnerships and common priorities with regions and localities.** Most value capture tools are applied at the local level, so local entities determine the use of value capture funding. Close partnership and coordination can ensure that state and local priorities align and funding is deployed in ways that maximize state resources and advance overall state priorities. In addition, the state can provide incentives for the local use of value capture strategies.

5. **Develop a consistent method for value calculation, application, and enforcement.** All value capture mechanisms rely on a consistent and reliable value calculation. Transportation professionals should expect challenges to this calculation and make sure that their methodology is consistent, academically sound, and defensible. Value capture measurement may account for pre- and post-project property values, rental rates, new developments, business retention rates, or increases in taxable sales. Benefits are typically assessed by increased value, frontage, land area, zones, or a distance factor. For assessment districts, properties can be charged a flat fee or on a per-square-foot or unit cost. Some jurisdictions have found it helpful to commission a specific study or analysis to develop the calculation approach. This study should outline any exemptions or discounts to the fee or tax and the process for granting them.

6. **Develop a phasing strategy.** Since they involve structural changes to taxes and fees, land value taxes and conversion to transportation utility fees are best phased in over a period of time to mitigate the impact of varying taxing rates and allow property owners adequate time to plan for the new rate.

Case Studies

Dallas-Fort Worth Region: Cotton Belt Innovative Financing Initiative

In 2009, Fort Worth's Transit Authority and Dallas Area Regional Transit explored how a public-private partnership could fund a light rail connection between the two systems and searched for a firm to design, build, operate, maintain, and finance the system. They also sought the help of the local metropolitan planning organization, the North Central Texas Council of Governments (NCTCOG), to identify new funding structures to supplement an insufficient level of federal funds.[29]

NCTCOG developed a new value capture program called the Innovative Financing Initiative (iFi) to partially fund the 62-mile transit link, which was named the Cotton Belt Corridor. Beginning in 2011, iFi conducted community and stakeholder outreach and began to explore value capture tools such as land value taxes and shared profits from development along the corridor. Potential land value taxes included city, county, sales, hotel, and transit-oriented development taxes. Assuming tax revenue is shared equally between the locality and the Cotton Belt Corridor, iFi found that these value capture tools could provide long-term funding over the next 40 years.[30]

29 Fishman, E. (2012, January). "Lessons Learned from Public-Private Transportation Projects in Texas." K&L Gates LLP for the National Council for Public Private Partnerships. Retrieved 11/21/2013 from http://ncppp.org.previewdns.com/wp-content/uploads/2013/03/Pres-Austin-Fishman-0112.pdf.

30 North Central Texas Council of Governments. (2011, December). *Innovative Finance Initiative: Cotton Belt Corridor*.

San Francisco: Transbay Terminal

The planned Transbay Terminal in San Francisco, California, demonstrates how to leverage multiple value capture mechanisms. The project will link more than a dozen transit systems in the Bay Area, including planned high speed rail, commuter rail, Muni, and other local transit services, improving the city's accessibility to the entire west coast and conveying unique benefits to the immediate surrounding neighborhood.

San Francisco is a rapidly growing city, anticipated to expand its job base by over 44 percent in the next 25 years.[31] In addition to dramatically expanding transit access and efficiency for the city, Transbay Terminal will add more than 2,600 new housing units and over 1.2 million square feet of commercial use.[32]

To fund the nearly $5 billion project, the city is using several value capture tools, including a tax increment financing district, that will yield $1.4 billion over 45 years, with $171 million to be used to repay a TIFIA construction loan. The city is also proposing to establish a special assessment district and impose development impact fees.[33]

Washington, DC: Special Assessment for Infill Transit

In the late 1990s, the area in DC currently known as NoMa ("North of Massachusetts Avenue"), which surrounds the intersection of New York Avenue and Florida Avenue, remained underdeveloped. Located just north of the U.S. Capitol and blocks from the central business district, the area primarily housed nightclubs, surface parking lots, abandoned industrial buildings, and waste transfer sites. Although the city's popular Red Line subway ran through the middle of the site, it did not stop there. The closest metro stations were roughly one mile away.

After years of decline, the area began to see growth in the late 1990s, and large parcels of underutilized property near the Capitol attracted the attention of the city and private developers. The city targeted the area as a prime location to create new technology jobs and high-end housing. The local business community envisioned substantial new office space, signature residential developments, and destination retail in a new, modern, and environmentally sustainable community in the heart of the city.

Both the city and private developers recognized that achieving this vision would require premium transportation access, particularly from premium transit. The city determined that building a metro station would cost over $100 million—money neither the city nor the transit agency had available to spend in the austere times of the late 1990s. Local private sector property owners recognized that access to a metro station could provide tremendous value to their properties and improve their ability to attract major employers such as the federal government. A group of property owners in the area proposed a special assessment district, essentially agreeing to tax themselves for the next 30 years in order to help finance the new facility. The special levy was an addition to the typical property tax and raised roughly a quarter of the funds necessary for the New York Avenue station, which opened in 2004.

Retrieved 8/2/12 from: http://www.nctcog.org/trans/spd/transitrail/ctnblt/CottonBelt-iFi-FinalReport.pdf.

31 Seifel Consulting Inc. (2008, May). *Downtown San Francisco: Market Demand, Growth Projections and Capacity Analysis*. Table V-1, pp. IV-5. Retrieved 8/20/12 from http://www.sf-planning.org/ftp/CDG/docs/transit_center/R_TransitCenter_051308_Final.pdf.

32 Nichols, C. M. (2012, January). "Value Capture Case Studies: San Francisco's Transbay Transit Center." Metropolitan Planning Council. Retrieved 8/2/12 from http://www.metroplanning.org/news-events/article/6315/.

33 *Ibid.*

Today the area has created thousands of new jobs and housing units. Over the coming decades, it will add millions of dollars to the District's tax base, expanding general fund resources over and above repayment of the initial transportation investment.[34]

The New York Avenue/NoMa case is instructive in a number of ways. Not only does it demonstrate the willingness of the private sector to contribute to transport investments, but it also highlights the need to be inclusive. In the 1990s, the residential portions of NoMa were predominantly low income, minority households. Inclusionary housing policies in the District were designed to retain these populations through redevelopment, but there was wide-spread suspicion of the special assessment and its impact on lower income residents. Honest communication was critical in overcoming this obstacle. In the end, a broad-based coalition testified in favor of the legislation and the proposed value capture.[35]

Resources

Center for Transit-Oriented Development website. CTOD Papers and Publications. http://www.ctod.org/ctod-research.php.

CTOD's website provides a number of resources for further information on value capture.

Levinson, D., & Istrate, E. (2011, April). Access for Value: Financing Transportation Through Land Value Capture. Brookings Metropolitan Policy Program. http://www.brookings.edu/research/papers/2011/04/28-transportation-funding-levinson-istrate.

This paper provides an overview of the impact of transportation access on land value and strategies for recouping that value for reinvestment.

Smith, J. J., Gihring, T. A., & Litman, T. (2011). Financing Transit Through Value Capture: An Annotated Bibliography. Victoria Transport Policy Institute. http://www.vtpi.org/smith.pdf.

This report provides a compilation of existing research on value capture.

U.S. Government Accountability Office. (2010, July). Public Transportation: Federal Role in Value Capture Strategies for Transit is Limited, but Additional Guidance Could Help Clarify Policies. http://www.gao.gov/new.items/d10781.pdf.

This report surveys transit agencies to identify common barriers to implementing value capture and provides recommendations on how the federal government can better support—and reform policies that hinder—value capture.

Case Studies

Cleary, R. & Tarr, J. (2012, February). NoMa: The Neighborhood That Transit Built. Urban Land Institute. http://urbanland.uli.org/Articles/2012/Jan/MacCleeryNOMA.

This article provides more detail on the role value capture has played in the NoMa neighborhood in Washington, DC.

---

34 PB Consulting *New York Avenue – Florida Avenue-Gallaudet University Metro Station: A Case Study*. American Association of State Highway and Transportation Officials Center for Excellence in Project Finance website Retrieved 8/16/12 from http://www.transportation-finance.org/pdf/funding_financing/funding/local_funding/New_York_Avenue_Case_Study.pdf.

35 MacCleery, R. & Tarr, J. (2012, February). "Noma: The Neighborhood that Built Transit." *Urban Land Magazine website*. Retrieved 8/16/12 from http://urbanland.uli.org/Articles/2012/Jan/MacCleeryNOMA.

Fishman, E. (2012, January). Lessons Learned from Public-Private Transportation Projects in Texas. http://www.ncppp.org/publications/TX_1201/Fishman_TX1201.pdf.

This public presentation by K & L Gates provides information on the public-private partnerships in North Central Texas described in the case study above.

Levinson, D., Zhao, Z., & Lari, A. (2009, June). Value Capture for Transportation Finance: Report to the Minnesota Legislature. University of Minnesota Center for Transportation Studies. http://www.cts.umn.edu/Publications/ResearchReports/pdfdownload.pl?id=1160.

This report provides an assessment of value capture policies and an evaluation of applicability based on efficiency, equity, sustainability, and feasibility.

Newberg, S. (2011, March). A Value-Capture Strategy for Transportation in Texas. http://urbanland.uli.org/Articles/2011/Mar/NewbergTexas.

This report describes the Urban Land Institute's coverage of the iFi program recently developed by NCTCOG.

North Central Texas Council of Governments. (2011, December). Innovative Finance Initiative: Cotton Belt Corridor. http://www.nctcog.org/trans/spd/transitrail/CtnBlt/CottonBelt-iFi-FinalReport.pdf.

This Phase 1 Final Report on the iFi program discusses the modeling of potential land value capture in the corridor.

South African Cities Network. Creating and Capturing Value Around Transport Nodes. http://ndp.treasury.gov.za/TTRI/Township%20Renewal%20Sourcebook/TTRI%20Case%20Studies/Case%20Study_Creating%20and%20Capturing%20Value%20around%20Transport%20Nodes_2011.pdf.

This report provides good case studies of development around U.S. transit stations.

Establish a Next-Generation User Fee

The Opportunity

In the past, state and local governments relied heavily on federal and state fuel taxes to fund transportation. However, in most states and at the federal level, fuel taxes are not indexed to inflation, so they lose value every year. In addition, as vehicle miles traveled trend downward, drivers adopt alternative fuel vehicles, and fuel economy continues to improve, gas tax revenues will decline further.

Responding to this looming revenue creation shortfall, many states are considering moving toward tolls and/or VMT charges to maintain roads and improve transportation infrastructure. A VMT fee, commonly known as a mileage-based user fee, or MBUF, is a distance-based tax levied on miles driven whose revenues can be used to fund transportation system costs. With an MBUF, vehicle operators—both personal and commercial—are charged a per-mile fee instead of, or in addition to, the gas tax. The following provides information on strategies to successfully move toward implementing this new type of user fee.

What Is It?

In many ways, MBUFs do a better job than fuel taxes at matching users' road use to the tax they pay for road maintenance and construction. In other words, because mileage driven better reflects the wear and tear a vehicle imposes on a transportation system, charging by the mile more efficiently allocates the costs to road users. An MBUF has the potential to replace fuel tax as the primary source of funds for transportation systems. Estimates show that implementing a one-cent-per-mile fee nationally would raise $32.4 billion per year.[36] Systems for billing such charges are under development, but collection systems for transponder-based tolling show that, for most motorists, this can be done automatically and at low cost.

Minnesota's Mileage-Based User Fee Policy Task Force identifies two primary objectives for implementing such a fee: 1) using MBUFs to promote equity by ensuring that drivers pay for the damage they cause to the roadway, regardless of fuel used; and 2) generating sufficient transportation funds through an MBUF instead of relying on the increasingly ineffective fuel tax. Additionally, the group identifies two supplementary long-term objectives related to the MBUF's potential to manage demand: 1) protecting the environment by reducing vehicle emissions, and 2) improving transportation system performance, thus reducing the need for capacity expansion.[37] On this point, a Mineta Transportation Institute study reached the following conclusions about the policy's effect in changing travel behavior:

- Charging higher fees for peak-hour travel and for travel in designated congested areas could effectively reduce congestion where it is the worst. The VMT reduction during peak-hour travel and in more congested zones will be greatest for drivers who live in denser, mixed-use neighborhoods.
- Compared to the current motor fuel tax system, a system based on mileage traveled will strengthen the effects urban form has on travel behavior. Switching to an MBUF policy

36 American Association of State Highway and Transportation Officials. Center for Excellence in Project Finance. "VMT Fees." Retrieved 8/2/12 from http://www.transportation-finance.org/funding_financing/funding/proposed_funding_sources/vmt_fees.aspx.

37 Minnesota Mileage-Based User Fee Task Force. (2011, December). "Report of Minnesota's Mileage-Based User Fee Policy Task Force." Retrieved 3/21/12 from http://www.dot.state.mn.us/mileagebaseduserfee/pdf/mbufpolicytaskforcereport.pdf.

would therefore improve the ability of planners to use land use planning to moderate single occupancy vehicle travel demand. This would be accomplished mainly by shifting solo driving trips to carpooling or more sustainable modes such as transit, bike, or pedestrian.

- An MBUF policy's impact on travel behavior depends on how it is implemented. If fees are paid relatively rarely compared to the current fuel tax, the effect on travel behavior will be weaker because the charges are less apparent. On the other hand, if fees are paid regularly—for instance, every time the driver refuels—the effect would be stronger.[38]

Implementation

State DOTs have yet to fully implement an MBUF charging program, but lessons learned from various pilot programs provide direction for the successful implementation of an MBUF program. There are also several existing fee collection systems that can provide lessons on how to structure an MBUF, such as the fees paid by commercial vehicles through the International Registration Plan.

The Minnesota MBUF Policy Task Force provided a list of concerns associated with implementing a policy of mileage-based fees.[39]

- **Cost:** Implementing the new policy may be administratively expensive compared to implementing a fuel tax. One report estimates that the administrative costs of collecting MBUFs would total up to six percent of total revenues, compared to the cost of collecting the fuel tax, which equals less than one percent of revenues.[40] However, the MBUF pilot suggests that costs might be lower than originally estimated, particularly if the system uses readily available technologies and infrastructure.

- **Privacy:** Many citizens feel that using technology to monitor their travel behavior is an invasion of their privacy.

- **Jurisdictional issues[41]:** There are technological limitations associated with implementing an MBUF policy across state boundaries. How to charge out-of-state drivers using an in-state roadway is one example. In the absence of a federal mileage-based fee, it may be overly complex to have varying state-by-state fees, which is how the fuel tax is currently structured. It is therefore recommended that, when exploring mileage-based fees or conducting pilot studies, states work in partnership with contiguous states to work out regional approaches to implementing MBUF charges. Coordination among states may also lower the administrative costs of implementing an MBUF strategy.

- **Acceptance:** Many policy decision-makers and citizens know little about MBUFs. Addressing their shared concerns would be a necessary step in receiving more widespread acceptance of a mileage-based fee.

---

38 Mineta Transportation Institute. (2011, March). "The Intersection of Urban Form and Mileage Fees: Findings from the Oregon Road User Fee Pilot Program." Retrieved 3/21/12 from http://transweb.sjsu.edu/PDFs/research/2909_10-04.pdf.

39 Humphrey School of Public Affairs at the University of Minnesota (2011, December). *Report of Minnesota's Mileage-Based User Fee Policy Task Force*. Retrieved 3/21/12 from http://www.dot.state.mn.us/mileagebaseduserfee/pdf/mbufpolicytaskforcereport.pdf.

40 The I-95 Corridor Coalition. (2012, April). *Concept of Operations for the Administration of Mileage-Based User Fees in a Multistate Environment.* Retrieved 8/2/12 from http://i95coalition.org/i95/Portals/0/Public_Files/pm/reports/I-95CC%20ConOps%20for%20Administration%20of%20MBUF%20in%20a%20Multistate%20Environment%202012_04.pdf.

41 *Ibid.*

- **Use of revenues:** State legislation typically specifies how revenues from fuel taxes must be distributed, but no state has determined how to use proceeds from a mileage-based fee. Flexibility in program funding to support multimodal options is essential, and states will need to address revenue allocation prior to any program implementation.[42]

A study by the University of Iowa Public Policy Center, which conducted a four-year national evaluation of mileage-based road user charges, came to several conclusions that address some of the concerns stated above. The study's results showed that support for the charge increased considerably when drivers became more familiar with the program. Initially, 42 percent of participants held a favorable view of the policy; ten months later, 70 percent held a positive view.[43] Because perceptions are positively affected by exposure, policymakers should stress public awareness and education in order to gain the most public support for an MBUF before attempting to push forward with legislation.

Case Studies

Oregon: Road User Fee Program

Oregon conducted a pilot program in 2006 and 2007, along with a follow-up study in 2011 and 2012, to test the feasibility of using electronically collected data from volunteer vehicles to implement a mileage-based fee system. In the earlier pilot, 285 vehicles were outfitted with an electronic device that monitored the number of miles driven in predefined zones. In addition, some participants were charged higher fees in specific congestion pricing zones and during peak travel times. The device generated an electronic receipt using global positioning system (GPS) signals that were sent to specially-equipped gas pumps when the vehicles were refueled. At the pump, the standard fuel tax was deducted from the amount owed by the driver, and the owed mileage-based fees were added back. In the end, the test demonstrated that mileage fees were effective for collecting revenues without eroding fuel efficiency and that the system was relatively easy to administer.[44]

A study by the Mineta Transportation Institute analyzing the results from Oregon's pilot program further assessed the impact implementing the policy had on travel behavior. Four primary impacts were observed:

1. Participants who were charged a higher fee during peak commute times did, in fact, reduce their peak-time travel more than participants who were charged the same per-mile fee at all times.

2. Participants who were charged more for driving in designated congestion zones reduced their miles driven in these areas more than participants who were charged the same per-mile fee for all areas.

3. Households in higher density, mixed-use neighborhoods reduced peak-period VMT more than similar households in lower density neighborhoods when paying a peak-period fee

42 Humphrey School of Public Affairs at the University of Minnesota (2011, December). *Report of Minnesota's Mileage-Based User Fee Policy Task Force*. (2011, December). Retrieved 3/21/12 from http://www.dot.state.mn.us/mileagebaseduserfee/pdf/mbufpolicytaskforcereport.pdf.

43 Hanley, P. F., & Kuhl, J. G. (2011, December). "National Evaluation of Mileage-Based Charges for Drivers." Transportation Research Record: Journal of the Transportation Research Board: 10-18. doi:10.3141/2221-02. Retrieved from http://ppc.uiowa.edu/publications/national-evaluation-mileage-based-charges-drivers.

44 Chalker, J., Achterman, G., & O'Neal, D. (2009, January). Letter to Senator Maria Cantwell. TOLLROADSNews website. Retrieved 3/21/12 from http://www.tollroadsnews.com/sites/default/files/WestOnVMT.pdf.

but, surprisingly, increased VMT when paying a flat per-mile fee. The authors attribute these findings to some combination of more nearby destinations and more travel options in dense neighborhoods, but conflicting incentives due to the elimination of gas taxes.

4. Surprisingly, the lower fee rates during off-peak hours and in areas outside congestion zones resulted in little or no increase in the level of VMT. The study noted, however, that this may be a result of Portland's Urban Growth Boundary, which limits development—and therefore destinations—outside the designated congestion zone.[45]

The state conducted a smaller and shorter follow-up study in 2012-2013 to better understand unanswered questions from the first pilot. The second, two-phase study tested different mechanisms for collecting and reporting mileage data and included a survey of user preferences and concerns.[46] The study also addressed equity concerns among urban versus rural drivers and low- versus high-efficiency vehicles.[47] The findings helped address the political feasibility of implementing a statewide program to replace the fuel tax.

In 2013, the Oregon legislature authorized a formal Road Usage Charge Program (RUCP) based on the pilot program model. The RUCP, which limits the number of low-efficiency vehicles allowed in the program, will offer a fuel tax alternative for 5,000 voluntary participants. The legislation requires Oregon DOT (ODOT) to account for any concerns related to accuracy, privacy, security, and compliance auditing. For example, at least one data collection option must not include vehicle location technology. ODOT is pursuing public private partnerships to fund the program and is planning for launch in mid-2015.[48]

Washington State Pilot Program

This study, conducted in 2005 and 2006, had similar findings as Oregon's. Managed by the Puget Sound Regional Council (PSRC), the study put GPS meters in 275 volunteer vehicles and electronically deducted mileage fees from a prepaid driver account based on time traveled, distance traveled, and roads used. The PSRC program raised transportation funds without revenue erosion from fuel efficiency, and was able to minimize administrative and infrastructure costs by using GPS technology.[49]

Minnesota Pilot Program

Minnesota began a pilot program in 2011 with the intent of "identifying and evaluating issues for potential implementation of [mileage-based user fees]" in the state. According to the Minnesota DOT, the MBUF Policy Study, like other pilot studies, was spurred by the desire to bridge the transportation funding gap caused by decreasing fuel tax revenues. In 2007, the state legislature approved $5 million from the Trunk Highway Fund[50] to be allocated to the pilot program.

---

45 Mineta Transportation Institute. (2011, March). *The Intersection of Urban Form and Mileage Fees: Findings from the Oregon Road User Fee Pilot Program*. Retrieved 3/21/12 from http://transweb.sjsu.edu/PDFs/research/2909_10-04.pdf.

46 Whitty, J. (editor). (2013, February). *Road Usage Pilot Program Preliminary Findings*. Retrieved 11/11/13 at http://www.oregon.gov/ODOT/HWY/RUFPP/docs/RUCPilotPrelimFind_Feb13.pdf.

47 Whitty, J. (editor). (2013, January). *Report on Impacts of Road Usage Charges in Rural, Urban and Mixed Communities* Retrieved 11/11/2013 from http://www.oregon.gov/ODOT/HWY/RUFPP/docs/FINAL_Report_Impacts_RoadUserCharges_Rural_Urban_Mixed_Counties_Jan_2013.pdf.

48 Oregon DOT (2013). "Road Usage Charge Overview." Road Usage Charge Program webpage. Retrieved on October 14, 2013 at http://www.oregon.gov/ODOT/HWY/RUFPP/Pages/ruc_overview.aspx.

49 Chalker, J., Achterman, G., & O'Neal, D. (2009, January). *Letter to Senator Maria Cantwell*. TOLLROADSnews website. Retrieved 3/21/12 from http://www.tollroadsnews.com/sites/default/files/WestOnVMT.pdf.

50 Humphrey School of Public Affairs at the University of Minnesota (2011, December) *Report of Minnesota's Mileage-Based User Fee Policy Task Force*. Retrieved 3/21/12 from http://www.dot.state.mn.us/mileagebaseduserfee/pdf/mbufpolicytaskforcereport.pdf.

Unlike Oregon and Washington, which used in-vehicle GPS devices to monitor travel behavior, the Minnesota study had volunteers using GPS capabilities in smart phones to provide travel behavior for particular trips.[51] The volunteers either opted into the smart phone-based mileage tracking or used their odometer instead. The study incentivized the use of smart phone technology with a reduced per-mile charge. Using existing infrastructure and available cell phone technologies, the program offered smart phone users the ability to log on to a web-based application to verify the accuracy of their mileage and to ask questions of program support staff. Preliminary findings suggest that the program achieved a high rate of user acceptance.[52] A final report for the study is expected to be available in 2012.

Resources

Chalker, J., Achterman, G., & O'Neal, D. (2009, January 16). Letter to Senator Maria Cantwell. http://www.tollroadsnews.com/sites/default/files/WestOnVMT.pdf.

This letter requests, on the part of three state DOTs, that Congress authorize a national study on the utility of a VMT charge, arguing that study results from tests conducted in individual states show the validity of the VMT charge, particularly as the effectiveness of the gas tax wanes.

I-95 Coalition. "Cost drivers and preliminary cost estimates for VMT-based charges administrative requirements."
http://i95coalition.org/i95/Portals/0/Public_Files/pm/reports/Working%20Document%20Excerpt%20-%20Section%206%20Cost%20Drivers%20and%20Preliminary%20Cost%20Estimates.pdf.

This document identifies the cost drivers impacting institutional and administrative requirements for implementing multistate VMT charges. The memo includes preliminary estimates of the potential administrative costs of VMT-based charges.

Mineta Transportation Institute. (2011, March). The Intersection of Urban Form and Mileage Fees: Findings from the Oregon Road User Fee Pilot Program. http://transweb.sjsu.edu/PDFs/research/2909_10-04.pdf.

This report analyzes data from the 2006-2007 Oregon Road User Fee Pilot Program to assess if and how urban form variables correlate with travel behavior changes. The study found that a mileage fee program charging a high rate during the peak hour is likely to strengthen the underlying influence of urban form on travel behavior. This finding suggests that switching from fuel taxes to mileage taxes would reinforce the use of land-use planning as a policy tool to shift some travel from solo driving trips to more sustainable modes.

Minnesota Department of Transportation. (2011, December). Report of Minnesota's Mileage-Based User Fee Policy Task Force. http://www.dot.state.mn.us/mileagebaseduserfee/pdf/mbufpolicytaskforcereport.pdf.

The task force discussed and evaluated the MBUF concept and related issues, determined benefits and concerns, considered potential system design options and preferences, and formulated policy objectives and recommendations. The task force focused on policy, rather

51 American Association of State Highway and Transportation Officials. (2011, April 22). "Mn/DOT to Test Technology for Potential VMT Fee." AASHTO Journal. Retrieved 3/21/12 from http://www.aashtojournal.org/Pages/042211minnesota.aspx..

52 Battelle, Ben Pierce (2012 April 10) *Preliminary Results from the MnDOT Mileage-Based User Fee Demonstration*. Presentation. Retrieved from http://www.ssti.us/wp/wp-content/uploads/2012/05/Pierce_SSTI-Community-of-Practice-MRFT-Presentation-4_23_2012.pdf.

than operational or technological recommendations.

"Preliminary Results from the MnDOT Mileage-Based User Fee Demonstration." Presented by Ben Pierce, Battelle. (2012, April 10). http://www.ssti.us/wp/wp-content/uploads/2012/05/Pierce_SSTI-Community-of-Practice-MRFT-Presentation-4_23_2012.pdf.

This PowerPoint presentation describes the logistics, challenges, technology, and preliminary results of the Minnesota VMT trial.

THE INNOVATIVE DOT

Focus Area 2: Revenue Allocation and Project Selection

Focus Area 2: Revenue Allocation and Project Selection

Scarce transportation dollars need to be spent where they do the most good. But making changes to long-standing practices, some of which are ensconced in law, can be difficult and present a hurdle to state departments of transportation (DOTs) looking to get the best bang for their buck.

Pressing forward with revenue allocation and project selection reform represents a major way in which DOTs can deliver projects with greater impact more quickly. Many agencies are now reforming project selection and formula funding processes for sub-state units of government, often tying proposed spending to state, departmental, and/or local goals and objectives.

In this section:

- Establish Revenue and Funding Flexibility: Mode-Neutral Evaluation and Funding Distribution
- Incorporate Asset Management
- Develop a Performance- and Outcome-Focused Project Selection Process
- Remove Barriers to Off-System Investment
- Update Funding Formulas and Implement Competitive Fund Distribution for Smart Transportation

Pictured: Improvements to the Perimeter Center Parkway in Atlanta, GA were part of the work of the Atlanta Livable Centers Initiative. *See "Update Funding Formulas and Implement Competitive Fund Distribution for Smart Transportation" to learn more.*

Establish Revenue and Funding Flexibility: Mode-Neutral Evaluation and Funding Distribution

The Opportunity

State and federal transportation revenues are often funneled into mode-specific pools and then distributed to projects of the same type. A dollar taken in from an auto toll facility is typically a dollar credited to additional roadway projects, while a dollar in transit fare is a dollar of transit offset. In fact, half the states have a constitutional or statutory provision that limits the use of state gas tax revenues exclusively to highway and road purposes.[1]

This siloed approach ignores the integrated nature of the transportation system and exacerbates the highway and road focus in transportation funding. Improvements to roadway surfaces benefit transit riders, for example, and more efficient and attractive transit options benefit those who drive. Options such as system management, transit investments, technology improvements, and demand management may be less costly and more effective solutions to transportation problems than capacity projects. Segregating funds by mode does not allow states to prioritize projects that best serve the system as a whole; rather, it creates budget biases and false choices.

What Is It?

State DOTs can allocate funds efficiently based on system-wide needs, priorities, and performance by pooling resources into a multimodal fund, and then distributing funds using mode-neutral criteria. Under this approach, a DOT conducts a consistent cost-benefit analysis or a return on investment (ROI) calculation for each project regardless of mode, and the option with the lowest cost-benefit ratio or the highest ROI receives funding. This means that no option—road building, transit, or system management—is ignored in the project selection process.

Under this approach, a state would:

- **Establish a dedicated transportation fund** as repository of pooled funds from transportation user fees;
- **Combine all revenues/resources into common pot** for redistribution to the most effective projects; and
- **Decide how to distribute funds through a comprehensive mode-neutral analysis** that evaluates proposed projects based on criteria tied to specific state goals that focus on economic development, job creation, health and safety, asset preservation, and other priorities.

Some states already allocate funds using this framework. In others, achieving it may be too great a political challenge, but in that case, the DOT can perform multimodal planning and work to find the funding to match the best plan.

One of the biggest challenges to establishing a mode-neutral approach to project evaluation is the mode-specific division of current federal transportation funding—highway funding, bridge funding, and

1 National Conference of State Legislatures. (2011, June 1). *Transportation Governance and Finance: A 50-State Review of State Legislatures and Departments of Transportation*. Retrieved 9/12/2013 from http://www.ncsl.org/default.aspx?tabid=19117.

transit funding are divided into separate pots of money that have different requirements for use and are administered by separate agencies within the U.S. DOT. However, there is more flexibility in these programs than is commonly acknowledged. The new flexibility among highway funding programs provided by the federal transportation program MAP-21 may allow states to start to address some of these issues, although trying to use federal funding flexibly across modes will still present challenges.

Implementation

For states that do not currently have a mode-neutral fund in place, creating such a fund to pool transportation resources will likely require legislative action. This can vary on a spectrum between fully eliminating all mode-specific accounts and simply finding openings in existing language that allow a demonstration of the benefits of mode-neutral revenue collection and distribution. Appropriate strategies will depend on a state's political climate and budgetary constraints.

Eliminate mode-specific accounts. States can eliminate or amend restrictive earmarking provisions and replace them with new language that allows revenue to be deposited into a single transportation fund for use across all transportation modes. Statutory language is typically easier to modify than constitutional language. Several states have statutory language that can serve as a model for states looking to amend existing earmarking provisions. For example, Oregon's Multimodal Fund[2] is separate from the state's General Fund and supports air, marine, rail, and public transit projects.

Create a sub-fund that allows flexible allocation based on state priorities. Washington shifted $114 million of its state road funds (generated through taxes, permits, etc.) to its Multimodal Account.[3] The Washington State DOT (WSDOT) and state legislature collaboratively distribute this funding based on priorities rather than mode. Several states, including Maryland, Florida, North Carolina, and Wisconsin, have all modified state legislation to allocate a portion of transportation funding based on state priorities.

Review statutory disbursement formulas. Some states have mandatory disbursement formulas set by their legislatures that establish how much must be spent on roadway projects versus non-highway projects. In some cases, these statutes have some implicit flexibility that states can utilize. Rhode Island, for example, established a dedicated state transportation fund by statute §31-36-20 that requires that all gas tax revenues be deposited into the Intermodal Surface Transportation Fund (ISTF).[4] While the legislation specifically allocated a portion of the fund to particular uses, the DOT has flexibility to allocate the majority of the fund to the most effective purposes.[5]

New York provides an alternative model for states that wish to retain some allocation formula. State Finance Laws §89-B[6] and §89-C[7] established the Dedicated Highway and Bridge Trust Fund and the

2 Oregon State Legislature. *Oregon Statute 367.080: Mulitmodal Transportation Fund*. Retrieved 9/12/2013 from http://www.oregonlaws.org/ors/367.080.

3 Center. Retrieved 9/12/2013 from http://www.washingtonpolicy.org/publications/legislative/wpc-recommendations-2012-transportation-tax-package-part-iii.

4 State of Rhode Island. Rhode Island State, Title 31: Motor and Other Vehicles. Chapter 31-6: Motor Fuel Tax. Retrieved 9/12/2013from http://www.rilin.state.ri.us/statutes/title31/31-36/31-36-20.HTM.

5 State of Rhode Island FY 2013 Governor's Budget. Executive Summary. Chapter 8: "Transportation." Last updated January 31, 2012. Retrieved 8/1/12 from http://www.budget.ri.gov/Documents/CurrentFY/ExecutiveSummary/8_Transportation.pdf.

6 New York State Legislature. *Statute §89-B, State Finance*. Retrieved 8/23/12 from http://public.leginfo.state.ny.us/LAWSSEAF.cgi?QUERYTYPE=LAWS+&QUERYDATA=$$STF89-B$$@TXSTF089-B+&LIST=SEA32+&BROWSER=BROWSER+&TOKEN=59091576+&TARGET=VIEW.

7 New York State Legislature. *Statute §89-C, State Finance*. Retrieved 8/23/12 from http://public.leginfo.state.ny.us/LAWSSEAF.cgi?QUERYTYPE=LAWS+&QUERYDATA=$$STF89-C$$@TXSTF089-C+&LIST=SEA33+&BROWSER=BROWSER+&TOKEN=59091576+&TARGET=VIEW.

Dedicated Mass Transportation Trust Fund, respectively, in the New York State DOT as repositories of transportation-related revenues. Although marginally constrained by mode, the DOT has flexibility to apply the funds toward a broad array of projects for highways, airports, ports, rail, ferries, and transit.

Expand the definition of "roads and highways." If changing earmarking language is not feasible, expanding the definition of "roads and highways" can allow states more flexibility with fund allocation. For example, as a result of state-level Complete Streets legislation, Wisconsin's DOT provided guidance in Chapter Trans 75 that requires roads built with state and federal funds to have amenities for bike, pedestrian, and transit users.[8] Communities now must consider all road users when building new roads, including motorized, non-motorized, and transit. This means that bike lanes, sidewalks, wide paved shoulders, and/or transit pull-outs may be included in the definition of a road, so separate funding is not necessary.

Identify openings in modal dedication language. If amending restrictive statutory or constitutional language is politically unfeasible, there are still opportunities for transportation revenue flexibility. Oregon has separated the tax paid on gas for non-road machines (such as lawn mowers, chainsaws, and leaf blowers) from the gas tax paid by motorists and sets aside this money, the "Lawnmower Fund," specifically for non-road transportation projects. As defined in ORS 184.642, this fund consists of taxes on fuel for non-road vehicles and machines, and therefore is not subject to the constitutional restrictions that apply to the state's highway fund.[9] This nuance complies with state law, which mandates that revenues generated from roads must be used exclusively for road projects. While the amount collected in the Lawnmower Fund is relatively small—approximately $5 million annually, as of 2009, compared to $328 million in the Highway Fund —it still provides some funding that the DOT may use for transportation projects that go beyond roads and highways.[10]

Case Studies

Maryland

Maryland's method of allocating funds for transportation allows complete flexibility across modes. Projects are selected based on the goals and objectives in Maryland's 20-year transportation plan. The approach is bottom-up: local municipalities submit project lists to the Maryland DOT (MDOT), and the governor prioritizes projects based on the state's goals and objectives, as well as the proposed project's level of service, safety, maintenance issues, economic development potential, availability of funding, and input received from public and local officials.[11] The governor makes the final project selection, which is submitted to the General Assembly for approval. The General Assembly is able to reduce funding for projects but cannot add funding.[12]

---

8 State of Wisconsin. (2010, December). Wisconsin Legislative Documents. Chapter Trans 75: Bikeways and Sidewalks in Highway Projects. Retrieved 9/12/2013 from https://docs.legis.wisconsin.gov/code/admin_code/trans/75.

9 Oregon State Legislature. ORS 184.642, Department of Transportation Operating Fund. Retrieved 8/23/12 from http://www.oregonlaws.org/ors/184.642.

10 Oregon State Legislature. *2009-2011 Oregon Legislatively Adopted Program Budget*. Retrieved 9/12/2013 from http://www.oregon.gov/ODOT/CS/FS/docs/budget/0911Lab_PrgBdgt.pdf?ga=t.

11 Cambridge Systematics, Inc., University of Maryland Center for Advanced Transportation Technology, and Resource Systems Group. (2010). "National Cooperative Highway Research Program Report 664: Measuring Transportation Network Performance." Transportation Research Board of the National Academies. Retrieved 8/15/12 from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_664.pdf.

12 National Conference of State Legislatures. (May, 2011). *Transportation Governance and Finance: A 50-State Review of State Legislatures and Departments of Transportation*. Retrieved 8/10/12 from http://www.ncsl.org/documents/transportation/FULL-REPORT.pdf.

This multimodal funding protocol, delineated in Chapter 725, was instituted in 2010 after a multi-year process and several amendments. The process was spurred by transportation advocacy organizations, which wanted more transparency in project selection. The advocacy coalition worked with MDOT and the state legislature to develop a bill that would better align state priorities with projects selected for funding. Chapter 725 requires MDOT to better define how the department evaluates and selects proposed major capital projects. Local jurisdictions must demonstrate the relationship between their prioritized projects and the long-term goals of the state transportation plan and local land use plans.[13]

While this legislation did not significantly change the process of allocating funds, it did create a more transparent process. Counties now have guidance on criteria, the timeframe for project submittal, and more information in order to build strong projects from the beginning.

Wisconsin

Wisconsin has a segregated transportation fund that takes in revenues from motor fuels taxes, vehicle registration, bonding, and other sources and supports all modes, including urban transit and a state-owned intercity freight rail network. Sometimes the "diversion" of revenues collected from one mode to support another—particularly transit—becomes a political issue. However, a Wisconsin DOT (WisDOT) study of the socioeconomic benefits of transit learned that public transit use saves the state's riders and taxpayers an estimated $730.2 million annually[14], contributes to overall quality of life, reduces emissions, and benefits drivers by mitigating highway congestion.

To better understand the value of public transit investments, WisDOT conducted a thorough cost-benefit analysis over the life cycle of the investment (20 to 30 years in the case of transit capital investment projects). This research showed that investing in transit would produce a return of more than three dollars on each dollar spent at all the potential state funding levels that were evaluated.[15] It furthermore documented benefits in greater detail, in terms of affordable mobility that transit provides (an especially crucial factor for households without ready access to an automobile, for whom transit is a key means of reducing household expenses allocated to transportation and thus allows household income to be invested in other sectors of the economy), congestion management, and economic development. Once all the benefits and costs had been estimated, investigators could calculate cost-benefit metrics such as net present value, cost-benefit ratio, and ROI under different levels of state funding. These types of metrics are useful to state decision-makers in assessing the economic worthiness of public transit.

Pennsylvania

The Pennsylvania DOT (PennDOT) developed a mode-neutral planning process as part of its Linking Planning and NEPA (LPN) initiative. This initiative was initially a response to changes in SAFETEA-LU legislation regarding the connection between the planning and NEPA (National Environmental Policy Act) phases of project delivery. The result of this initiative was the development of a series of screening tools that are to be used during the long-range transportation planning process that is conducted by metropolitan planning organizations (MPOs) and rural planning organizations (RPOs) throughout

13 Maryland Transportation Code Ann. 2-103.1 (c)(5). Retrieved 8/1/12 from http://www.mdot.maryland.gov/Office%20of%20Planning%20and%20Capital%20Programming/County_Priority_Letters/Documents/Ch_725_hb1155.pdf.

14 Wisconsin Department of Transportation Research Program. (May, 2006). Wisconsin Project 0092-05-14, "The Socioeconomic Benefits of Transit in Wisconsin, Phase II: Benefit Cost Analysis." Retrieved 9/12/2013 from http://wisdotresearch.wi.gov/wp-content/uploads/05-14tranbenefits-f1.pdf.

15 *Ibid.*, p. 6.

Pennsylvania.[16] PennDOT worked with MPOs and RPOs to develop screening tools that require the assessment of all modes of travel for all problems and candidate projects. Although these tools have been in place for several years, they are just beginning to be tested in current rounds of long-range transportation plan development.

Oregon

In 2012, the Oregon DOT (ODOT) changed how the Statewide Transportation Improvement Program (STIP) is developed. The STIP will no longer be developed as a collection of programs tied to specific pools of funding dedicated to particular transportation modes or specialty programs. Instead, STIP funds will be divided into two broad categories, with 76% of funds going toward the preservation of existing statewide and regional assets such as pavement and bridges and the remaining funds reserved for "activities that enhance, expand, or improve the transportation system."[17]

While the list of eligible enhancement projects reflects the consolidation of non-highway programs under MAP-21, it also represents a significant change in the way ODOT identifies, designs, and evaluates projects. Enhancement projects are selected and submitted primarily by MPOs and Area Commissions of Transportation (ACTs), then evaluated by the Oregon Transportation Commission (OTC), ODOT staff, and elected officials against ten benefit categories tied to stakeholder interests, the Oregon Transportation Plan, and other state priorities. Oregon uses a single standard application to allow mode neutral evaluation and comparison of competing projects. The ability to design and combine infrastructure projects and operational programs (such as transportation demand management) for multiple modes reflects ODOT's commitment to its sustainability objectives.[18]

Minnesota

Minnesota DOT (MnDOT) recently built upon its highly regarded investment decision-making approach—used primarily during the planning, project development, and programming of its projects—to evaluate long-term investment strategies. Its decision-making framework currently incorporates benefit-cost analysis (BCA) and life-cycle cost analysis (LCCA), which account for environmental, social, and economic factors including safety, travel time, travel time reliability, emissions, health, and land impacts. However, recognizing that its aging infrastructure, changing travel demands, and limited funds will pose new challenges in the coming decades, the agency recently began testing a new approach for evaluating the implications of various investment strategies over the course of 20 years.

In 2012, the governor-appointed Minnesota Transportation Finance Advisory Committee (TFAC) released a report outlining recommended funding and investment strategies over the next 20 years. In that report, TFAC identified three investment scenarios: 1) maintaining current funding levels; 2) maintaining the current performance of the system at an estimated cost of $5 billion above baseline spending; and 3) building an economically competitive system at an estimated cost of $10-12 billion above baseline spending. TFAC recommended that the state pursue the third scenario.[19] Given the range of investment strategies available for working toward this goal and the potential funding

16 Pennsylvania Department of Transportation. Center for Program Development and Management. (2010, September). *Developing Regional Long Range Transportation Plans: Resource Guidance for Pennsylvania Planning Partners.* Retrieved 8/1/12 from: ftp://ftp.dot.state.pa.us/public/Bureaus/Cpdm/FinalLRTPGuide.pdf.

17 September 24, 2012. Retrieved 10/9/2013 from http://www.oregon.gov/ODOT/TD/TP/STIP/Introduction%20To%20Enhance%20and%20Fix-It%20-%20September%2024%202012.pdf.

18 Oregon Department of Transportation (2012, October)). "2015-2018 STIP Enhance Application How-to Webinar" October 11, 2012. Retrieved 10/9/2013 from http://www.oregon.gov/ODOT/TD/TP/STIP/STIP_how_to.pdf.

19 Minnesota Transportation Finance Advisory Committee. (2012, November). "Summary Report and Recommendations." Retrieved 11/18/13 from http://www.dot.state.mn.us/tfac/docs/TFACSummaryReportNov30.pdf.

challenges, MnDOT conducted a comprehensive return-on-investment (ROI) analysis, with support from Smart Growth America, to estimate the expected benefits of pursuing each scenario and the relative benefits of different investment strategies.

MnDOT's ROI analysis builds upon its BCA analysis approach, meaning that it accounts for a broader range of costs and benefits than a typical private sector ROI analysis. In their study, the agency analyzed ROI over 20 years for 10 different investment categories. Benefits and costs were estimated from representative projects and from relevant literature. This work revealed considerable benefits of maintaining the system's current level of performance and somewhat less but still substantial benefits of pursuing a world-class system. Perhaps more importantly, the work revealed that specific strategies, such as active traffic management (ATM), congestion mitigation, safety spot improvements, and tolled express lanes offered the greatest potential ROI, compared to things like paving and bridge work. This work will help the agency identify a viable investment framework for allocating available funds to meet stakeholder needs. Moving forward, the ROI framework provides an important mode-neutral approach to project prioritization and investment decision-making.[20]

Resources

American Planning Association (2010). Policy Guide on Surface Transportation. http://www.planning.org/policy/guides/adopted/surfacetransportation.htm.

This guide provides an overview of surface transportation funding challenges and outlines APA's policy approach.

Cambridge Systematics, Inc., University of Maryland Center for Advanced Transportation Technology and Resource Systems Group. (2010). National Cooperative Highway Research Program Report 664: Measuring Transportation Network Performance. Transportation Research Board of the National Academies: Washington, DC http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_664.pdf.

This guidebook outlines strategies for integrating existing performance measures from individual transportation modes and jurisdictions into systems for evaluating full network performance.

National Conference of State Legislatures. (2011, May). Transportation Governance and Finance: A 50-State Review of State Legislatures and Departments of Transportation. http://www.ncsl.org/default.aspx?tabid=19117.

This report provides a review of transportation governance and finance in each of the 50 states, including in-depth profiles for each state.

Pennsylvania DOT & New Jersey DOT. (2008, March). Smart Transportation Guidebook: Planning and Designing Highways and Streets to Support Livable and Sustainable Communities. http://smart-transportation.com/guidebook.html.

This joint effort of the Pennsylvania and New Jersey DOTs provides guidance to project managers for state transportation projects on the key components of local community context—land use plans and policies, street network connections, and development controls—that allow more sound state investment in a larger share of the transportation system.

Wisconsin DOT Research Program. Wisconsin Project 0092-05-14, "The Socioeconomic Benefits of Transit in Wisconsin, Phase II: Benefit Cost Analysis." http://wisdotresearch.wi.gov/wp-content/uploads/05-14tranbenefits-f1.pdf.

This report provides a model for performing a transit cost-benefit analysis.

20 Smart Growth America. (2013, November). "Assessing Return on Investment in Minnesota's State Highway Program." Retrieved 12/10/2013 from http://www.dot.state.mn.us/minnesotago/pdf/2013/MnDOTFinalReport.pdf.

Incorporate Asset Management

The Opportunity

From 2004 to 2008, 57 percent of state road funding went to expanding lane miles, but this work only represented 1.3 percent of total state-owned highway miles. That means the remaining 43 percent of funds went toward 98.7 percent of the road system.[21] This average suggests that maintenance is often a lower priority, despite indications that existing roads are in desperate need of repair. The American Society of Civil Engineers gave U.S. roads a D and its bridges a C+ in its 2013 Report Card on America's Infrastructure.[22] One-third of the county's roads rank in poor or mediocre condition. Postponing maintenance greatly increases its cost. The American Association of State Highway and Transportation Officials (AASHTO) estimates that every $1 spent to keep roads in good condition today allows a state to avoid spending $6-$14 to fix a road once it has significantly deteriorated.[23]

At the same time, public scrutiny and suspicion of wasteful or excessive spending has increased. Limited public funds must be used in the best way possible, and voters are holding their public officials accountable. According to a survey by the Rockefeller Foundation, 86 percent of respondents favor a "fix-it first" policy that maintains existing assets before building new ones.[24] Literally fixing every road before considering new capacity would be a crude form of asset management, but this poll shows an appreciation for the importance of system preservation.

Adopting an aggressive asset management program is an opportunity to optimize the use of scarce resources, encouraging more policy- and data-driven decisions when weighing big spending categories such as maintenance, construction, and operations, or when considering projects and design alternatives.

What Is It?

All states engage in some level of asset management with maintenance budgets; however, in recent years the term has expanded to include a targeted effort by states to keep infrastructure in good or better condition than at present, consider trade-offs in capital planning, and contain the costs of planning, construction, and operating new facilities.

According to the Federal Highway Administration (FHWA):

> Asset Management capitalizes upon three key factors. **First**, pavements, bridges and maintenance appurtenances tend to degrade at predictable rates, so their future conditions can be predicted based upon asset condition history and known deterioration curves. **Second**, timely preservation, and preventive and rehabilitative treatments at the right point of the deterioration curve can be very economical because they prevent the rapid degradation of

21 Smart Growth America. (2011, June). *Repair Priorities: Transportation Spending Strategies to Save Taxpayer Dollars and Improve Roads*. Retrieved 9/12/2013 from http://www.smartgrowthamerica.org/documents/repair-priorities.pdf.

22 American Society of Civil Engineers. (2013). *Report Card for America's Infrastructure*. Retrieved 11/26/13 from http://www.infrastructurereportcard.org/.

23 American Association of State Highway and Transportation Officials and the Road Information Project. (2009). "Rough Roads Ahead: Fix Them Now or Pay for It Later." Retrieved 9/12/2013 from http://roughroads.transportation.org/.

24 Rockefeller Foundation. (2011). *The Rockefeller Foundation Infrastructure Survey*. Retrieved 5/17/12 from http://www.rockefellerfoundation.org/uploads/files/80e28432-0790-4d42-91ec-afb6d11febee.pdf.

assets that occurs once they reach a deteriorated state. Restoring severely degraded assets is more costly than preserving them in a sound state. **Third**, assets have significantly different values; for example, high-volume pavements and bridges create more public value than do lightly traveled ones. By carefully assigning economic values to assets and by prioritizing the treatment of those which have the highest economic value and by setting appropriate treatment timings, transportation agencies can optimize scarce resources. This systematic optimization allows agencies to "get the biggest bang" for their scarce infrastructure resources and demonstrate that they are taking a rational and systematic approach to maximizing public resources.[25]

Access to appropriate data and careful analysis are the keys to effective asset management:

Data. First, a DOT needs a solid accounting of the entire system and the condition of its assets. Some DOTs hire contractors to collect this data initially and then update the information internally. Florida's Roadway Characteristics Inventory (RCI) is both a field handbook describing how to collect data and a staff handbook that reports on the data collected. For the Florida DOT (FDOT), the RCI also provides valuable information on safety issues and helps the department target budgets and reduce crashes.[26]

Analysis. With data in hand, agencies can perform analyses to help guide investment. They can predict pavement performance to avoid disinvestment through deferred maintenance, prevent the need for simultaneous rebuilding of large fractions of the system, and smooth the rate of spending. Nebraska, for example, runs a pavement optimization program that tracks pavement deterioration and provides cost-benefit ratios that determine where dollars can have the biggest effect.

Life-cycle cost analysis (LCCA) is an important complementary tool that allows agencies to consider the future costs of proposed new facilities in their long-term asset management planning. LCCA considers both initial costs and discounted future costs, including maintenance, reconstruction, and user costs. Such accounting is especially critical in cases where non-DOT entities, such as local governments, have the power to capitalize capacity projects and then turn them over to the DOT for operation and maintenance.

Implementation

Legislative direction (optional). An asset management program can be initiated by legislation that calls for performance measures of the state's transportation system. In Michigan, for example, former Governor Jennifer Granholm spoke about responsible transportation spending and asset management during her first campaign in 2002; after winning the election, she redirected $400 million toward repairs.[27] Michigan's 2002 Act 499 created a Transportation Asset Management Council and required all jurisdictions to submit an annual asset management report covering a multi-year program.[28]

Washington's asset management program began in 1994, when the state legislature passed 1993

25 Federal Highway Administration. (2012, June) "Executive Brief: Advancing a Transportation Asset Management Approach (FHWA-IF-12-034). Retrieved from 9/12/2013 from http://www.fhwa.dot.gov/asset/pubs/if12034.pdf.

26 Federal Highway Administration. (2012, August 17). "Highway Safety & Asset Management." Retrieved 9/12/2013 from http://www.fhwa.dot.gov/asset/assetmgmt_safety.cfm.

27 The Governors' Institute on Community Design (2007, April) "Adopt a Fix-it-First Policy." *Policies that Work: A Governors' Guide to Growth and Development*. Retrieved from http://govinstitute.org/policyguide/pdfs/policyguide.pdf

28 Sanada, B. "Asset Management and Act 51." Presentation for Michigan Transportation Asset Management Council. Retrieved 9/12/2013 from http://www.michigan.gov/documents/mdot/MDOT_Act51_Asset_Management_Process_283478_7.pdf.

replacing a formula-driven selection process with a more flexible model that emphasized preservation and improvement programs.[29]

A DOT does not need legislation to start an asset management program; however, these examples show how a governor or legislature initiated the change and required the DOT to implement it.

Asset inventory. Asset management requires DOTs to make decisions based on data about road characteristics and conditions, so database updates must be integrated into the process for informed decision making. Washington began its asset inventory as a series of cross-referenced databases, but in recent years has embarked upon a geographic information system (GIS)-based dataset called Workbench.[30] States should also make asset inventories available to local jurisdictions to help them understand life cycles and road conditions. The Metropolitan Transportation Commission (MTC) in the Bay Area uses StreetSaver, a computer-based pavement management system that is available to MTC's cities and counties.[31]

Goals and policies. DOTs should start with a baseline so they can design high but achievable goals. For example, a DOT might aim to increase its state highway status ranked as good from 35 percent to 50 percent in five years. Prioritization of roads, scoring criteria, and performance measures should be created to help achieve these goals. The principles of asset management require that preservation or maintenance be considered on a level playing field with expansion projects, or even as a higher priority, given the importance of maintaining the system.

The North Carolina DOT (NCDOT) undertook a comprehensive Transportation Asset Management (TAM) program in 2003. The agency created a TAM office and divided roads into tiers by state, region, and subregion, as well as by level of need. Through legislation, a line item was added to the state budget for system preservation; highway funds are no longer restricted to paving projects but can now also include "improvement." As a result of its asset management program, NCDOT can now produce trade-off scenarios to evaluate the best use of funds across all projects.[32]

Cultural shift. All DOTs engage in asset management at some level and in some departments, but too often these departments, such as highways, bridges, or mass transit, do not communicate with each other. Washington found that transparency of data within the agency helped staff understand that the DOT's success depended on the success of every department. In Michigan, leaders promoted the road and bridge network as a "corporate asset," rather than a resource that everyone fought over for their own particular projects.

Another cultural shift would be to think outside of agency silos. For example, many states do not take into account user costs when evaluating LCCA or other cost-benefit analyses. This may be due to the difficulty in estimating these costs, a state DOT's focus on its own agency costs, or the risk of user costs "swamping" the data due to its potential magnitude. But these reasons should not deter state DOTs from finding ways to take into account vehicle operating costs, effects on property values, crash costs, and more. Costs can be weighted according to a DOT's priorities, and cost calculations already

29 Federal Highway Administration. (2007 April). "Comprehensive Transportation Asset Management: The Washington State Experience." Retrieved 9/12/2013 http://www.fhwa.dot.gov/infrastructure/asstmgmt/cswa07.pdf.

30 Environmental Geospatial Information for Transportation Peer Exchange. (2006, November) *Transportation Research Circulator Number E-C106: Environmental Geospatial Information for Transportation*. Retrieved 8/20/12 from http://onlinepubs.trb.org/onlinepubs/circulars/ec106.pdf.

31 California Metropolitan Transportation Commission. Retrieved 9/22/2013 from http://www.mtc.ca.gov/about_mtc/about.htm.

32 Federal Highway Administration. (2011). "Comprehensive Transportation Asset Management: The North Carolina Experience, Part II." Retrieved 9/12/2013 from http://www.fhwa.dot.gov/asset/hif12006/hif12006.pdf.

exist for certain components of user costs. For example, research studies have quantified how much the international roughness index (IRI) of a pavement can impact vehicle operating costs.[33]

Reporting and monitoring. Asset management can readily be tied into other initiatives in this handbook, such as system-wide performance metrics and performance-based project prioritization. Transparent reporting, a theme running through several initiatives, reassures the public that their tax dollars are managed well. Reporting through dashboards or other web tools about the amount of money saved and future savings through system re-investment shows the public fiscal prudence.

Delivery. Once an agency has prioritized projects according to its asset management framework, it must take the necessary steps to deliver those projects in a timely manner. The Tennessee DOT recently postponed major new capacity projects (such as a long-planned new 65-mile stretch of Interstate 69), until it can its meet its obligations to repair and replace old bridges and resurface existing roads.[34] In order to address its nearly 4,500 deficient bridges, the Pennsylvania DOT has launched a Rapid Bridge Replacement Project (RBRP) through which anywhere from 200 to 1,000 projects can be bundled together in a public private partnership for rapid delivery.[35]

Case Studies

Florida

Hillsborough County makes extensive use of information systems in its asset management program. The county realized it needed better coordination of its activities,[36] so the engineering, construction, and road and street maintenance departments were combined into a new public works agency, with each department bringing its own database and management system. Staff realized the new agency needed a combined inventory of roadways, shoulders, curbs, and sidewalks. To undertake this effort, the county hired a contractor, which collected detailed data on condition, speed, and other metrics on 20,000 linear miles in a four-month period.[37] The data were integrated into the county's existing Hansen Infrastructure Management System Roadway Module and ultimately linked to a GIS base.

This integrated management information system, known as the Hillsborough County Asset Management System (HAMS), allows staff to see any county road's condition, maintenance history, and photos of the location, as well as update data. As the dataset evolved, cost and benefit data were added, along with a desire to use the data for economic analysis and smart investments. Prior to this, capital projects were typically selected ***ad hoc***. Now that the county has adopted asset management into its project selection process, asset coordinators can query HAMS and find more than 38 road variables when evaluating projects.[38]

At the state level, asset management has been integrated into the entire planning, programming, and monitoring processes. FDOT created policies for road maintenance based on specific outcomes. For

33 Barnes, G. & Langworthy, P. (2003, June). "The Per-mile Costs of Operating Automobiles and Trucks." State and Local Policy Program, Humphrey Institute of Public Affairs, University of Minnesota. Retrieved 8/20/12 from http://www.cts.umn.edu/Publications/ResearchReports/reportdetail.html?id=670.

34 State Smart Transportation Initiative. (2013, March 11). "Tennessee DOT Commissioner halts I-69 project." Retrieved 11/12/13 from http://www.ssti.us/2013/03/tennessee-dot-commissioner-halts-i-69-project/.

35 Finerty, John (2013 February 12) "Public-private partnership eyed to repair Pa. bridges quicker" The Shannon Herald. Retrieved 10/25/2013 at http://sharonherald.com/local/x1633480163/Public-private-partnership-eyed-to-repair-Pa-bridges-quicker.

36 Federal Highway Administration. (2005, May). *Economics in Asset Management: The Hillsborough County, Florida, Experience.* Retrieved 8/2/12 from http://www.fhwa.dot.gov/infrastructure/asstmgmt/difl.pdf.

37 *Ibid.*

38 *Ibid.*

example, FDOT's resurfacing operating policy calls for resurfacing, on average, 5.6 percent of the state's highway system each year. Bridges declared deficient are replaced in nine years.[39]

Florida, like Hillsborough County, makes extensive use of private contractors to inventory assets and perform routine maintenance. FDOT's asset management contracts have grown from $484 million in 2004 to $900 million in 2008.[40] Asset management is supported by the Roadway Characteristics Inventory, which includes roadway condition information as well as data needed for federal and state reporting requirements.[41] The offices of planning, maintenance, and traffic operations administer the dataset.

FDOT's efforts have led to excellent results. Bridges and resurfacings exceed FDOT targets for good repair (90 percent and 80 percent, respectively).[42] FDOT also communicates regularly with the public and administers surveys to determine expectations. Asset management has been adopted as part of the culture at FDOT; it is not a special function, but rather has become business as usual.

Pennsylvania's Life Cycle Cost Analysis

PennDOT wanted to choose pavement types based not only on initial cost and institutional opinion, but also on a consideration of life cycle costs. LCCA allows DOTs to compare the merits of competing pavement designs, and the policy was adopted by PennDOT in 1980. PennDOT requires this analysis for all projects that cost more than $10 million and for all interstate highway projects over $1 million.[43] Before adopting an LCCA policy, paving choice was left up to the project engineer. As a result, PennDOT had a long list of different paving types with various maintenance needs and life spans to maintain and rehabilitate. Road rehabilitation required construction zones or closures, which then affected vehicle flow. PennDOT wants paving designs that will last for at least 20 years, and it expects rehabilitation to add another 20 years to the life cycle. Engineers submit their costs for construction and maintenance over a 40-year period, and PennDOT evaluates pavement proposals based on current and future costs.[44] Because PennDOT's contracting system already contained a significant amount of data on previous bids and projects, LCCA did not require a huge amount of new data collection. The LCCA process was created by a special task force at PennDOT and became institutionalized in the PennDOT Highway Geometric Design Manual and its Pavement Policy Manual. As a result of LCCA's rigorous nature, PennDOT now has better pavement design.[45]

Michigan's Annual Reporting System

Michigan DOT was a pioneer in research into pavement management. Years of work beginning in the 1980s culminated in a requirement in 2002 by the legislature for MDOT and local road agencies to implement an asset management approach for all road mileage eligible for federal aid. Local units employ the simple Pavement Surface Evaluation and Rating (PASER) system to survey 40,000 route-miles every two years and tabulate pavement condition. The health of the system is reported annually in terms of remaining service life. Procedures for the process are developed by an Asset Management Council, on which local units, regional planning agencies, and MDOT are represented, assisted by academic institutions. Six of the annual reports have been issued so far, confirming a steady

39 American Association of State Highway and Transportation Officials. (2007). "US Domestic Scan Program: Best Practices in Transportation Asset Management." Retrieved 9/12/2013 from http://onlinepubs.trb.org/onlinepubs/trbnet/acl/ncrhp2068_domestic_scan_tam_final_report.pdf.

40 *Ibid.*

41 *Ibid.*

42 *Ibid.*

43 Federal Highway Administration. (2011, April 7). "PennDOT's LCCA Program." Retrieved 8/20/12 from http://www.fhwa.dot.gov/infrastructure/asstmgmt/dipa206.cfm.

44 *Ibid.*

45 *Ibid.*

deterioration of system conditions through disinvestment due to underfunding.[46]

Minnesota's Cap and Swap

In some states, an inherent conflict of interest exists where capital funds come from local sources, often dependent on selling projects to the public, and maintenance costs are borne by a separate entity. One remedy is to simply cap the number of lane miles of roadway that the state agrees to maintain. If a new facility were added to the system, an equal number of miles would be swapped with local authorities that would agree to perpetual ownership and maintenance.

One state that has such a cap, which has prompted swaps of roadway back to local governments, is Minnesota. "The trunk highway system may not exceed 12,200 miles in extent, except the legislature may add trunk highways in excess of the mileage limitation as necessary or expedient to take advantage of any federal aid made available by the United States to the state of Minnesota."[47]

Such a cap imposes a form of LCCA considerations on local decision-making. Any new lane miles added to the state system are offset by devolving state lane miles to the locals, who take over owner-operator responsibility.

Resources

General

The American Association of State Highway and Transportation Officials & The Road Information Project. (2009). Rough Roads Ahead: Fix Them Now or Pay for It Later. http://www.ttap.mtu.edu/library/RoughRoadsAhead.pdf.

> This report describes the preservation needs of the nation's highways and examines some of the solutions that can be applied, ranging from fix-it-first to multimodal freight strategy.

Federal Highway Administration (2013). Asset Management web page. Current as of 11/21/2013. http://www.fhwa.dot.gov/asset/index.cfm.

> FHWA maintains a web site devoted to asset management, with numerous resources and case studies.

Federal Highway Administration. (2007). Asset Management Overview. http://www.fhwa.dot.gov/asset/if08008/assetmgmt_overview.pdf.

> This report discusses next steps, challenges, and strategies for implementing an asset management program, and includes best practices learned since the 1999 FHWA Asset Management Primer was published.

Federal Highway Administration. (2011, April 7). Improving Transportation Decision Investment Decisions Through Life-Cycle Cost Analysis web page. U.S. http://www.fhwa.dot.gov/infrastructure/asstmgmt/lccafact.cfm.

> This is a short online primer on LCCA, describing its rationale, how it works, basic methodological process, and relevant FHWA technical outreach programs.

Smart Growth America & Taxpayers for Common Sense. (2011, June). Repair Priorities: Transportation spending strategies to save taxpayer dollars and improve roads. http://www.smartgrowthamerica.org/

46 Contributed by Aarne Frobom, Planning Specialist, Michigan DOT. (2012, August).

47 State of Minnesota. *Constitution of the State of Minnesota, Article XIV: Public Highway System*. Justial.com website. Retrieved 11/12/2013 at http://law.justia.com/constitution/minnesota/Article14.html.

documents/repair-priorities.pdf.
This report lays out the benefits of adopting a fix-it-first transportation policy and provides strategic advice to both state and federal policymakers.

Washington State DOT. (2012, April). Transportation Asset Management (TAM) Plans Including Best Practices: Synthesis. http://www.wsdot.wa.gov/NR/rdonlyres/D5CBDD16-361C-4D7A-9F28-94850C5E3E62/0/SynthesisofStateTransportationAssetManagementPlansMorinP2012kl1D.pdf.
This report provides a thorough discussion of how other states handle asset management, with links to further resources, organized in a bibliographical format.

The Hamilton Project. (2011, February). Fix it First, Expand it Second, Reward it Third: A New Strategy for America's Highways. http://www.brookings.edu/~/media/research/files/papers/2011/2/highway%20infrastructure%20kahn%20levinson/02_highway_infrastructure_kahn_levinson_paper.pdf.
This paper proposes reordering national highway infrastructure priorities, with a focus on fix-it-first policies. The paper also discusses the creation of a Federal Highway Bank.

Case Studies

The Federal Highway Administration. (2011, April 7). Life-Cycle Cost Analysis: The Pennsylvania Experience. http://www.fhwa.dot.gov/infrastructure/asstmgmt/dipa2toc.cfm.
This case study summarizes how the Pennsylvania DOT implemented its LCCA policy. Topics discussed include a historical perspective, LCCA methodology, data requirements, implementation, and benefits.

The Federal Highway Administration. (2005). Economics in Asset Management: The Hillsborough County, Florida, Experience. http://www.fhwa.dot.gov/infrastructure/asstmgmt/difl.pdf.
This case study reviews HAMS, with a discussion of how the county operated before HAMS, how the Hillsborough County's Public Works Department implemented HAMS, and the benefits it has received since then.

Florida DOT. (2012, April). Transportation Statistics RCI Field Handbook. ftp://ftp.dot.state.fl.us/fdot/co/planning/transtat/gis/RCIHandbook/RCI%20Field%20Handbook%20March%202003.pdf.
This roadway characteristics inventory shows the process of data collection, important data features and characteristics, highway performance monitoring systems, and inventory practices.

Develop a Performance- and Outcome-Focused Project Selection Process

The Opportunity

Setting measures of success is not unique. Most transportation project selection processes consider the success of alternatives in addressing narrowly defined, project-specific transportation needs. However, in these cases, the transportation project is perceived as the "end," not the "means," to achieving broader objectives.

In order to achieve greater gains with limited dollars, some DOTs have begun selecting projects using criteria that consider the full spectrum of the state's strategic goals, such as safety, economic development, transportation choice, community character, and resource conservation. This approach to evaluating performance ensures that states get more than successful individual projects—they get a transportation system that supports the economy and helps to address other state priorities. The approach also demonstrates the results of transportation investments to stakeholders and constituents, which can ultimately play a critical role in building public support for transportation funding increases.

What Is It?

Performance-based project selection is a data-driven process that gives transportation agencies the ability to evaluate the impact of projects using standard criteria and prioritize those that will produce the best results. Through this approach, agencies develop performance measures for the transportation system, collect data over time to assess progress, and allocate resources based on the results. It is most effective when agencies set specific, time-bound performance targets and prioritize investments based on progress toward achieving those targets.

Traditionally, transportation agencies evaluate performance with mobility-based measures, such as volume/capacity ratio or travel time between points, or system condition measures, such as pavement quality or bridge condition. Expanding the approach by evaluating project and system performance based on a more comprehensive set of indicators can help manage increasingly complex transportation systems with competing priorities.

Implementation

Establishing a comprehensive performance-based project selection approach will typically involve the following steps:

Articulate clear goals for the transportation system

Performance measures and indicators should be tied to the state's goals for its transportation network. These goals will vary by agency, but a comprehensive set of desired outcomes will generally include the following:

- Economic growth and development
- Effective flow of goods for commerce
- Job creation
- Health and safety

- Accessibility
- Transportation choices for travelers
- Coordination with local land use policies
- Life cycle costs of assets including roads, bridges, and transit
- Energy savings and emissions reduction

Enable reform

Linking project selection to performance metrics can come from elected officials or from within a DOT. In Oregon and North Carolina, legislators mandated an overhaul of the project selection process. Oregon reform came from a broader state program aimed at enhancing economic growth[48], while in North Carolina, elected officials wanted to remove politics from the decision-making process.[49]

While the support of elected officials can provide valuable political backing and resources, a DOT can demonstrate leadership in this area by creating a cross-agency task force to brainstorm new programming processes and examine current methods to pinpoint any deficiencies.

Develop partnerships with other state and local agencies

Efforts at the DOT level to integrate performance measures into planning and project selection frequently dovetail with broader statewide initiatives and can open the door for collaboration with other agencies. Creating a methodology and structure for system-wide performance metrics may not be viable if they focus solely on DOT-funded projects. Branding the initiative as a way to get better results from the transportation system with greater transparency in the decision-making process can help to bring a broad range of partners on board. Support from MPOs and other regional and local agencies can smooth the adoption of a new performance measurement system.

Create performance measures (system-wide and project-level)

Performance measures and indicators will vary by state and context, but successful measures have common characteristics. System-wide performance metrics must be applicable across all projects. Agency staff and stakeholders will typically assign a common metric, such as monetary value, to each measure and indicator. The most robust decision-making tools use both quantitative and qualitative measures. In terms of quantitative measures, several desktop and web-based applications are available today that are capable of running sophisticated mathematical analysis and budget optimization for project selection.

Limiting the number of measures helps ensure that data collection isn't overly burdensome for the agency; generally, broader measures are needed for policy and planning purposes, as they guide larger overarching goals, whereas more specific measures are needed for programming and resource allocation in order to provide clear bench marks.

A recent study by the Pew Center on the States and the Rockefeller Foundation shows that 13 states have created holistic transportation performance measures, including job creation, commerce, environment, and neighborhood preservation, but the state of the practice remains fledgling.[50] For example, the measures may call for a project to energize the economy, but actually measuring the project's economic impact remains difficult.

48 Interview with staff from the Long Range Planning Office of the Oregon DOT. (2012, April).

49 Interview with staff from the Strategic Planning Office at the North Carolina DOT. (2012, April).

50 Pew Center on the States and the Rockefeller Foundation. (2011, May). *Measuring Transportation Investments: The Road to Results.* Retrieved 8/20/12 from http://www.pewtrusts.org/uploadedFiles/wwwpewtrustsorg/Reports/State_policy/Transportation_Report_2011.pdf.

Develop a framework for integrating performance measures into the decision-making process

State DOTs can apply performance measures to different parts of the planning and project selection process. Oregon's least-cost planning tool, known as Mosaic, involves a rigorous and time-intensive data collection and evaluation process that informs the development of the Long-Range State Plan, which is updated every ten years. Staff of ODOT's Long Range Planning office explained that Mosaic evaluates "bundles of actions"—a series of strategies for a region—rather than individual projects.[51] By contrast, North Carolina's Prioritization 2.0 process applies to the State Transportation Improvement Program (STIP) development process.[52]

The Tennessee DOT restructured its project prioritization and selection process to provide greater transparency; it now selects projects based on a data-driven evaluation. Tennessee's Project Evaluation System builds upon policies in its Long-Range Transportation Plan and includes both quantitative and qualitative evaluation. The system has two evaluation tiers: Tier 1 analysis uses technical measures to address mobility, economic development, goods and freight movements, safety, and security, and Tier 2 uses mode-neutral, more qualitative measures such as public support, livable communities, and funding.[53] More recently, TDOT chose Decision Lens—a collaborative decision-making tool—for evaluating and prioritizing projects and setting performance criteria. DOTs in Delaware, Minnesota, Mississippi, and Pennsylvania also use the software.[54]

To make performance metrics applicable across the full transportation system, data collection methods should be integrated into all levels of the DOT. They must align vertically (from top management to technical staff) and horizontally (across functional units).

Build in flexibility

Performance measures should grow and evolve over time to incorporate new practices and state priorities.

Communicate results with dashboards and other performance measurement tools

Several DOTs use report cards, graphics, and online dashboards to communicate progress to elected officials and taxpayers. Innovative dashboards can include measures of factors beyond congestion and level of service, such as quality of life and economic development.

The Michigan DOT integrated its performance measures into the statewide dashboard so residents can easily and clearly see how the state's progress with its transportation system connects to other state goals. The dashboard tracks economic growth, safety, accountability, mobility, and road conditions.[55]

---

51 Interview with Transportation Programs and Economic Analysis Unit Manager at Oregon DOT. (2012, April).

52 North Carolina Department of Transportation. "Strategic Prioritization Process." Retrieved 9/22/2013 from http://www.ncdot.gov/performance/reform/prioritization/.

53 Tennessee Department of Transportation. (2005). *Final Report Tennessee Long-Range Transportation Plan Project Evaluation System*. p vi. Retrieved 8/1/12 from http://www.tdot.state.tn.us/plango/pdfs/plan/ProjEvalSys.pdf.

54 Decision Lens, Inc. (2013, January 16). "Decision Lens Selected by Mississippi Department of Transportation for Capital Plann." Retrieved 11/12/13 from http://www.decisionlens.com/news/decision_lens_selected_by_mississippi_dot_capital_planning.

55 American Association of State Highway and Transportation Officials. (2012, January 27). "Michigan DOT Puts Transportation Dashboard on the Web." *AASHTO Journal.* Retrieved 8/13/12 from http://www.aashtojournal.org/Pages/012712michigan.aspx.

Case Studies

North Carolina: DOT's Transformation

When North Carolina Governor Bev Purdue took office in January 2009, she immediately sought to reform the DOT's process for developing transportation plans and approving projects by creating professional standards for project evaluation and selection.[56] Passage of House Bill 2436 made the Office of Governance responsible for implementing transportation reform[57], although the NCDOT had already begun work on a number of internal reforms.

NCDOT had to build the entire prioritization framework and process from the ground up. According to strategic planning staff at NCDOT, some stakeholders were skeptical that their input would be fully incorporated and supported with meaningful data. NCDOT addressed this issue by creating a work group charged with helping shape and develop the project scoring methodology. The work group included NCDOT staff and external partners, including the state's MPOs and RPOs. In a March 2012 interview, staff suggested that this process gave NCDOT's partners a sense of ownership in the process and provided the local collaboration and participation that NCDOT sought.[58]

NCDOT's new project prioritization framework is designed to integrate state policy goals into the project selection process through the development of several transportation plans. NCDOT's long-range 2040 Plan, branded "Policy to Projects," was the first building block of the reform effort.[59] The 30-year plan lays out the agency's overarching goals and policies. A second ten-year Program and Resource Plan, created through a data-driven prioritization process, lists revenue projections and allocations for all modes. This ten-year plan then feeds into the STIP.[60]

In 2009, as part of the process for developing the ten-year Program and Resource Plan, NCDOT asked its MPOs to describe their transportation needs. In response, the DOT received a list of $54 billion in desired capital projects. However, the agency had only $10.5 billion to allocate for 2015-2020 ($9 billion for highway and $1.5 for non-highway).[61] To allocate these funds, NCDOT staff ranked each project by its mode into the three main goals of safety, mobility, and infrastructure health, and cross-categorized by geography: state, region, and sub-region. The ten-year Program and Resource Plan laid out current allocations to each mode, amounts requested by the MPO, and recommendations from three stakeholder summits.[62]

Next projects went through the scoring and prioritization process "Prioritization 1.0."[63] Project scoring differs between highway and non-highway projects; NCDOT currently envisions incorporating a more data-driven method into the non-highway projects. Examples of scoring measures include:

---

56 North Carolina Department of Transportation. (2011, July 6) From Policy to Projects. Retrieved 1/10/14, from http://www.ncdot.gov/performance/reform/default.html.

57 General Assembly of North Carolina, House Bill 2436. (2007) Retrieved 8/14/12 from http://www.ncga.state.nc.us/sessions/2007/bills/house/pdf/h2436v9.pdf.

58 Interview with staff from the Strategic Planning Office of Transportation at the North Carolina DOT. (2012, March).

59 North Carolina Department of Transportation. (2011, July 6) *From Policy to Projects.* Retrieved 8/13/12, from http://www.ncdot.gov/performance/reform/default.html.

60 *Ibid.*

61 North Carolina Department of Transportation. (2011, July 6) *From Policy to Projects.* Retrieved 8/13/12 from http://www.ncdot.gov/performance/reform/default.html.

62 *Ibid.*

63 Kissel, C. (2012, July 13). Project Prioritization: Case Study: North Carolina Develops Statewide Performance-based Prioritization Process. National Association of Development Organizations. Retrieved 8/14/12 from http://www.nado.org/project-prioritization-case-study-north-carolina-develops-statewide-performance-based-prioritization-process/.

- Does the project include HOV/HOT/LRT/BRT in the highway right of way?
- Does the project provide a direct connection to a transportation terminal (airport, seaport, ferry, intermodal, or train)?
- Does the project increase economic competitiveness as calculated by the Transportation Economic Development Impact System (TREDIS) model?

Highway projects received scores based on a combined quantitative score (pavement conditions data), qualitative score (local input), and multimodal score (bonus points for inclusion of HOT/HOV lanes, connection to transit terminal, etc.)[64] For non-highway projects, the scoring methodology currently varies by division. For rail projects, criteria include service type (heavy rail, light rail, etc.), service frequency, and connections to existing services, while for pedestrian and bicycle projects, scores are based on local priority, cost, and inclusion in the local pedestrian and bicycle plan, among other criteria. The scoring of non-highway projects is not standardized, which makes it difficult to rank different modes (such as rail and public transportation) against each other. The priorities of the MPOs and RPOs make up a substantial portion of the prioritization score: 30 percent of the total.[65]

The strategic prioritization process has successfully met all of its goals: it has engaged and involved stakeholders and now reflects local priorities. It has also influenced aspects of the programming process and has provided NCDOT's partners and the public with access to all the data and scores used to prioritize transportation projects. NCDOT has an online database to house project information and data and to manage the entire process. Strategic planning staff concluded that the implementation of the strategic prioritization process has resulted in increased credibility and use of data to score and evaluate projects. This framework enabled NCDOT to work with the legislature and governor to successfully enact a new Mobility Fund in 2010 to help relieve congestion and enhance mobility across the state.[66]

NCDOT recently completed the next round of prioritization for its 2018-2022 projects. Changes in Prioritization 2.0 include:[67]

- New economic impact measures (TREDIS)
- An economic competitiveness component to determine the value added of each highway investment within a community
- A data-driven process for evaluating bicycle and pedestrian projects. Bicycle and pedestrian projects are evaluated on a 100-point scale that includes local input, inclusion of the project in a local adopted plan, safety impacts (number of vehicle-pedestrian-cyclist crashes), population density, and whether the project provides a direct connection to a land use such as a school or transit station.
- A data-driven process for evaluating urban public transportation projects. Public transportation projects get ranked on elements such as whether the project reduces vehicle fleet age, provides new connections to other modes or services, increases lifespan of facilities, and accepts local input.
- A new web portal that allows MPOs, RPOs, and division staff to submit new priority projects, rank projects, and access information about project information and rankings for

64 *Ibid.*

65 North Carolina Department of Transportation. Strategic Prioritization Process Highway Scoring Matrix. Retrieved 8/13/12 from https://connect.ncdot.gov/projects/planning/Planning%20Document%20Library/Prioritization%201.0%20Highway%20Scoring%20Matrix.pdf.

66 Based on an interview with staff from the Strategic Planning Office of Transportation at the North Carolina Department of Transportation (2012, March).

67 North Carolina Department of Transportation. "Strategic Prioritization Process." Retrieved 8/14/12 from http://www.ncdot.gov/performance/reform/prioritization/.

the entire state.
- More flexibility for MPOs and RPOs, which can now work together to transfer points between areas in order to prioritize larger projects with greater regional significance.

While Prioritization 1.0 represented a major shift for NCDOT, the process became increasingly robust in the second round of long-range planning. Eighteen months before the governor's executive order mandating change, NCDOT had already begun identifying internal reforms through a staff transformation management team. The drive to change the programming process can start from within or be mandated at the legislative level. Other state STIP programs can adapt the process used by NCDOT and modify performance measures as needed to incorporate the state's unique needs.[68]

San Francisco Bay Area: 2035 Regional Transportation Plan

In California, the majority of the state's transportation funds are allocated directly to regional transportation planning agencies (RTPAs) and MPOs. Consequently, regional entities have a significant role in project prioritization. The MTC, the Bay Area's MPO, initially resisted developing performance measures, despite pressure from stakeholders to do so. The agency was wary of creating measures that would become too controlling or limiting, and was unwilling to expose member agencies' competing goals and visions for the region.[69] A state-level mandate drove the MTC to overhaul its programming approach in 2002, when Senate Bill 1492 (now State Government Code Sec. 66535) required the MTC to establish performance measurement criteria on both a project and corridor level to evaluate and prioritize all new investments for consideration in the 25-year Regional Transportation Plan (RTP).[70]

MTC defined its new approach as a focus "on the measurable outcomes of potential investments and the degree to which they support stated policies."[71] The agency created overarching principles of economy, environment, and equity, as well as support for sub-goals and quantifiable performance objectives. MTC created very ambitious targets, called "stretch" targets, that guide the long-term vision of the region. Examples of these overarching measures and performance targets include:[72]

- Goal: Equity
  - Measure: Access, Livable Communities
    - Performance Objective: Ten percent reduction from today in the percent of income spent on housing and transportation by low-income households

- Goal: Economy
  - Measure: Movement and Safety
    - Performance Objective: Motor vehicle fatalities reduced by 15 percent; pedestrian and cyclist injuries and fatalities reduced by 25 percent

The first round of application of the performance measures occurred in 2003 as part of the development of the region's 2030 RTP[73] but did little to affect programming, as the RTP projects had

68 Based on an interview with staff from the Strategic Planning Office of Transportation at the North Carolina DOT. (2012, March).

69 Innes, J. and Gruber, J. *Bay Area's Transportation Decision Making in the Wake of ISTEA*. Retrieved 4/5/12 from http://www.uctc.net/papers/514.pdf.

70 *Ibid.*

71 California Metropolitan Transportation Commission. (December 2008). *Change in Motion: Transportation 2035 plan for the Bay Area performance assessment report*. Part 1. Retrieved 8/14/12 from http://www.mtc.ca.gov/planning/2035_plan/Supplementary/T2035Plan-Perf_AssessmentReport.pdf.

72 *Ibid.*, p. 3.

73 California Metropolitan *Transportation Commission. (2004, December). Transportation 2030 Plan: Project Performance Evaluation Technical Report*. Retrieved 8/15/12 from http://www.mtc.ca.gov/planning/2030_plan/downloads/PPER/Project_Evaluation_Report.pdf.

already been selected. MTC greatly expanded its performance-based planning for the next version, the Transportation 2035 Plan, incorporating regional objectives and evaluation of previous RTP project results far in advance of the long-range plan to arm decision makers with data. Of MTC's $218 billion 2035 planning funds, $32 billion are discretionary, meaning MTC has decision-making power over the allocation. Of the 700 projects submitted for discretionary funding, most are major investments over $50 million. These projects must undergo a quantitative performance analysis so MTC can determine which of them advance regional goals the most.[74]

MTC's project selection and prioritization process has now become a leading practice. Since MTC undertakes such a rigorous prioritization process, its recommendations are generally adopted by CalTrans, thus empowering the local decision-making process. In the project selection process, MTC performs a quantitative cost-benefit analysis that monetizes indicators like carbon dioxide emissions, direct user costs, and transit travel time. Projects are divided into tiers based on the level of cost-benefit ratio they return.

MTC's process works for states where regional organizations such as MPOs or congestion management associations have considerable power over long-term planning goals and objectives and programming. Being such a large state with regionally diverse needs, California entrusts its regions with the task of determining which projects are most needed. However, states could also use elements of MTC's approach for statewide planning and programming purposes.

California: Smart Mobility Framework

In 2010, the California DOT (Caltrans) launched the Smart Mobility Framework (SMF) initiative to develop a comprehensive and consistent framework for evaluating, prioritizing, and designing transportation projects at the state and regional level. The framework is intended to inform the State Transportation Improvement Program (STIP) and revisions to state and local design standards. The SMF rests on six principles: location efficiency, reliable mobility, health and safety, environmental stewardship, social equity, and robust economy. The framework emphasizes mode-neutral performance measures such as safety and health considerations, travel time, reliability, and service quality. Caltrans is also developing scorecards and design standards appropriate to different local contexts (urban centers, rural areas, etc.) with supplementary performance measures for each context as needed.[75]

In 2013, Caltrans initiated two SMF implementation pilot studies. The Pilot Area 1 study will test and evaluate SMF performance measures and outcomes as they were applied to the I-680 corridor within Contra Costa County (Caltrans District 4). The goal is to use lessons learned from the project to create guidance for future Caltrans' system planning and development processes. The Pilot Area 2 study will apply SMF principles and performance measures to assess future projects for a sub-regional long range transportation plan in the South Bay Cities Council of Governments Region. The goal is to develop a suite of easy-to-use processes and tools to apply the framework and best practices to inform infrastructure decision making.[76]

---

74 Federal Highway Administration, Office of Planning, Environment and Realty. (2011, September 15). "Performance Based Planning Case Studies: Metropolitan Transportation Commission." Retrieved 9/12/2013) from http://www.fhwa.dot.gov/planning/performance_based_planning/case_studies/san_francisco/.

75 Caltrans (2010, February) *Smart Mobility 2010: A Call to Action for the New Decade*. Retrieved on 10/15/2013 from http://www.dot.ca.gov/hq/tpp/offices/ocp/smf_files/SMF_handbook_062210.pdf.

76 Caltrans (2013, April) "Smart Mobility Framework" Factsheet. Retrieved 10/25/2013 from http://www.dot.ca.gov/hq/tpp/offices/ocp/smf_files/SMF_Pilot_Study_Fact_Sheet_041613.pdf.

Resources

The American Association of State Highway and Transportation Officials. (2008, January). A Primer on Performance-Based Highway Program Management: Examples from Select States.

This primer provides an overview of the history of highway performance measures and state practices.

The Federal Highway Administration. (2011, March). Key Performance Indicators in Public-Private Partnership: A State of the Practice Report. Retrieved 3/23/12 from http://international.fhwa.dot.gov/pubs/pl10029/pl10029.pdf.

This report provides a national scan of performance measures used to measure success in public-private partnerships.

The Federal Highway Administration, Office Of Planning, Environment and Realty. (2011, September 15). Performance Based Planning and Programing. http://www.fhwa.dot.gov/planning/performance_based_planning/.

This website on performance-based planning provides resources for further information and case studies, including a case study on the San Francisco Bay Area's MTC.

National Cooperative Highway Research Program. (2006). Report 551: Performance Measures and Targets for Transportation Asset Management. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_551.pdf.

This three-volume report on the use of performance measures and targets for transportation asset management reviews the national state of the practice, provides criteria and guidelines for selecting appropriate performance measures and targets, and describes an overall framework states can use to develop performance measures.

Pew Center on the States. (2011, May). Measuring Transportation Investments: The Road to Results. http://www.pewtrusts.org/uploadedFiles/wwwpewtrustsorg/Reports/State_policy/Transportation_Report_2011.pdf.

This report evaluates how well all 50 state transportation agencies are using comprehensive goals, performance measures, and data related to economic growth, job creation, mobility, access, and other policy outcomes to inform transportation decision-making.

WSDOT. (2004, November). Emerging Performance Measurement Responses to Changing Political Pressures at State DOTs: A Practitioner's Perspective. http://www.wsdot.wa.gov/NR/rdonlyres/139F581F-0CED-40E6-B3DB-E89581B016DF/0/Practitioners_Perspective.pdf.

This report discusses how performance measures have changed over time, from a very data-intensive process to one that embraces the qualitative side as well, and includes metrics on the economy and the environment.

Case Studies

General Assembly of North Carolina. (2007). House Bill 2436, http://www.ncga.state.nc.us/sessions/2007/bills/house/pdf/h2436v9.pdf.

This website provides the text of North Carolina's legislative mandate for the reform of transportation project programming.

The Federal Highway Administration, Office of Planning, Environment, and Realty. (2011, September 15). Performance Based Planning Case Studies: Metropolitan Transportation Commission. http://www.fhwa.dot.gov/planning/performance_based_planning/case_studies/san_francisco/.

This case study describes the performance measures used by the MTC, how they fit into the programming process and lessons learned from MTC staff.

Innes, J. & Gruber, J. Bay Areas Transportation Decision Making in the Wake of ISTEA. http://www.uctc.net/papers/514.pdf.

Starting on page 339, this report details how performance measures were initially opposed, then adopted, by the MTC.

Metropolitan Transportation Commission. (2003). Transportation 2030 Project Performance Evaluation Report. Attachment 1: Legislative Requirement: Text of Senate Bill 1492, enacted in 2002 as California State Government Code Section 66535. http://www.mtc.ca.gov/planning/2030_plan/downloads/PPER/1-Legislation.pdf.

This provides the text from Senate Bill 1492 requiring the MTC to adopt performance measures

Tennessee Department of Transportation and Smart Growth America. (2012, August 20). Transportation Process Alternatives for Tennessee: Removing Barriers to Smarter Transportation Investments, Final Report. http://www.smartgrowthamerica.org/documents/removing-barriers-in-tennessee.pdf.

This report, developed through a partnership between TDOT and Smart Growth America, analyzes TDOT's current approach to project identification and development and identifies strategies TDOT can use to enable and encourage flexible, lower-cost ways to increase capacity on the state's transportation system.

Tennessee Department of Transportation. (2005, December). Tennessee Long-Range Transportation Plan: Project Evaluation System. www.tdot.state.tn.us/plango/pdfs/plan/ProjEvalSys.pdf.

This report lays out Tennessee's revised project selection and scoring process.

Remove Barriers to Off-System Investment

The Opportunity

Rebuilding our economy and creating new jobs is the most important issue of our generation. Thriving local economies need access to workers, materials, and markets. Transportation investment is key to economic recovery and prosperity, yet old ways of doing business often unnecessarily limit DOT investment options to facilities "owned" by the department.

DOTs can enable and encourage flexible, lower-cost ways to improve the capacity of the state's entire transportation system (regardless of ownership) to expedite job creation and economic development. While obvious on its face, this approach is unusual due to policies and practices that limit the ability to spend federal and/or state transportation dollars on transportation facilities that are not designated as federal or state facilities. Removing barriers to off-system investments is an opportunity for the DOT and the state's political leadership to demonstrate that they are leading efforts to reform the way government works, and to ensure that taxpayer money is buying the most cost-effective solutions.

Several states have successfully spent federal and/or state dollars on a project-by-project basis on facilities that were not on the federal or state highway system. When off-system investment is the most cost-effective solution, it should be considered as a matter of policy.

What Is It?

Typically, federal and state dollars are spent on national and state transportation facilities. Directing some of these funds to improve local facilities can be a more cost-effective way to improve the transportation system overall.

State leaders do not need to be bound by the roads under state ownership to direct their investments. Partnerships with FHWA can enable federal dollars to be spent on the local transportation system, but shifting funds to the local transportation system also requires education about the benefits and cost savings that can result from this transfer.

For example, the New Jersey DOT (NJDOT) planned a routine bypass to address congestion on NJ Route 31 where it runs through Raritan Township and the Borough of Flemington. However, further analysis showed that a different plan focused on local roads would more effectively address the congestion, better support local economic development, and cost a great deal less (see case study below). The key was the state DOT's willingness to work for the most cost-effective improvements, regardless of who owned which pieces of the network.

Implementation

States have had varied success in spending federal and state dollars on local transportation networks, and most pursue this option as an exception or special case rather than a systematic way of maximizing the value of the existing transportation network. Key steps to implementing an approach that allows for off-system investment include:

1. Determining if there are legal or policy limitations to spending state monies on local facilities. If none exist, explore whether this has been done in the past and what the obstacles have been.

2. If legal barriers exist, exploring the practicality of modifying legislation and gathering support from legislators. This is likely to require education and examples of benefits.

3. Documenting value-to-price ratios or cost-benefit analyses to demonstrate the advantages of allowing investment on an entire network, regardless of ownership, versus restricting investment to state-owned facilities. This may require the development of an analytical tool or model to demonstrate how the system would function overall.

4. Engaging the local decision-makers who have jurisdiction over the transportation system targeted for improvement early in the process, and prior to having a broad public discussion.

5. Working with the federal funding partner (i.e., FHWA) at the local, regional, and federal levels and providing it with analytical information that demonstrates the value of investing in local facilities compared to the value of investing in the state or federal facility.

6. Developing a systematic approach to identifying the conditions that should exist in order to invest in the local transportation system.

7. Modifying the programming mechanisms to allow for this investment.

Case Studies

New Jersey

Over the past several years, NJDOT has been working with counties, municipalities, and other stakeholders to reinvest in established communities through a state program known as New Jersey Futures in Transportation (NJFIT). NJDOT established this effort in 2005 in partnership with the Office of Smart Growth (now the Office for Planning Advocacy) and other state agencies.

As one of NJFIT's pilot projects, NJDOT reevaluated a planned bypass on Route 31 in Raritan Township and Flemington Borough intended to relieve congestion on a stretch of the route running through the heart of Flemington's commercial district. The bypass had languished in the DOT's project pipeline for decades due to a lack of funds.[77] NJDOT re-examined whether the proposed bypass solution—which was projected at great cost and which the Flemington community believed would reinforce Route 31's role as a high-speed highway out of step with local desires for community character—was truly the best way forward.[78] NJDOT conducted an extensive analysis that emphasized both stakeholder involvement and a technical analysis of different roadway design alternatives, and ultimately decided to replace the planned bypass with a two-lane parkway that would provide additional access to Route 31 while preserving the region's open spaces and community character.

One of the most important components of this project was an emphasis on developing a better-connected network of local streets in the community, including amenities to support bicycling and

77 New Jersey Department of Transportation. (2010, October). "NJFIT: Future in Transportation: Route 31 project Hunterdon County." Retrieved 8/1/12 from http://www.state.nj.us/transportation/works/njfit/route31.shtm.

78 ICF International (2008, November). "NJ Route 31 Integrated Land Use and Transportation Plan." Retrieved 8/1/12 from http://www.transportationforcommunities.com/shrpc01/case_study/11/corridor. NJDOT had estimated the cost of the freeway bypass at between $125 and $150 million. For reference purposes, New Jersey DOT's fiscal year 2005 capital budget was approximately $1.4 billion, according to NJDOT records accessed at http://www.state.nj.us/transportation/about/press/2004/040604.shtm, at the high end of its cost estimates, the Route 31 bypass project would have used over 10 percent of this budget.

walking, to minimize pressure on Route 31. New development will add to this street network over time, providing additional routing options for local traffic. NJDOT developed a transportation model to evaluate the effectiveness of the additional local street network on the functionality of Route 31. Analyses indicated that investing in local networks effectively relieved congestion on Route 31 at a much lower cost than building new roads or expanding the state network.[79]

Oregon

The Oregon DOT (ODOT) is using least-cost planning to define more cost-effective ways to improve Oregon's transportation system, including the local network. Least-cost planning is "a process of comparing direct and indirect costs of demand and supply options to meet transportation goals, policies, or both, and the intent of the process is to identify the most cost-effective mix of options."[80] This initiative was defined by the 2009 Oregon Legislature in the Jobs and Transportation Act (House Bill 2001) and complements ODOT's practical design initiative, required by the same law.[81] Practical design stresses the value of making strategic decisions based on what most benefit the overall system and directs available dollars toward activities and projects that optimize the system as a whole. Since 2009, ODOT estimates that practical design has saved the agency "tens of millions of dollars."[82]

Resources

Pennsylvania DOT and New Jersey DOT. (2008, March). Smart Transportation Guidebook: Planning and Designing Highways and Streets to Support Livable and Sustainable Communities. http://smart-transportation.com/guidebook.html.

> This joint effort of the Pennsylvania and New Jersey DOTs provides guidance to project managers for state transportation projects on the key components of local community context—land use plans and policies, street network connections, and development controls—that allow more sound state investment in a larger share of the transportation system.

Oregon DOT Highway Division. (2010, March). Oregon Practical Design Strategy. http://www.oregon.gov/ODOT/HWY/TECHSERV/docs/Practical_Design_Guideline.pdf?ga=t.

> This is a guidebook for Practical Design, as it has been used by ODOT. Practical design has been used by ODOT as a way to enhance its transportation system. Even with scarce resources, ODOT has been able to improve its transportation system because it has established project scopes that deliver specific results, and it offers flexible parameters for design teams.

Tennessee DOT and Smart Growth America. (2012, August 20). Transportation Process Alternatives for Tennessee: Removing Barriers to Smarter Transportation Investments, Final Report. http://www.smartgrowthamerica.org/documents/removing-barriers-in-tennessee.pdf.

> This report, developed through a partnership between TDOT and Smart Growth America, analyzes TDOT's current approach to project identification and development and identifies strategies TDOT can use to enable and encourage flexible, lower-cost ways to increase capacity on the state's transportation system.

Wisconsin DOT Research Program. Project 0092-05-14, "The Socioeconomic Benefits of Transit in Wisconsin, Phase II: Benefit Cost Analysis." http://wisdotresearch.wi.gov/wp-content/uploads/05-14tranbenefits-f1.pdf.

> This report provides an example of how to perform a cost-benefit analysis of transit in a state,

79 *Ibid.*
80 Oregon Revised Statutes 184.653 §6.
81 *Ibid.,* §19.
82 Oregon Department of Transportation. (2012, July 17). "Practical Design Stretches Resources Further." Retrieved 8/2/12 from http://cms.oregon.gov/ODOT/GOVREL/Pages/news/071712a.aspx.

Update Funding Formulas and Implement Competitive Fund Distribution for Smart Transportation

The Opportunity

States provide half of all surface transportation funding.[83] Thus, state funding distribution processes weigh heavily on the development of a transportation system that supports a state's economy and prosperity.

For many states, decisions about how this money is distributed are based on traditional formulas that don't directly reflect the current needs of the state or its transportation system. These formulas often have little to do with which transportation investments actually provide the greatest return by helping to grow the economy and maintain a healthy transportation system. For example, Caltrans relies on a static formula to apportion 75 percent of the STIP funding to the Regional Transportation Improvement Program; 40 percent goes to northern counties and 60 percent to southern counties, with allocation at the county level based on population (weighted 75%) and state highway lane miles (weighted 25%).[84]

What if Caltrans used a distribution formula that considered future demographic changes and shifting transportation demand variables? More useful, comprehensive funding distribution processes could reflect a broad range of transportation issues such as roadway safety, future needs from population growth, and preservation of current system assets. Revised funding distribution processes that take these variables into account would enable states to distribute money based on a holistic view of current assets and future needs within the transportation system. It would result in funding going to regions, projects, and modes that contribute to a smarter transportation system. Likewise, at least for a portion of fund distribution, relying on competitive funding programs could increase the transparency and efficiency of the funding process.

Changing outdated distribution formulas to a competitive, results-driven process is an opportunity for a state's DOT and governor to show the public that the state is serious about getting the most from taxpayer dollars, serious about getting the state's fiscal house in order, and serious about addressing the current economic crisis. Transparent funding distribution aligned with statewide goals will drive innovation at the local level that is in line with the needs of the larger region, strengthening the competitiveness of the state as a whole.

What Is It?

Methods for adopting more comprehensive funding distribution approaches include:

1. **Matching criteria and performance metrics against statewide goals.** Retool current formulas in order to channel funding to projects that are aligned with statewide goals. These changes will increase government transparency and allow a state to articulate its goals and performance outcomes when it plans transportation improvements. Fund allocation criteria should also be tied to measurable performance metrics. This will allow the DOT to track the

83 Intergovernmental Forum on Transportation Finance. (2008, January). *Financing Transportation in the 21st Century: An Intergovernmental Perspective.* Retrieved 8/20/12 from http://www.napawash.org/wp-content/uploads/2008/08-16.pdf.

84 Metropolitan Transportation Commission (2003, March). "Overview of Transportation Funding." Retrieved 9/12/2013 from http://www.mtc.ca.gov/meetings/presentations/.

impact of its funding investments in order to report on progress and maximize the program's effectiveness. Reporting on progress with regards to metrics also supports the DOT in its efforts to more clearly communicate the criteria on which it bases its funding decisions. In the case of the Minnesota DOT's (MnDOT) Target Formula Re-evaluation, performance metrics were weighted according to the statewide goals of improving safety, system preservation, and mobility (see case study below).

2. **Creating competitive transportation grant programs.** A competitive grant program can maximize the investment of limited transportation funds and leverage private sector contributions. While a competitive grant program may represent a small portion of funding relative to a state's formula-based funding, it can spark innovative solutions to transportation problems that can result in cost savings and better outcomes. Beyond the projects that are ultimately funded, the funding programs themselves provide an orientation toward innovative and lower cost transportation that extends their reach. Other communities can see the success of these transportation projects, even if they are on a small scale, and applying for the funds forces applicants to think about smarter transportation possibilities.

   On a regional level, the Atlanta Regional Commission's (ARC) Livable Centers Initiative transportation grant program links land use and transportation funding and has supported 100 transportation projects in the past ten years using only one percent of the Atlanta Regional Transportation Plan's funding.[85] The competitive Livable Centers Initiative grants are given to localities based on the community's land use and zoning policies that meet broader regional goals to create centralized areas of activity that promote walking, cycling, transit use, and greater roadway connectivity. The Livable Centers Initiative Implementation Report 2011 details ARC's funding process and how it spurred the adaptation of local comprehensive plans to line up with regional goals.[86]

   At the state level, Washington State DOT has also instituted a competitive grant program, through which it has provided $143.5 million since 2006 to support local mobility projects; the DOT is currently soliciting applications for the 2013-2015 biennium.[87] This Regional Mobility Grant Program supports local efforts to improve transit mobility and reduce congestion on the most heavily traveled roadways. WSDOT is undertaking studies to develop methods of evaluating the cost-effectiveness of each project.

3. **Prioritizing transportation project funding.** Explicit and substantiated prioritization can improve the fund distribution process by giving precedence to projects that are particularly cost-effective or do a particularly strong job of meeting certain goals. In addition to the competitive grant program mentioned above, WSDOT has implemented a project prioritization process to ensure that taxpayers get the most value for the dollars spent.[88] This prioritization program, spelled out in RCW 47.05[89], ranks projects based on their costs and benefits within six project areas—safety, preservation, mobility, economic, environmental retrofit, and other

85 Atlanta Regional Commission. (2009). *Livable Centers Initiative Indicators and Benefits Study,* 3-4. Retrieved 8/9/12 from http://www.atlantaregional.com/File%20Library/Land%20Use/lu_lci09_indicatorsbenefits_1009.pdf.

86 Atlanta Regional Commission. (2011). *Livable Centers Initiative Implementation Report.* Retrieved 8/20/12 from http://www.atlantaregional.com/File Library/Land Use/LCI/lu_2011_lci_implementation_report_06-2011.pdf.

87 Washington Department of Transportation. (2012). "Regional Mobility." Retrieved 8/1/12 from http://www.wsdot.wa.gov/Transit/Grants/mobility.htm.

88 Washington Department of Transportation. (2012). Highway Construction Program – Project Prioritization. Retrieved 8/20/12 from http://www.wsdot.wa.gov/projects/prioritization/default.htm.

89 Washington State Legislature. Revised Code of Washington - RCW Title 47 Public Highways And Transportation - Section 47.05.030 Ten-year programs -- Investments, improvements, preservation. Retrieved 9/12/2013 from http://law.onecle.com/washington/public-highways-and-transportation/47.05.030.html.

facilities— and the goal of the process is to provide the biggest benefit for the least cost.[90] While Washington's prioritization process is limited to highway construction processes, a similar process could be expanded to include all transportation projects within a state.

Implementation

1. **Conduct an internal evaluation.** State DOTs wield relatively significant control over how funds are allocated for transportation projects. The funding reform process begins with an internal evaluation process within the capital programs or finance departments and broadens to include the county and local DOTs. Frequently, this process is championed by department officials and takes place within the department in conjunction with county and municipal officials and stakeholders. According to staff of MnDOT's Office of Capital Programs and Performance Measures, that agency led the most recent revision to the federal and state target funding formulas in 2006, integrating statewide goals and performance objectives. In the case of North Carolina's Transportation Reform, Governor Bev Perdue pushed for departmental reform with an executive order.[91]

2. **Develop partnerships with local and state agencies.** Funding formula reform will be most effective if the state DOT works in conjunction with regional MPOs to accommodate a greater variety of transportation projects. Partnerships with local governments and regional organizations will also help to overcome the common misperception that funding changes will reduce local control of projects. This strategy proved effective in Atlanta, where the ARC's competitive funding distribution provided communities with financial support to develop their own transportation plans, resulting in greater local control.

   Recalibration of allocations must be also done in concert with other state agencies, such as planning, natural resources, and economic development, to advance and address not only transportation system concerns and performance, but economic and environmental deliverables as well.

3. **Start small and set aside funding.** Baby steps are often necessary to test out new fund distribution processes. A small demonstration program fund is a good place to start as a test run and may not require legislative authorization, making it an easier way to demonstrate smart transportation principles. Finding the money is likely the most challenging part of establishing a competitive fund for smart transportation projects. Gas tax funds are often limited by statute or state constitution. Pennsylvania was able to address this problem by setting aside federal funds.

Timeframe and expectations. Revising funding procedures can take time; the processes described in the case studies below took two to three years of extensive meetings with stakeholders at the state, local, and community levels. If performance measures are already in place, the process will likely proceed more quickly.

States have the best opportunities to revise funding formulas when state and local long-term transportation plans and objectives are in alignment. State-wide goals can also foster local planning by awarding funding to projects that address regional development goals. This has occurred with ARC's

90 Washington Department of Transportation. (2012). Highway Construction Program—Project Prioritization. Retrieved 9/12/2013 from http://www.wsdot.wa.gov/projects/prioritization/default.htm.

91 North Carolina Department of Transportation. (2009). Transportation Reform. Retrieved 8/9/12 from http://www.ncdot.gov/performance/reform/.

Livable Centers Initiative: currently, 88 percent of the communities involved in the project have modified their comprehensive plans to create economic activity corridors and community improvement districts according to their own Livable Centers Initiative studies.[92]

Special considerations outside of the funding formula must be made for major infrastructure emergencies or large infrastructure projects in communities with unique maintenance issues. In these situations, state level transportation funding reserves can be maintained and granted through a separate allocation process.

While agencies and stakeholders may be wary of changes to existing funding formulas, there is an opportunity to integrate existing funding levels with statewide goals on performance measures to improve safety, preserve and maintain roads and bridges, reduce congestion, and prepare for future population growth. As explained in further detail below, MnDOT successfully revised its funding formulas to maintain roughly the same allocations to the state's transportation districts while still incorporating more performance measures.

Case Studies

Pennsylvania

The State of Pennsylvania started the Pennsylvania Community Transportation Initiative (PCTI)[93] to competitively distribute funding for smart local transportation initiatives in late 2008.[94] In response to its first announcement, PennDOT received more than 400 applications from cities, boroughs, townships, MPOs, and RPOs requesting more than $600 million. PennDOT staff evaluated the proposals based on their focus on town-building rather than sprawl, their capacity to leverage other funding, their consistency with regional plans, and their innovation and suitability to teach or demonstrate the positive application of smart transportation principles. Ultimately, $59.2 million was distributed to 50 projects throughout the state that link transportation investments to local land use planning and decision-making. In 2010, PennDOT administered a second round of funding, distributing $24.7 million to 41 projects.[95]

Pennsylvania funded this program by setting aside federal funding. Though the program faced initial resistance from MPOs and RPOs and some PennDOT staff concerned about the use of funds, it aligned closely with the smart transportation framework developed by the DOT during a massive spending overhaul in 2004, so it was ultimately approved as a demonstration laboratory to launch projects embodying smart transportation principles.

Lancaster County Transportation Coordinating Committee (TCC)

Inspired by the Pennsylvania PCTI, described above, Lancaster County launched its own smart growth transportation program in 2011. The TCC, a multiagency committee, dedicated $2 million from the state allocation of transportation funds to the county to a competitive smart transportation project fund. The program is intended to encourage smaller projects that will increase mobility and connectivity[96] at

92 Atlanta Regional Commission. (2011). *Livable Centers Initiative 2011 Implementation Report.* p. 4. Retrieved 8/9/12 from http://www.atlantaregional.com/File%20Library/Land%20Use/LCI/lu_2011_lci_implementation_report_06-2011.pdf.

93 Pennsylvania Department of Transportation. Pennsylvania Community Transportation Initiative. Retrieved 9/12/2013 from http://www.smart-transportation.com/pcti.html.

94 *Ibid.*

95 *Ibid.*

96 Lancaster County Transportation Coordinating Committee. (2011, July 28). "Lancaster County Smart Growth

the municipal level. Thirteen projects were submitted in the first round of funding and five were chosen to receive a total of $1.5 million[97], including a pedestrian path expansion and sidewalks near a bus stop and a school. If the funds were not used for smart growth projects, the money would have gone to roadway or bridge projects in the county.

Minnesota: Target Formula Re-Evaluation

In response to the Intermodal Surface Transportation Efficiency Act regional planning requirements, MnDOT created Area Transportation Partnership (ATP) Districts to allocate federal funds in the early 1990s. The first funding formula was based on discussions with ATP stakeholders and ensured that the transportation fund distribution didn't change drastically from existing levels. MnDOT allocated funding according to target formulas weighting system size at 40 percent and system usage at 60 percent; it determined system size based on existing lane miles and system usage based on both current and future vehicle miles traveled (VMT).[98] Subsequent revisions in 2003 and 2006 allowed the funding formula to evolve to incorporate statewide goals addressing safety concerns, roadway and bridge maintenance, and transit needs. Target funding formulas for both federal and state fund allocations are now weighted to include:[99]

- 60 percent preservation, determined by average bridge needs, heavy commercial VMT, and average pavement needs;
- 10 percent safety, determined by three-year average traffic fatalities; and
- 30 percent mobility, determined by congested daily VMT for trunk highways, transit needs, and future VMT based on population predictions.

The staff of MnDOT's Office of Capital Programs and Performance Measures spearheaded the most recent revision to the federal and state target funding formulas, integrating statewide goals from the Minnesota State-wide Multimodal Transportation Plan. These statewide goals are operationalized through clearly stated performance targets. Some of the performance metrics employed by MnDOT include:[100]

- Targets:
  - To reduce traffic fatalities to 400 annual fatalities by 2010. MnDOT successfully met this goal.
  - Create 100 percent ADA accessible pedestrian signals by 2030.
  - Increase bus service hours to 1.6 million by 2015.

- Maintenance of system:
  - 84 percent of the state's bridges in a state of good or satisfactory repair.
  - Good pavement quality: 70 percent of principal arterials in good quality, 65 percent of non-principal arterials in good quality.
  - Congestion reduced to ensure travel can maintain target speed (55-60 miles per hour) along 95 percent of interregional corridors.

Transportation Program." Retrieved 8/1/12 from http://www.co.lancaster.pa.us/planning/lib/planning/projects_and_programs/sgt_program_guidelines_as_adopted_6-27-11-final.pdf.

97 Harris, B. (2012, July 4). "Funding OK'd for smart growth projects." *Lancaster Online.* Retrieved 8/1/12 from http://lancasteronline.com/article/local/682716_Funding-OK-d-for-smart-growth-projects.html.

98 Minnesota Department of Transportation. (2001). *State Transportation Improvement Program Guidance.* Appendix C, pg. C1-2. Retrieved 8/9/12 from http://www.dot.state.mn.us/planning/program/pdf/STIPGMar01.pdf.

99 Minnesota Department of Transportation. (2006). "Approved Federal and State Target Funding Formulas," Retrieved 9/12/2013 from http://www.dot.state.mn.us/planning/program/targetformula.html.

100 Minnesota Department of Transportation. (2010). *Transportation Results Scorecard.* Retrieved 8/10/12 from http://www.dot.state.mn.us/measures/pdf/2010%20SCORECARD.pdf.

- 100 percent on-time bridge inspections.
- Customer satisfaction of highway maintenance at 7.0 on a scale of 10.0 or better.

ATP districts prioritize their transportation needs first; then those needs are incorporated into state-level transportation priorities and weighted against state performance measures. The ATP districts are given the allotted transportation funding according to the target funding formulas. The districts have significant local control over the projects they choose to produce in order to meet statewide goals of safety, mobility, and preservation.

As transportation funding formulas have been revised, MnDOT has aligned its state goals with performance based funding. Other state transportation improvement program fund allocations can adopt the revision process used by MnDOT to create federal and state funding formulas that meet statewide goals and help to guide regional transportation project prioritization.

Atlanta Livable Centers Initiative

In 1999, the ARC and the Georgia DOT (GDOT) saw an opportunity to link land use policy and transportation funding to improve air quality and created the Livable Centers Initiative. As part of the LCI, $18 million in transportation planning study funds will be awarded between 2000-2017 to support transit use, walking, and bicycling. Transportation projects resulting from LCI studies are eligible through a competitive grant process for a portion of $500 million in priority funds dedicated to the program (individual award amounts range from $80,00 to $120,000).[101] In the past ten years, the LCI has spurred almost 100 transportation projects using only one percent of the Atlanta Regional Transportation Plan's funding, maximizing limited investments.[102]

Prior to the LCI program, all transportation funding was allocated based on the projects outlined in the Regional Transportation Plan, which is developed and guided by the MPO's planning staff, the Transportation Coordinating Committee, and the Transportation Air Quality Committee.

The LCI encouraged greater support of counties, cities, and towns to plan transportation projects based on their own needs while also coordinating with larger regional development goals. ARC staff explain that the LCI is popular with local officials and citizens because they can link it to their own local plans to improve economic growth by balancing jobs and housing needs.[103] At the same time, the region benefits by taking advantage of the infrastructure and private investments committed in the local community to achieve more balanced regional development, reduce VMT, and improve the regional air quality.[104]

Because Surface Transportation Program (STP) projects with federal funding must go through GDOT's planned development process, there is extensive review time. ARC's LCI staff have worked with GDOT to streamline the process and cut the amount of time in half.[105]

---

101 Atlanta Regional Commission. Livable Centers Initiative. Retrieved 9/12/2013 from http://www.atlantaregional.com/land-use/livable-centers-initiative/.

102 Atlanta Regional Commission. (2009). *Livable Centers Initiative Indicators and Benefits Study*, pp. 3-4. Retrieved 8/10/12 from http://www.atlantaregional.com/File%20Library/Land%20Use/lu_lci09_indicatorsbenefits_1009.pdf.

103 Interview with ARC Project Manager, (2012, May).

104 Atlanta Regional Commission. (2009) Livable Centers Initiative Indicators and Benefits Study, pp. 3-4. Retrieved 8/10/12 from http://www.atlantaregional.com/File%20Library/Land%20Use/lu_lci09_indicatorsbenefits_1009.pdf.

105 Interview with ARC Project Manager, (2012, May).

Resources

Atlanta Regional Commission. (2011). 2011 Livable Centers Initiative Implementation Report. http://www.atlantaregional.com/File%20Library/Land%20Use/LCI/lu_2011_lci_implementation_report_06-2011.pdf.

This report provides the results of a three-tiered survey conducted biennially by the ARC to measure the success of the LCI program. The survey quantifies changes in development, measures changes in land use policy, and assesses attitudes toward improvement and livability resulting from implementation of LCI studies.

Atlanta Regional Commission. (2012). LCI Transportation Program Implementation Progress Report, July 2011-December 2011. http://www.atlantaregional.com/File%20Library/Land%20Use/LCI/lu_lci_breaking_ground_12_2011_final.pdf.

This report examines the LCI program's history and outlines the types of projects funded in the most recent round of grants, the project status, and committed funds.

Minnesota DOT. (2006). Federal Target Formula. http://www.dot.state.mn.us/planning/program/pdf/targetformula/Approved%20Federal%20Formula%20January%202006.pdf.

This website gives the final approved federal funding formula.

Minnesota DOT, Office of Investment Management. (2001). Guidance for the Development of the State Transportation Improvement Program. http://www.dot.state.mn.us/planning/program/pdf/STIPGMar01.pdf.

This provides an overall framework of the ATIP/STIP process in Minnesota.

Minnesota DOT, Office of Investment Management. (2006). Talking Points for Funding Formula Re-evaluation. http://www.dot.state.mn.us/planning/program/pdf/targetformula/Talking%20Points%20for%20Web%202-22-06.pdf.

This lists discussion points detailing how and why the funding formula was revised in 2006.

Pennsylvania DOT. (2010). Pennsylvania Community Transportation Initiative (PCTI) 2010 Program Guide. http://www.ncentral.com/uploads/Trans/PDF/PCTI_Program_Guide.pdf.

This guide outlines the themes and funding selection process for PCTI grant applicants.

THE INNOVATIVE DOT

Focus Area 3: Pricing

Focus Area 3: Pricing

Appropriate pricing strategies can raise revenues and manage demand, keeping costs down. On the other hand, when transportation system users do not see appropriate price signals, demand is artificially high, increasing congestion and pressure for new capacity. State departments of transportation generally cannot impose price signals on their own, but they can work with a variety of stakeholders and decision-makers, from legislators to insurance companies, to accomplish these goals.

In this section:

- Use Variable Tolling to Manage Demand
- Implement Pay-As-You-Drive Insurance

Pictured: Express Lanes along Utah's I-15. *See "Use Variable Tolling to Manage Demand" to learn more.*

Use Variable Tolling to Manage Demand

The Opportunity

It is well known that transportation funding in the U.S. has not kept pace with the cost of system maintenance and modernization. Tolling can help solve this problem by creating a user-generated revenue source for transportation. Just as important, tolls can help to manage finite roadway capacity, moderating demand through the use of pricing based on location, time of day, and traffic conditions. Variable tolls that are higher at peak times can reduce traffic congestion by shifting transportation away from single-occupancy vehicles, out of peak travel periods, and to less-congested roads or modes of transportation. Tolling can also be a more popular alternative to fuel tax increases, especially if the revenues are earmarked for maintaining transportation infrastructure and the toll variability can be shown to reduce congestion.

State and local governments, travelers, and businesses can all benefit from demand-sensitive tolling. Transportation agencies receive additional dollars without having to borrow or implement a tax increase. For drivers, traffic in tolled lanes can be priced to move at a faster pace than non-tolled lanes, saving time on commutes and guaranteeing reliable speeds and travel times. Express bus riders experience a similar speed and travel time benefit, because express buses are typically given free access to managed lanes. Variable tolling also sends a price signal that leads some drivers to use public transportation, carpool, or shift trips to off-peak hours. In fact, using tolls for demand management may be cheaper than building new roadway capacity. According to estimates by the Federal Highway Administration (FHWA), widespread use of value pricing methods such as variable tolling would reduce the amount of capital investment needed to sustain the performance and condition of the highway system by nearly one-third—from $127 billion per year to about $85 billion per year.[1]

Unsurprisingly, variable tolling raises fairness and equity considerations related to the distribution of the benefits and burdens of the toll. Broadly, there are three types of equity concerns for tolling projects: income equity (does the project negatively impact low-income people?), geographic equity (does the project negatively impact particular areas?), and modal equity (does the project negatively impact people who are taking transit?). These concerns have derailed tolling projects in many states and cities, and the extent of variable tolling's equity impact is still being examined.[2] Nevertheless, attempts can be made to address fairness concerns through the design of the tolling program, for instance, by putting toll revenues back into the tolled corridor to finance transit service as well as the highway.

What Is It?

Flat-price tolls have long been employed to cover the costs of construction and sometimes operations and maintenance of highways. Variable tolling, the modern version of this long-standing practice, also raises revenues, but at the same time manages demand to reduce congestion and the need for costly expansions. Variable tolling is a type of value pricing where prices are set to align with the value delivered from quicker and more reliable travel times. Variable tolling has the added benefit of generating revenue to cover some portion of the costs of providing the service.

---

1 Congressional Budget Office. (2011, May 17). "The Highway Trust Fund and Paying for Highways," p. 14. Retrieved 5/8/12 from http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/121xx/doc12173/05-17-highwayfunding.pdf.

2 Government Accountability Office. (2012, January). "Road Pricing Can Help Reduce Congestion, But Equity Concerns May Grow." (GAO-12-119). Retrieved 9/12/2013 from http://www.gao.gov/assets/590/587833.pdf.

Value pricing is widely used to manage demand for other classes of infrastructure such as water and power, where prices may be higher during on-peak periods or as usage increases. In transportation, value pricing means charging drivers an extra fee to use an express lane or to drive on a particular roadway; this fee will be higher when the road or lane is more congested.[3] Faced with paying a fee that is higher at peak times, fewer drivers will use the highway or express lane at that time, so traffic is reduced and trip times for those willing to pay the toll become shorter and more reliable.

Variable tolling optimizes the use of roadways when they are close to or at full capacity. It offers many benefits, including reduced congestion, shorter travel times, more reliable travel times, and more efficient investment in roadway infrastructure.

Currently operational tolling projects include four types of pricing strategies to manage demand:[4]

1. High occupancy toll (HOT) lanes: variably priced lanes that set pricing based on time of day, level of congestion, or a pre-set schedule;
2. Variable tolls on entire roadways: peak period-priced facilities that base pricing on time of day;
3. Cordon charges: variable or fixed charges to drive within or into a congested area; and
4. Area-wide charges: per-mile charges on all roads within an area that may vary depending on congestion.

The latter two—cordon charges and area-wide charges—are not yet common in the United States, but HOT lanes and peak-period priced facilities have been gaining momentum since the 1990s.

Implementation

Variable tolling in the form of variably priced lanes and roads and peak-period priced facilities is underway on roadways in a number of states, including California, Texas, Florida, Georgia, New Jersey, Minnesota, Washington, Utah, Colorado, Maryland, and Virginia (see Figure 1 below). Projects are being considered and/or developed in North Carolina, Illinois, and Oregon.

The path to authorizing and implementing variable tolling has been unique in each state. In Minnesota, it took more than a decade of failed bills and investigative studies before the Minnesota State Legislature passed a bill authorizing the state to implement variable tolls.[5] In Oregon, on the other hand, the authority to impose variable tolls for the purposes of a pilot project passed the Legislature relatively smoothly.[6] Meanwhile, the FHWA's Congestion Pricing Pilot Program, which was established in 1991, hastened the legislative process by funding variable tolling projects in San Diego, Houston, and Lee County, Florida. Not surprisingly, these states were among the first to authorize variable tolling.[7]

---

3 Federal Highway Administration. (2001, October 17). "Value Pricing Pilot Program Information." Retrieved 9/12/2013 from http://www.fhwa.dot.gov/policy/vppp.htm.

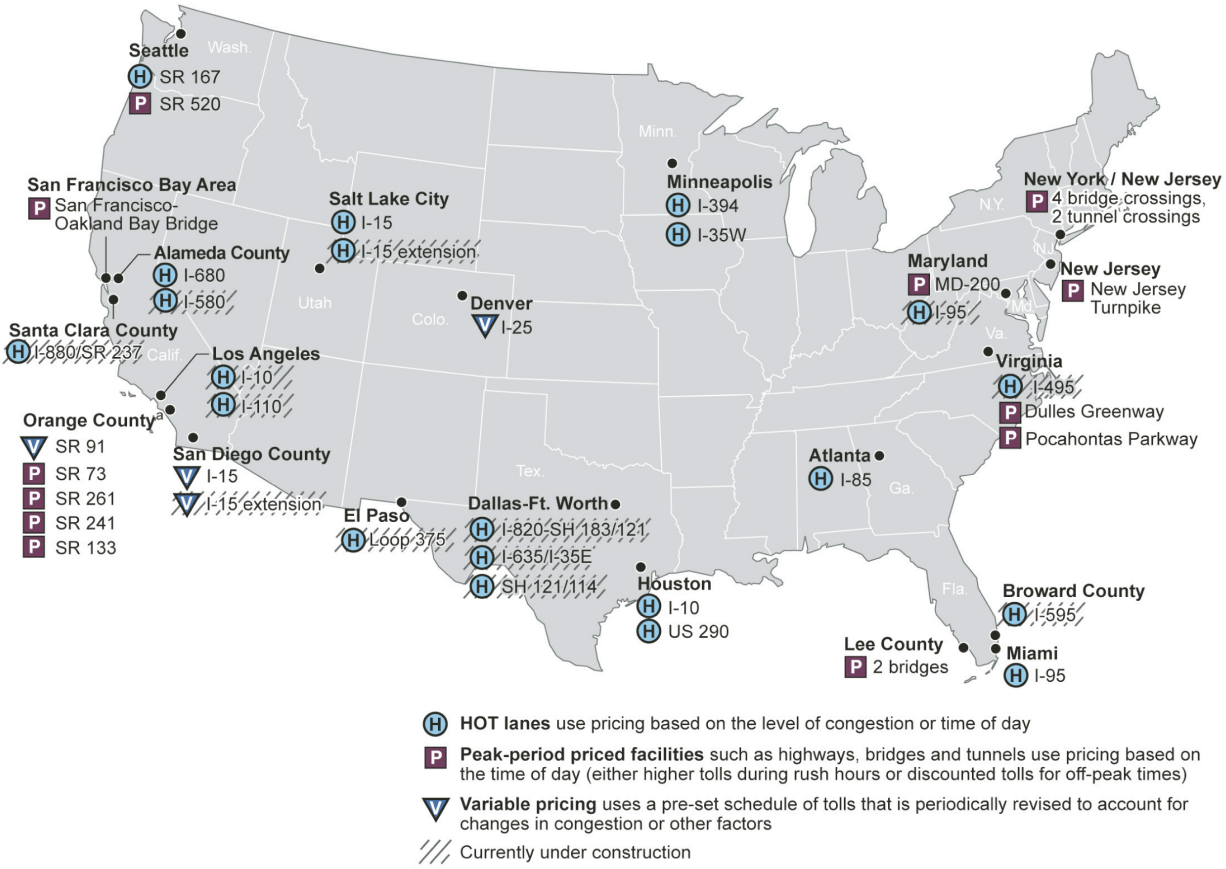
4 Federal Highway Administration. (2008, May 30). "Congestion Pricing: A Primer, II. What is Congestion Pricing?" Retrieved 9/12/2013 from http://ops.fhwa.dot.gov/publications/congestionpricing/sec2.htm.

5 Government Accountability Office. (2012, January). Road Pricing Can Help Reduce Congestion, but Equity Concerns May Grow(GAO-12-119). Retrieved 9/12/2013 from http://www.gao.gov/assets/590/587833.pdf.

6 Buckeye, K., & Lee M. (2004). "Value Pricing Outreach and Education: Key Steps in Reaching High-Occupancy Toll Lane Consensus in Minnesota." University of Minnesota, Humphrey School of Public Affairs. Retrieved 9/12/2013 from http://www.hhh.umn.edu/centers/slp/transportation/congestion_pricing/pdf/ValuePricingOutreachandEducation-Buckeye_Munnich.pdf.

7 Oregon Department of Transportation. (2010, November 30). *Congestion Pricing Pilot Program Report*. Retrieved 9/12/2013 from http://www.oregon.gov/ODOT/HWY/REGION1/congestionpricing/113010_CongestionPricing.pdf?ga=t.

Figure 1
U.S. Congestion Pricing Projects in Operation or Under Construction[8]



Variable tolling can be introduced in several ways, including pricing existing high occupancy vehicle (HOV) lanes, where excess HOV capacity is "sold"; applying value pricing (varying by time of day, level of congestion, vehicle classification, etc.) on tollways that currently rely on static tolling; and pricing new capacity on freeways or in particular regions within a city.

If variable tolling is not yet in place in a particular state, the following steps would typically accompany implementation:

1. **Determine the limitations of the state tolling authority/commission.**[9] State enabling legislation may be needed to implement variable tolling and/or require tolling authorities to obtain voter approval prior to implementation. Legislation should be aligned with a particular state's goals for variable tolling. In Washington, for example, the authorizing legislation allows the tolling authority to offer discounts to single-occupancy vehicles with low emissions.[10] Such exceptions can increase the project's popularity, but the more exceptions to the fee, the less likely the facility will produce the desired level of revenue.

8 Government Accountability Office. (2012, January). "Road Pricing Can Help Reduce Congestion, but Equity Concerns May Grow." (GAO-12-119). Retrieved from http://www.gao.gov/assets/590/587833.pdf.

9 The federal government imposes restrictions on tolling of interstate highways. The new MAP-21 federal transportation act provides some new freedoms but, at this writing, the U.S. DOT has not issued related guidance.

10 Texas Transportation Institute. (2011, March). "Operational Performance Management of Priced Facilities." Retrieved from http://tti.tamu.edu/documents/0-6396-1.pdf.

2. **Conduct analysis and feasibility studies.** Concurrent with legislative action to authorize variable tolling, extensive legal, environmental, technological, organizational, pricing, traffic, demand, and financial analysis will be necessary to set the range, structure, and management of the tolls and tolling facilities, and to gauge the impact of variable toll introduction on existing traffic patterns. An example of such a study was carried out for the City of Seattle, which is in the process of implementing variable tolling on several roads and bridges.[11]

3. **Engage and educate the public.** Public resistance to and a lack of understanding of the benefits of value pricing are likely the most challenging obstacles to implementation. Where the toll is new, many drivers will resist the concept just because it introduces a fee on something that was previously free. Where flat tolls are converted to variable charges, drivers may suspect a scheme to simply raise rates. Plain and direct communication on the benefits of tolling—including time-savings for travelers and revenues to invest in travel alternatives—are essential to the success of a tolling project. When variable tolling started in Lee County, Florida, the slogan "Avoid the rush, pay half as much!" was advertised to promote taking trips off-peak.[12] Extensive communication regarding the phase-in schedule for tolling, the toll structure, and the application of revenues and transit alternatives is also crucial.

   In addition to public engagement in the logistics and benefits of variable tolling, equity concerns associated with tolling must be addressed. As noted previously, one roadblock to variable tolling programs is actual or perceived inequity to disadvantaged communities, where higher tolls prevent low-income people from using certain roads and the benefits of express lanes are only available to those able and willing to pay the toll. Studies on this topic show that correctly identifying equity concerns and addressing them with careful planning can alleviate many of the problems, though the scope and depth of the equity impact is still being studied.[13] Key issues include whether toll facilities are located in the areas of highest need, whether there are ways to redistribute toll revenue to disadvantaged communities, whether a viable public transportation alternative exists or can be created in the corridor, whether alternative access options such as free use by HOVs or discounted toll rates for low-income households have been considered, and whether citizen groups were involved in identifying projects and considering the impact on their communities.

4. **Report on performance.** Success begets success, but success must be demonstrated and highlighted. Determine which performance measures—travel time savings, freight movement, reliability, traffic reduction, emissions reduction, or reinvestment—will be most compelling to elected officials and the public so to demonstrate. Even in the early assessment stages, it is vital to understand how the public and elected officials measure success and what is most meaningful to them. Measuring and reporting outcomes and successes will build a case that will allow tolling projects to be replicated elsewhere in the state.

---

11 Booz Allen Hamilton, Booz & Company, and the City of Seattle Department of Transportation. (2009, May). Seattle Variable Tolling Study. Retrieved from http://www.seattle.gov/transportation/docs/FINAL%20Tolling%20Study%20report%20revised%206.25.10.pdf.

12 Center for Urban Transportation Research. (1998). "Variable tolling starts in Lee County, Florida." http://cutr.usf.edu/pubs/news_let/articles/winterC98/news936.htm.

13 Congressional Budget Office. (2009, March). "Using Pricing to Reduce Traffic Congestion." Retrieved from http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/97xx/doc9750/03-11-congestionpricing.pdf.

Case Studies

California

In California, AB 1467, approved in 2006, allowed California's Regional Transportation Agencies, in cooperation with the state DOT (Caltrans), to apply to the California Transportation Commission (CTC) to develop and operate new variably priced HOT lanes.[14] The CTC has approved four new projects that meet its eligibility guidelines, two in Northern California and two in Southern California.

More recently, Senate Bill 4 (SBx2), like its predecessor, authorizes Caltrans and Regional Transportation Planning Agencies to nominate transportation projects for approval by CTC, with no limit on the number of projects to be approved.[15] Variable pricing projects must go through this process. Approved projects must satisfy four performance objectives:[16]

1. Improve mobility through faster travel times or reduced congestion;
2. Improve operation/safety;
3. Provide quantifiable air quality benefits; and
4. Address known forecast demand.

SBX2 4 also created the Public Infrastructure Advisory Commission, a clearinghouse for public-private partnership-related services and information. This legislation sunsets on January 1, 2017.

Two California variable pricing projects have served as models for states and DOTs for decades. The first, the SR-91 express lanes in Orange County, opened in 1995 as a private toll road venture between Caltrans and the California Private Transportation Corporation (CPTC), and has been variably priced, based on a pre-set schedule, since. This project predated AB 1467 and was authorized by the state's earlier public-private partnership legislation, AB 680, which allowed Caltrans to enter into agreements with private entities to develop, operate, and maintain transportation demonstration projects. Spurred by a controversial non-compete clause in the original agreement with the CPTC, the Orange County Transportation Authority bought the toll road from the private company in 2002 and continues to operate and maintain it today.[17] The peak express lane toll (3-4 p.m. eastbound on Fridays) was $10.05 as of July 1, 2012, making it the country's most expensive toll road (which is appropriate, given that it is also one of the most heavily used roads in the country).[18] Transit vehicles and carpools use the road toll-free, except when traveling eastbound during weekday evening rush hours, when they pay 50 percent of the full toll. Fifteen years of data demonstrate that the SR 91 express lanes have been a success: the average speed of vehicles in the express lanes is more than 60 miles per hour (mph),[19] reducing commute times by 20 to 30 minutes each way for express lane users.[20] Recent discussions have considered extending the express lanes into Riverside County and connecting with I-15.[21]

---

14 California State Legislature. (2006). Assembly Bill No. 1467. Retrieved 8/20/12 from http://www.dot.ca.gov/hq/innovfinance/Public-Private Partnerships/ab_1467_bill_20060519_chaptered.pdf.

15 California State Legislature. (2009). Senate Bill 4 (SBx2). Retrieved from http://www.leginfo.ca.gov/pub/09-10/bill/sen/sb_0001-0050/sbx2_4_bill_20090220_chaptered.html.

16 California State Legislature. (2009, February 11). California Senate Bill X2 4. Retrieved from http://www.leginfo.ca.gov/pub/09-10/bill/sen/sb_0001-0050/sbx2_4_bill_20090220_chaptered.html.

17 California Department of Transportation. "State Route 91 (91 Express Lanes)." Retrieved 9/12/2013 from http://www.dot.ca.gov/hq/paffairs/about/toll/rt91.htm.

18 Orange County Transportation Authority. (2012, July 1). "Toll Schedules." Retrieved 9/12/2013 from http://www.91expresslanes.com/schedules.asp.

19 Federal Highway Administration. (2006, December 27). "Congestion Pricing: A Primer, IV. Examples in the U.S." Retrieved 9/12/2013 from http://ops.fhwa.dot.gov/publications/congestionpricing/sec4.htm.

20 Orange County Transportation Authority. (2011). *91 Express Lanes: Fiscal year 2010-2011 Annual Report*. Retrieved 9/12/2013 from http://www.octafiles.net/91annual.pdf.

21 Adams, C. (2011, December 19). "Local agencies pave the way for 91 Express Lane project." OC Metro. Retrieved

San Diego's I-15 express lanes, California's second variable pricing example, were converted from HOV lanes as part of the FHWA's Congestion Pricing Pilot Program in 1996. Prior to the implementation of the program, the I-15 corridor just north of San Diego was perennially congested, with average delays ranging from 30 to 45 minutes. Projections showed that, by 2020, those delays could increase up to an hour and a half if improvements were not made.[22] Operated by the San Diego Association of Governments (SANDAG), the original facility was an eight-mile, two-lane, reversible HOV facility. Since then, it has grown into a 20-mile stretch of express lanes between SR 78 in Escondido and SR 163 in San Diego.[23] The full corridor opened to drivers in January 2012, with tolls ranging from 50 cents to $8, depending on congestion and the distance traveled.[24] HOT lane users saved 20 minutes over unpriced lane travelers, by one estimate.[25]

Dubbed the "expressway-within-the-freeway," the project has a movable barrier that can allow for three lanes of traffic in the peak direction and direct access ramps for transit, carpools, vanpools, motorcycles, and permitted clean air vehicles—all of whom do not pay the toll—and solo drivers, who pay a toll via a transponder. Revenues from the corridor fund an express bus that currently operates only during peak commute hours but, by 2013, will be replaced with a new bus rapid transit system that will operate every ten minutes. Revenues will also be used to purchase buses for the new system.[26] The total project cost, including the transit improvements, is about $1.3 billion and was funded by the local TransNet sales tax and various state and federal funds.[27]

Washington

Washington's transportation commission, an independent, non-partisan panel of experts appointed by the Governor, is authorized to set tolls in the state. However, the commission is not in charge of all aspects of tolling: Washington State DOT owns the tolling facilities, the Washington State Patrol enforces the tolling, and the State Legislature is the only entity with the authority to impose tolls on a facility. According to RCW 47.56.850, toll revenues must be set at a level that will generate income sufficient to meet operating costs for the tolling facilities, debt service associated with the facilities, and other obligations of the tolling authority.[28] Revenues may also be used for operation and maintenance of roads, as well as the optimization of system performance. Specifically, the RCW states that "established toll rates may include variable pricing, and should be set to optimize system performance... Tolls may vary for type of vehicle, time of day, traffic conditions, or other factors designed to improve performance of the system."

Seattle's successful HOT lanes were introduced (on converted HOV lanes) on nine miles of State Route (SR) 167 in 2008. The project, authorized by RCW 47.56.403, is a four-year pilot project.[29] Toll rates

9/12/2013 from http://www.ocmetro.com/t-OCTA-RCTC-91-express-lane-project-12-19-2011.aspx.

22 San Diego Association of Governments. (2012, January). "I-15 Express Lanes Fact Sheet." Retrieved from http://www.sandag.org/uploads/publicationid/publicationid_6_1065.pdf.

23 *Ibid.*

24 Federal Highway Administration Office of Operations. (2011, June 1). "Value Pricing Pilot Program Projects Involving Tolls: Project—California: HOT Lanes on I-15 in San Diego." Retrieved 9/12/2013 from http://ops.fhwa.dot.gov/tolling_pricing/value_pricing/projects/involving_tolls/priced_lanes/hot_lanes/ca_hotlanes_i15sd.htm.

25 Government Accountability Office. (2012, January). "Road Pricing Can Help Reduce Congestion, But Equity Concerns May Grow." (GAO-12-119). Retrieved 9/12/2013 from http://www.gao.gov/assets/590/587833.pdf.

26 Hawkins, R. (2012, January 12). "Last leg of I-15 express lanes dedicated, opens Jan. 16." San Diego Union-Tribune. Retrieved 9/12/2013 from http://www.utsandiego.com/news/2012/jan/12/last-leg-i-15-express-lanes-dedicated-opens-jan-16/.

27 San Diego Association of Governments. (2012, January). "I-15 Express Lanes Fact Sheet." Retrieved 9/12/2013 from http://www.sandag.org/uploads/publicationid/publicationid_6_1065.pdf.

28 Washington State Legislature. RCW 47.56.850. Retrieved 9/12/2013 from http://apps.leg.wa.gov/rcw/default.aspx?cite=47.56.850.

29 Washington State Legislature. RCW 47.56.403. Retrieved 9/12/2013 from http://apps.leg.wa.gov/RCW/default.aspx?cite=47.56.403.

vary dynamically to ensure that the HOT lanes are free-flowing even when general-purpose lanes are congested. The HOT lanes preserve transit and carpool advantages (they travel toll-free, and reports indicate that travel times for carpools and transit have not increased since the introduction of the HOT lane), while allowing solo drivers the option to pay for a faster trip when they need it.[30] Rush hour speeds on SR 167 increased by as much as 19 percent after the implementation of the tolls.[31] Average tolls are between $0.75 and $1.00, with the maximum toll floating around $4.75. HOT lane volumes have increased each year, and revenue increased by 35 percent in 2011 over 2010, generating $750,000. Toll revenue began exceeding operational costs in April 2011.[32]

Minnesota

The Minnesota DOT is authorized to charge tolls on dynamic shoulder lanes and HOV lanes by Minnesota Statute 160.93.[33] The commissioner must consult with the Twin Cities Metropolitan Council (the region's metropolitan planning organization) before implementing user fees. Notably, the statute requires that half of all revenues from the tolls not used to repay the capital and operating costs of the system be directed toward transit improvements.

Minnesota has two express lane facilities currently in operation, both conversions from underused HOV lanes: I-394,[34] completed in 2005, and I-35W,[35] completed in late 2009. Additional express lanes are planned on I-35, I-94, and Highway 36.[36] On existing segments of I-394 and I-35W, transit vehicles and carpoolers are allowed to use the lanes without charge, while single-occupancy vehicles are allowed to use the lanes by paying a toll that varies depending on traffic volume—the toll dynamically increases when traffic is moving below 50 mph. On I-394, solo drivers pay a toll of $0.25 to $8 during rush hours to use an 11-mile HOT lane. Tolls on I-35W depend on the section of the road, but the average toll during peak periods is $1 to $4, with a maximum of $8.[37]

Evaluations suggest that Minnesota's HOT lanes have reduced congestion and increased use of the formerly nearly empty HOV lanes. On a typical day, the HOT lanes move 1,000 vehicles each morning and 600 vehicles each evening out of general purpose lanes and into the express lanes. As a result, HOT lane users can expect a 20-mph increase in their average speed. Those in the general purpose lanes also see a slight increase in speed, thanks to the broader distribution of cars among lanes.[38]

---

30 Washington State Department of Transportation. (2011). *SR 167 HOT Lanes Pilot Project: Third Annual Performance Summary May 2008 – April 2011*. Retrieved 8/20/12 from http://www.wsdot.wa.gov/NR/rdonlyres/C198671E-7B2F-4186-9912-A41A0B274103/0/SR167_AnnualPerformanceSummary_113011_FINAL_WEB.pdf.

31 Government Accountability Office. (2012, January). "Road Pricing Can Help Reduce Congestion, But Equity Concerns May Grow." (GAO-12-119). Retrieved 9/12/2013 from http://www.gao.gov/assets/590/587833.pdf.

32 Washington State Department of Transportation. (2011). *SR 167 HOT Lanes Pilot Project: Third Annual Performance Summary May 2008—April 2011*. Retrieved 9/12/2013 from http://www.wsdot.wa.gov/NR/rdonlyres/C198671E-7B2F-4186-9912-A41A0B274103/0/SR167_AnnualPerformanceSummary_113011_FINAL_WEB.pdf.

33 Minnesota Office of the Revisor of Statures. (2011). Minnesota Statute 160.93. Retrieved 9/12/2013 from https://www.revisor.mn.gov/statutes/?id=160.93.

34 Minnesota Department of Transportation & University of Minnesota, Humphrey Institute of Public Affairs. *I-394 MnPAss: A New Choice for Commuters*. Retrieved 8/21/12 from http://www.mnpass.org/pdfs/mnpassreport-uofm0306.pdf.

35 Federal Highway Administration. (2010, August 23). "I-35W MnPASS" – I-35W, Minneapolis, MN, HOV to HOT Conversion and Shoulder to HOT Conversion Project." Retrieved 9/12/2013 from http://ops.fhwa.dot.gov/freewaymgmt/publications/documents/nrpc0610/workshop_materials/case_studies/minneapolis_i35.pdf.

36 Minnesota Department of Transportation. (2012, October). MnPass Express Lanes. Retrieved 11/25/13 from http://www.dot.state.mn.us/metro/projects/35estpaul/pdf/mnpassfactsheet.pdf.

37 Minnesota Department of Transportation. MnPASS Express Lanes. Retrieved 9/12/2013 from http://www.mnpass.org/index%20394.html.

38 Minnesota Department of Transportation & University of Minnesota, Humphrey Institute of Public Affairs. *I-394 MnPAss: A New Choice for Commuters*. Retrieved 8/21/12 from http://www.mnpass.org/pdfs/mnpassreport-uofm0306.pdf.

Money collected from variable tolling on I-394 and I-35W must be deposited in a corridor-specific account within the state's special revenue fund. Money in the account is appropriated to the commissioner, who is required to repay the trunk highway fund and any other fund source for installing equipment or modifying the corridor for tolling. After paying all the costs of administering the toll collection system, the commissioner is required to spend half the remaining money on transportation capital improvements within the corridor and to forward half to the Metropolitan Council for expansion and improvement of bus transit services within the corridor.[39]

Resources

Bay Area Toll Authority Long-Range Plan. (2006, December). http://bata.mtc.ca.gov/pdfs/BATA_Long-Range_Plan.pdf.

This plan identifies toll-funded projects, including the seismic retrofit bridge program, bridge construction projects, and investments in transit operating funding.

The Federal Highway Administration, Tolling and Pricing Program. http://www.ops.fhwa.dot.gov/tolling_pricing/index.htm.

The Office of Innovative Program Delivery offers online and other resources for agencies interested in tolling and pricing programs, particularly pilot program assistance.

National Highway Cooperative Research Program. (2006). Synthesis 364: Estimating Toll Road Demand and Revenue. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_364.pdf.

This report provides a state of the practice for forecasting demand and revenues for toll roads in the United States. The synthesis focuses on models that are used to forecast the demand for travel and reports on results from a survey of state DOTs, toll authorities, bond rating agencies, and bond insurance agencies.

National Highway Cooperative Research Program. (2008). Synthesis 377: Compilation of Public Opinion Data on Tolls and Road Pricing. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_377.pdf.

This report provides an analysis of public opinion on tolling and road pricing across the United States and internationally, and offers a systematic review of how the public feels about tolls and road pricing.

Seattle Department of Transportation. (2009, May). Seattle Variable Tolling Study. http://www.seattle.gov/transportation/tolling_study.htm.

This comprehensive study investigates variable tolling as a strategy to reduce greenhouse gas emissions. It identifies types of tolling and their benefits, establishes Seattle's tolling interests, and evaluates tolling concepts.

Washington State's HB 1773—Imposition of Tolls. (2008). http://apps.leg.wa.gov/billinfo/summary.aspx?bill=1773&year=2007.

This legislation provides a framework for collecting tolls in Washington, gives the legislature the authority to impose tolls on unspecified roads and bridges, and makes the Washington State Transportation Commission responsible for determining toll rates (including variable pricing).

39 Minnesota Office of the Revisor of Statures. (2011). Minnesota Statute 160.93. Retrieved from https://www.revisor.mn.gov/statutes/?id=160.93.

Implement Pay-As-You-Drive Insurance

The Opportunity

State transportation agencies may not play a direct role in the provision of auto insurance to drivers, but they stand to benefit if insurance programs are structured to maximize the life of the infrastructure they maintain. Pay-As-You-Drive (PAYD) auto insurance can help manage transportation demand by giving motorists an option for auto insurance that effectively rewards them for driving less.

Even small reductions during peak demand can lead to significant decreases in roadway congestion, eliminating delays and improving flow.[40] A Brookings Institute report calculated that PAYD insurance implemented in all 50 states could reduce vehicle miles traveled (VMT) by eight percent and save $50-$60 billion a year by decreasing the number of crashes and other driving-related externalities. With PAYD insurance, nearly two-thirds of households would save an average of $270 per car per year. In turn, insurance would become more affordable and the number of uninsured drivers would decrease. One study found that PAYD insurance has the same impact on managing demand as a $1-per-gallon gas tax increase.[41] Decreased congestion through VMT reductions would also result in decreased pressure for highway capacity expansions.

What Is It?

Most automobile insurance rates make only minor distinctions between drivers who log thousands of miles every year (and are thus exposed to significantly greater risks) and those who only travel a few hundred. PAYD insurance supports the actuarial nature of insurance (higher exposure means higher risk), allowing those at lower risk due to less driving to reduce their financial obligation.

PAYD auto insurance premiums are priced per miles driven. While program structures can vary, insurance companies generally divide current premiums by the category of miles reported to the insurer. For example, a $250 premium for 10,000 miles reported becomes 2.5 cents per mile; an $1,800 premium for 15,000 miles equals 12 cents per mile. For the typical driver, premiums would average 6.5 cents per mile.[42] Potential payment methods include:

- Pay the premium based on the expected mileage category; a driver will pay the difference or receive a refund at the end of the policy term, depending on actual miles driven.
- Purchase a lump sum of miles at the start of the policy term and buy more miles if needed or receive credit for unused miles.
- Be billed for usage on a monthly basis, similar to a utility.[43]

PAYD insurance relies on accurate mileage data. Fortunately, there are a number of existing commercially available technology options for collecting data on distance traveled, many of which do

40 Federal Highway Administration. (2008, December*). Examining the Speed–Flow-Delay Paradox in the Washington DC Region: Potential Impacts of Reduced Traffic on Congestion Delay and Potential for Reductions in Discretionary Travel During Peak Periods: Final Report.* Retrieved 5/1/12 from http://ops.fhwa.dot.gov/publications/fhwahop09017/008_section_2.htm#26.

41 The Hamilton Project and Brookings Institution. (2008, July). *Pay-As-You-Drive Auto Insurance: A Simple Way to Reduce Driving-Related Harms and Increase Equity.* Retrieved 3/27/12 from http://www.brookings.edu/~/media/Files/rc/papers/2008/07_payd_bordoffnoel/07_payd_bordoffnoel.pdf.

42 Victoria Transport Policy Institute. "Pay-As-You-Drive Pricing and Insurance Regulatory Objectives." Retrieved 3/27/12 from http://www.vtpi.org/jir_payd.pdf.

43 *Ibid.*

not transmit information about driver location (or can be tailored to remove that capability in order to address privacy concerns). Most new cars already record odometer data electronically onto internal computers. Two potential data collection methods include:

- Installing an odometer tracking device (the "dongle" used by Progressive, for example, plugs into the car's diagnostic port); or
- Installing a GPS tracker such as On Star.

Feasible payment and data collection structures will depend on each state's particular insurance regulations.

Implementation

State transportation agencies can play an important leadership role by taking the following steps to promote PAYD and encourage its adoption.

Enable the offering of PAYD insurance. Most state laws already enable PAYD-type insurance systems. The Georgia Institute of Technology conducted a survey of state insurance commissioners in 2002 to determine whether current regulations explicitly ban PAYD. Of the 43 respondents, 27 said that current laws in their states do not prohibit PAYD.[44] Since the study was conducted, PAYD has become more common; for example, Progressive Insurance offers its Snapshot program, a PAYD product, in 39 states. Some states have passed legislation that explicitly allows insurance companies to offer PAYD.[45]

In some cases, additional legislative changes may be necessary to make PAYD feasible. For example, certain states, such as North Carolina, require that annual insurance premiums be stated upfront.[46] In a mileage-based system, the premium may increase or decrease depending on miles driven; this type of requirement can limit PAYD's attractiveness to drivers if there is no provision for granting a credit if a driver drives less than his original predicted mileage. Some insurance companies currently structure their programs so that this is not an issue; for example, GMAC and Progressive collect data and then provide discounts on future premiums.[47]

Educate drivers about the benefits of PAYD. PAYD insurance has clear benefits, including significant cost savings, for many drivers. PAYD policies vary but, in general, offer discounts for driving less than a set number of miles per year.[48]

Establish broad-based partnerships. Environmental advocates are natural allies because PAYD insurance reduces VMT and emissions. Insurance companies are important partners and tend to be supportive of PAYD because it lowers their risk, which leads to smaller payouts. State insurance commissions are essential partners because of their role in the implementation of the program, and state DOTs can be valuable advocates in helping to pass any necessary legislation.

---

44 Guensler, R. et al. (2003). Current State Regulatory Support for Pay-As-You-Drive Automobile Insurance Options. Journal of Insurance Regulation, (Vol. 21, No. 3), p. 31. Retrieved 9/12/2013 from http://transportation.ce.gatech.edu/sites/default/files/files/current_state_regulatory_support_for_pay-as-you-drive_automobile_insurance_options.pdf.

45 *Ibid.*

46 Environmental Defense Fund. "Drive less, pay less for insurance." Retrieved 9/12/2013 from http://www.business.edf.org/projects/innovation-exchange/2008-innovations-review/drive-less-pay-less

47 Center for Insurance Policy and Research. (2012, June 5). "Usage-based insurance." Retrieved 8/8/12 from http://www.naic.org/cipr_topics/topic_usage_based_insurance.htm.

48 See, for example, Progressive's web site: http://www.progressive.com/auto/snapshot-common-questions.aspx. Drivers are discounted for "driving fewer miles than the average driver in your state."

Start with a sizeable market share. Washington's program began with Unigard, a local insurance company. Unigard could only offer up to a five percent savings total, and as of June 2011, only six vehicles were enrolled.[49] California, on the other hand, rolled out PAYD with State Farm, which offers a five percent discount just for signing up for PAYD. State Farm insures 3.5 million California drivers with premiums totaling $2.5 billion.

Run a pilot program. One of the biggest obstacles to widespread adoption of PAYD is a lack of knowledge on the part of insurance companies and state decision makers about how to structure it. A pilot program can be an effective way to test potential payment structures and data collection methods and reduce the start-up costs to insurance companies. It can also be a means to collect state-specific data about the benefits of PAYD, by monitoring changes in driver behavior. State transportation agencies can play an important leadership role and, in many cases, will be in the best position to administer such a program (see the Massachusetts case study below).

Case Studies

California PAYD

Proposition 103, which has guided California's insurance policy since 1988, requires insurance companies to consider three main factors when determining premiums: the driver's safety record, the driver's experience, and annual miles driven. Mileage is self-reported, and there is a wide mileage range for each mileage category. For example, if a range of mileage covered 10,000 to 20,000 miles, a person who drove 10,000 miles a year would pay the same premium as someone who drove 20,000 miles.[50]

In 2008, Assemblyman Jared Huffman proposed and successfully passed legislation that would authorize PAYD. The campaign shared success stories from other states to promote cost savings and capitalized on the rising cost of gas. To address privacy concerns, the legislation does not allow the use of GPS devices to track miles.[51]

The original bill had the support of the Automobile Club of Southern California and State Farm, which began offering PAYD to customers in early 2011. Since then, two more companies have begun offering PAYD in California. State Farm says that, as of April 2012, it is on track to enroll 25 percent of its 3.5 million drivers in California in the PAYD program.[52] The program allows customers to self-report mileage online or through a State Farm agent, or install OnStar in their vehicle.[53]

---

49 Rosenberg, M. (2011, November 3). "King County to resuscitate pay-as-you-go insurance model." *Crosscut Public Media*. Retrieved 9/12/2013 from http://crosscut.com/2011/11/03/crosscut-blog/20634/King-County-resuscitate-payasyougo-insurance-model/.

50 The Hamilton Project and The Brookings Institution. (2008, July). *Pay-As-You-Drive Auto Insurance: A Simple Way to Reduce Driving-Related Harms and Increase Equity.* Retrieved 3/27/12 from http://www.brookings.edu/~/media/Files/rc/papers/2008/07_payd_bordoffnoel/07_payd_bordoffnoel.pdf.

51 California Assembly Bill 2800. (2008, August 25). Office of Senate Floor Analyses. Retrieved 9/12/2013 from http://leginfo.ca.gov/pub/07-08/bill/asm/ab_2751-2800/ab_2800_cfa_20080825_113959_sen_floor.html.

52 Gumz, J. (2012, April 12). "Drive less and save: Drivers pleased with program to cut premiums." *Santa Cruz Sentinel*. Retrieved 4/30/12 from http://www.mercurynews.com/breaking-news/ci_20385093/drive-less-and-save-drivers-pleased-program-cut.

53 State Farm web site. Retrieved 1/12/14 from https://www.statefarm.com/insurance/auto/discounts/drive-safe-save/california.

Massachusetts PAYD

In an effort to reduce carbon emissions by 25 percent below 1990 levels by the year 2020, Massachusetts decided to execute strategies for reducing greenhouse gases, including a PAYD program.[54] Costs for fully implementing PAYD in Massachusetts are expected to be about $2.57 million. In 2010, MassDOT received a $2.1 million grant from the FHWA Value Pricing Pilot Program to take on a Pay-As-You-Drive Insurance Pilot Program. Conservation Law Foundation Ventures, the non-profit strategy-consulting arm of the Conservation Law Foundation (CLF), provided a portion of the private match to cover the remainder of the program cost and will conduct the study.[55] Plymouth Rock Assurance Corporation, a local insurance provider, will contribute additional funding and act as insurer for the participants.[56]

MassDOT's Office of Transportation Planning will oversee the implementation of the pilot program in close coordination with the Massachusetts Executive Office of Energy and Environmental Affairs and the Massachusetts Division of Insurance.[57] This pilot program will test a variety of pricing structures, such as a monthly billing system that will provide PAYD customers with "real-time" pricing signals. It will also install on-board telematics devices that will track mileage and driving patterns in control groups of drivers to study the impacts on VMT.[58] Up to 3,000 policyholders will participate in the pilot program, which is expected to launch in 2014 and run for three years.[59]

Before embarking on this pilot program, CLF and the Environmental Insurance Agency commissioned a study that used actual insurance claims in Massachusetts to assess the "risk-mileage relationship." The study analyzed $502 million in claims on about three million cars driven a total of 34 billion miles.[60] The results of the study indicated the soundness of PAYD: if all Massachusetts drivers switched to PAYD, it would create considerable reductions in miles driven, fuel consumption, greenhouse gas emissions, and auto accident losses without harming lower-income drivers.

Resources

The Brookings Institution. (2008, July). Pay-As-You-Drive Auto Insurance: A Simple Way to Reduce Driving-Related Harms and Increase Equity. http://www.brookings.edu/research/papers/2008/07/payd-bordoffnoel.

54 Massachusetts Executive Office of Energy and Environmental Affairs. (2010, December 29). "Massachusetts Clean Energy and Climate Plan for 2020." Retrieved from http://www.mass.gov/eea/docs/eea/energy/2020-clean-energy-plan.pdf.

55 Massachusetts Office of Consumer Affairs and Business Regulation. (2011, January 21). "Bulletin 2011-01; Pay-As-You-Drive Auto Insurance Pilot." Retrieved 7/20/12 from http://www.mass.gov/ocabr/government/oca-agencies/doi-lp/bulletin-2011-01-pay-as-you-drive-auto.html.

56 Conservation Law Foundation , (2013, September 16). "Conservation Law Foundation Announces Study to Measure How Financial Incentives Impact Massachusetts Motorists' Driving Habits" Conservation Law Foundation website. Retrieved 10/16/13 from http://www.clf.org/newsroom/conservation-law-foundation-announces-study-measure-financial-incentives-impact-massachusetts-motorists-driving-habits/.

57 Federal Highway Administration. "VPP Projects Not Involving Tolls Category: Projects That Make Auto Use Costs Variable." Retrieved 7/20/12 from http://www.ops.fhwa.dot.gov/tolling_pricing/value_pricing/projects/not_involving_tolls/autousecostsvariable/ma_payd.htm.

58 Federal Highway Administration. "VPP Projects Not Involving Tolls Category: Projects That Make Auto Use Costs Variable." Retrieved 7/20/12 from http://www.ops.fhwa.dot.gov/tolling_pricing/value_pricing/projects/not_involving_tolls/autousecostsvariable/ma_payd.htm.

59 Conservation Law Foundation, (2013, September 16). "Conservation Law Foundation Announces Study to Measure How Financial Incentives Impact Massachusetts Motorists' Driving Habits." Conservation Law Foundation website. Retrieved 10/16/13 from http://www.clf.org/newsroom/conservation-law-foundation-announces-study-measure-financial-incentives-impact-massachusetts-motorists-driving-habits/.

60 Joseph, F., and Eric, M. (2010, October). "Pay-As-You-Drive Auto Insurance in Massachusetts." Retrieved 7/20/12 from http://mit.edu/jf/www/payd/PAYD_CLF_Study_Nov2010.pdf.

This report makes a strong case for implementing PAYD and quantifies a number of the benefits. It also provides recommendations on how states and the federal government can encourage widespread adoption.

Ferreira, Jr., J., & Minikel, E. (2010, November). Pay-As-You-Drive Auto Insurance in Massachusetts: A Risk Assessment and Report on Consumer, Industry and Environmental Benefits. http://mit.edu/jf/www/payd/PAYD_CLF_Study_Nov2010.pdf.

This study, commissioned by the Conservation Law Foundation and Environmental Insurance Agency, offers an analysis of the risk-mileage relationship based on insurance claims information in Massachusetts.

International Transport Forum. (2011, September). Pay-as-you-drive vehicle insurance as a tool to reduce crash risk: Results so far and further potential. http://www.internationaltransportforum.org/jtrc/DiscussionPapers/DP201123.pdf.

This report provides behavioral and crash analysis on some more mature PAYD programs internationally.

Victoria Transport Policy Institute. “Pay-As-You-Drive Pricing and Insurance Regulatory Objectives.” http://www.vtpi.org/jir_payd.pdf.

This is an excellent resource on the mechanics behind PAYD and pricing options.

THE INNOVATIVE DOT

Focus Area 4: Increasing Transportation System Efficiency

Focus Area 4: Increasing Transportation System Efficiency

It is often prohibitively expensive to add lane miles to relieve congestion. Where dollars for capacity are available, expansions may run counter to community development and environmental goals, and may only induce more traffic. Faced with this challenge, agencies have come up with operational improvements and other ways to improve the efficiency of existing systems without major new capital investments. Strategies include operational improvements, demand management, and cooperation with local governments to ensure that state and local systems work synergistically.

In this section:

- Reform Level of Service
- Use Practical Design and Context Sensitive Solutions
- Improve Street Connectivity
- Modernize Access Management Standards
- Use Transportation Demand Management
- Invest in System Management

Pictured: Ramp meters in the Minneapolis/St. Paul area. *See "Invest in System Management" to learn more.*

Reform Level of Service

The Opportunity

Transportation agencies constantly face the challenge of improving access to destinations with fewer resources. Measures of congestion such as level of service (LOS) are often cited as a major reason for making expensive capacity additions. However, this approach can lead DOTs away from the best investments because LOS is an interim measure—a measure of whether cars can move rapidly along a stretch of road—and not a measure of the ultimate outcome.

An overly rigid focus on LOS can lead to costly expansion projects built to serve narrowly-defined conditions that are not representative of typical infrastructure use, and can ultimately undermine desired outcomes related, for example, to economic development and safety. In some cases, free-flowing traffic may not be necessary; if traffic is slow but trips are short, travelers still get to their destinations quickly. Low volumes of traffic on high capacity streets may not be an indicator of good engineering; they may instead be an indicator of a dying town and an underutilized public investment (the road). Likewise, increasing speeds in a congested business district to improve LOS may negatively impact the businesses that rely on the traffic stopping to spend money.

Using LOS in a new way provides an opportunity for DOTs to ensure that investments achieve multiple intended goals.

What Is It?

Transportation engineering and planning have generally measured LOS as a ratio of actual traffic volume to the theoretical capacity of the road. There are two solutions DOTs can try to ensure LOS steers consistently toward high value investments: use LOS standards differently, and redefine them.

For instance, DOTs often measure LOS at the time of peak delay during the day and use that to decide if capacity additions are warranted. In the extreme example where service is bad for one hour of the day and then good for the remainder, a large amount of money may be spent to solve a problem that only exists for a very short time, while the road is hugely underutilized for the rest of the time, making the benefits low and the costs high.

Another important consideration is context. Some places are heavily congested because they are very desirable places to be. These places are often centers of economic activity that rely on a high volume of travel and may be harmed by wider roads or faster traffic. Since one of the goals of transportation investments is economic development, it may be counterproductive to “fix the traffic” by means of capacity expansion. Instead, it may be better to improve service by ensuring that people who choose to travel by walking, biking, or transit can do so. However, traditional measures of LOS don’t measure these changes, rendering these improvements virtually worthless as a means of improving the measured LOS.

To capture the impacts of multimodal improvements, LOS can be redefined to account for the capacity and utilization of all modes. Measures of pedestrian, bicycling, and transit LOS mirror roadway LOS measures in that they evaluate the adequacy/availability of the facility for accommodating existing and new travel. These generally include measures of capacity such as the presence, density, and extensiveness of sidewalks and bike lanes; measures of connectivity, frequency, quality, and size of the

transit system; and measures of utilization, such as people per square meter, volume of cyclists, and number of public transportation users.

Implementation

Redefining LOS and its application is a change in policy that requires little or no additional funding or enforcement, and may be instituted entirely within a transportation agency. Policies on infrastructure performance are not often codified in state legislation, so the agency has considerable flexibility to revise its benchmarks of what is an acceptable measure.

Successful implementation will involve close partnerships with and buy-in from cities and counties. State agencies should also engage the Federal Highway Administration in this discussion and partner strategically with elected officials. It is critical to ensure that communicating a revised definition of acceptable performance levels is done effectively, especially as agencies seek to advance long-delayed projects or other efforts that carry specific constituent expectations.

Detailed Steps

Moving forward with reforming LOS does not need to follow a set pattern of steps. As the case studies later in this narrative suggest, there is no single "right" way to pursue this approach, but rather multiple potential strategies, each of which is tailored to the specific needs of the state and communities that the project serves. However, there tend to be some common approaches to this type of reform, including the approaches described below that have been taken in state agencies.

1. **Modify specific LOS requirements that emphasize peak hours, special events, or other exceptional scenarios of demand on infrastructure with an eye toward flexibility.** Criteria that focus on the most acute points of challenge to infrastructure performance, such as specific intersections or roadway segments, can be eased in favor of an understanding of an entire corridor's average performance, or even an entire system's. For example, rather than intersection-based levels of service, overall corridor levels of service, measured as a function of travel speed and time along a corridor, may provide a more meaningful measure of performance that also lessens the acute need for an expensive project to address performance issues at a specific location. If select intersections experience congestion but the entire corridor functions within an acceptable range of travel time and speed, there may be no real need for the project from the standpoint of providing regional access.

2. **Consider different circumstances in different parts of the state, especially urban areas and rural areas.** Urban areas generally have a greater and more complex set of travel needs and, in many cases, warrant a different standard of performance than rural areas.

3. **Incorporate language that emphasizes flexibility into design manuals.** This may include starting designs with minimum values to meet standards and not "desirable" or "preferable" values. It may also include removing language such as "desirable" or "preferable" entirely.

Because of the ability that most state agencies have to change these policies internally, action can happen fairly quickly. However, as mentioned previously, these policies are inherently tied to the eventual design-driven factors involved in transportation projects and, as a result, may take a longer period of time for their effectiveness to be demonstrated and understood.

The promise of cost savings and stretching budgets farther is highly appealing to elected officials, but careful communication of this message is essential to keep the true policy intent of a practical design approach from being distorted for political purposes. In particular, a policy approach that changes LOS

standards and that may result in projects that are more modestly designed may be misinterpreted by elected officials as providing less utility per project, or removing value. It is important to emphasize that, while this is lowering the cost, it is actually increasing the benefits per dollar spent and that remaining money is therefore available for other projects.

Case Studies

Florida

The Florida DOT has proposed relaxing standards for roadway design time periods and volumes.[1] These new standards are based on lower traffic volumes, but still founded in commonly accepted engineering methodology (even if the acceptable values differ from those used in conventional practice). Florida's approach is based on a system of standard K factors, or the ratio of peak-hour traffic to a roadway's overall traffic throughout the day, which is used to determine capacity needs and, in turn, guide roadway project design.[2] Engineers use this factor to calculate peak-hour volume from overall daily volume (or vice versa), and it serves as a general guide to how peak-oriented traffic flow is on a given facility.

Florida's proposed system specifies the K factors to be used on different roadway facilities and in different areas of the state, permitting lower K factor values (and thus lower peak-hour design volumes) in urban areas than in rural areas. This recognizes that roadway projects in urban areas are more costly in general, and especially more costly when they attempt to design for exceptionally high levels of traffic. At the same time, the proposed policy eliminates confusion in what factors to apply by specifying clear values to be used in a given combination of conditions. It gives the Florida DOT a solid and defensible approach to design criteria, and represents an acceptance of greater levels of traffic and a need for design flexibility in urban areas.

In addition to flexibility in its administration of LOS, the Florida DOT in 2002 gained national notice when it issued multimodal LOS Standards for the State. This practice was continued in its 2009 FDOT Quality/Level of Service Handbook[3] which notes that, as LOS for one mode changes, others may be affected as well; that different roads play different roles in the system, with some focused more on mobility and some on access; and that there is a correlation between urban size and acceptance of some highway congestion in exchange for urban amenities.[4]

Pennsylvania

As a part of its Smart Transportation initiative, the Pennsylvania DOT (PennDOT) has taken a broad policy approach to 'right size' projects, focusing on a number of planned projects throughout the state that it determined it could no longer afford to deliver as initially designed. Instead of proceeding with original plans, PennDOT offered to continue with a less ambitious version of each project that would still address community needs and congestion issues, but at a lower cost.

---

1 Florida Department of Transportation, Systems Planning Office. "DRAFT Issue Paper on Improving Florida's Transportation Planning and Design Analysis Time Period Process." Retrieved 1/12/14 from http://www.dot.state.fl.us/planning/systems/programs/sm/transition/information/District%20Pilot%20Study.pdf.

2 *Ibid.*

3 Florida Department of Transportation. (2009). Quality/Level of Service Handbook. Retrieved 1/12/14 from http://www.dot.state.fl.us/planning/systems/programs/sm/los/pdfs/2009FDOTQLOS_Handbook.pdf.

4 Florida Department of Transportation. (2009). *FDOT Quality/Level of Service Handbook*. Retrieved 1/12/14 from http://www.dot.state.fl.us/planning/systems/programs/sm/los/pdfs/2009FDOTQLOS_Handbook.pdf.

U.S. Route 202, for example, was originally conceived as a 70 mile-per-hour grade-separated expressway through Montgomery and Bucks Counties northwest of Philadelphia, but the project stalled in the early 2000s due to funding constraints and local controversy. In 2005, PennDOT re-evaluated the nine-mile, $465 million project and formed consensus around an at-grade, slower-speed, multimodal, and smaller-scale project called the US 202 Parkway through a collaborative process involving the local communities along the corridor and several federal and state agencies. In this case, the defined need along the Route 202 corridor was primarily for local access, not for significant volumes of regional traffic expecting a high-speed travel experience. The parkway option filled this need by completing the regional and local roadway network ***without*** attracting a significant volume of new trips.[5]

The project was under construction by 2009 and expected to be open to traffic in 2012 at a cost of $206 million, less than half the cost of the original expressway concept. The approach also streamlined implementation by transforming a project that had been in plans for nearly four decades into a smaller project with less community impact, all in less than one decade.

Kentucky

Faced with an operating environment similar to Pennsylvania's, the Kentucky Transportation Cabinet (KYTC, the state transportation agency) has begun to use a different approach to defining project need.

Inspired by the project-based successes of the Missouri DOT, KYTC initiated a "Practical Solutions" approach to project development and design in 2008. As part of this initiative, KYTC reevaluated the traditional early indicators of performance that often drive the purpose and need of eventual projects as well as the specifics of project design. Senior management issued guidance throughout the agency encouraging project teams to use flexibility in their selection of design volumes, opting for intermediate design years and not always the conventionally accepted 20-year forecast. This guidance was intended to control project costs by managing the scale of eventual project design, keeping projects focused on the core purpose and need and preventing the over-design of roadways that occurs when traffic projections are extremely conservative.[6]

KYTC has also adopted Missouri's broadened focus on system performance over specific facility performance, preferring a "great system of good roads" over a single project that designs a "great road" at a significantly higher cost. It has not developed specific policies based on LOS or other conventional systems of measuring infrastructure performance. However, it has taken an approach based on relative performance, where current LOS or performance is understood as a baseline and any improvements realized from this baseline are considered with respect to project cost.

Kentucky has not set aside staff resources to track the performance of the Practical Solutions program, although numerous specific project designs based on revised policies that help to determine project purpose and need demonstrate that the concept has been successful.[7] KYTC acknowledges that this lack of a formal monitoring system does not readily allow for an even comparison of policy approaches, but, at the same time, the non-bureaucratic nature of the concept within the agency has promoted flexibility in its use and has generally reduced the resistance to broad reform initiatives that many other agencies experience at the staff and management levels.

---

5 Pennsylvania Department of Transportation (2012) "US 202 Section 700 Parkway" Website. Retrieved 8/15/12 from http://www.us202-700.com/.

6 Interview with Jeff Jasper, Program Manager for the Practical Solutions program, Kentucky Transportation Cabinet. (2012, March 29).

7 Kentuckians for Better Transportation. (2008). "KYTC to Use Practical Solutions to 'Do More with Less.'" *Transportation News*. Retrieved 9/12/2013 from www.kbtnet.org/uploads/TransportationNews2008_08_08.doc.

Denver, Colorado: A Different Approach to Measuring Travel Capacity and Demand at the Regional Level

Denver's Department of Public Works developed the region's Strategic Transportation Plan (STP) in 2008 through partnerships with other city agencies and stakeholder engagement. The plan takes an innovative approach to evaluating current and future transportation needs in the region and identifying strategies to address those needs. Rather than assessing capacity and demand on the corridor scale, the plan analyzes trips within "travel sheds," a concept based on the theory of a watershed. Travel sheds are geographic areas characterized by similar travel patterns on local routes, which feed into the larger transportation network. This approach enabled the project team to evaluate the effectiveness of the layout of and connections between the full network, including the grid and arterial system, transit routes, bike routes, and pedestrian throughways.

The project team also analyzed "person trips," rather than vehicle trips, to assess current travel conditions and forecast conditions for 2030, determining that this was a more accurate measure of the impacts of all types of travel. To do this, the team calculated the total "person-trip capacity" of corridors within each travel shed and compared this to the "person-trip demand," the total number of trips taken by all modes of travel within each travel shed. The project team identified areas where person-trip demand exceeded capacity as "gaps" in the transportation system and developed recommendations for improvement strategies for each travel shed based on the results.[8]

California

Concerns about the environmental consequences of level of service (LOS) requirements recently prompted action by the rule makers in the state of California. In September 2013 the state passed SB 743, which removes highway LOS considerations from traffic mitigation analyses in "transit priority areas"—those areas within one-half mile of a proposed or existing major transit stop—recognizing that these considerations reward projects that encourage automobile travel.[9] In place of the conventional LOS measure, the bill calls for a more appropriate traffic impact criteria that will "promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses." This action is intended to shift the focus away from vehicle delay and traffic congestion toward measures such as vehicle trip generation and total vehicle travel.

The prior version of CEQA (California Environmental Quality Act), which included LOS criteria, prevented multimodal projects from moving forward if they were perceived to negatively impact the nearby flow of traffic. The revised CEQA recognizes that projects in compact areas near transit offer environmental benefits because they generate small amounts of motor vehicle traffic and offer new opportunities for travel by other modes. The senate bill calls for the state's Office of Planning and Research to recommend new criteria for evaluating environmental impacts by July 2014. As specified in the bill:[10]

"Those criteria shall promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses. In developing the criteria, the office shall recommend potential metrics to measure transportation impacts that may include, but are not limited to, vehicle miles traveled, vehicle miles traveled per capita, automobile trip generation rates, or automobile trips generated."

---

8 Denver Department of Public Works. (2008). *Denver Strategic Transportation Plan.* Retrieved from http://www.denvergov.org/Portals/688/documents/DenverSTP_8-5x11.pdf.

9 State Smart Transportation Initiative (2013) "California moves to reform traffic mitigation process." Retrieved on 10/30/2013 from http://www.ssti.us/2013/09/california-moves-to-reform-traffic-mitigation-process/.

10 State of California. (2013, September 7). Senate Bill No. 743. Retrieved 11/25/13 from http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB743.

Resources

Florida Department of Transportation, Systems Planning Office. DRAFT Issue Paper on Improving Florida's Transportation Planning and Design Analysis Time Period Process. http://www.dot.state.fl.us/planning/systems/sm/transition/information/District%20Pilot%20Study.pdf.

This paper examines the best time period for planning and designing transportation facilities. It looks at both the positive and negative aspects of the approach that it recommended to the Florida DOT.

Florida Department of Transportation. 2009 FDOT Quality/Level of Service Handbook. http://www.dot.state.fl.us/planning/systems/sm/los.

This handbook and software are intended for planners, engineers, and decision makers for the review of roadway capacity and quality/level of service. It provides analytical techniques, updated generalized service volumes, and cost-effective methods for gathering input data.

Missouri Department of Transportation. Practical Design. http://www.modot.org/business/documents/PracticalDesignImplementation.pdf.

The "Practical Design" manual provides readers with steps for effectively implementing Practical Design, and it's written to allow for flexibility in project locations.

State Smart Transportation Initiative. (2011). Review of PennDOT's Smart Transportation Initiative. http://ssti.us/wp/wp-content/uploads/2011/02/SSTI_Review_of_PennDOT_Smart_Transportation.pdf.

This provides a comprehensive evaluations of PennDOT's reform program, exploring both internal operations and external outreach as well as connections to partner agencies. Chapter 9 focuses on new approaches to project delivery, with U.S. 202 project as an example.

Use Practical Design and Context Sensitive Solutions

The Opportunity

Transportation agencies across the United States are facing chronic budget shortfalls as they try to stretch declining gas tax revenues to cover ever-increasing infrastructure maintenance costs. In spite of this, DOTs often design projects to the highest specifications in the highway design manual, which can make the projects unnecessarily expensive to build and maintain. In addition, these investments may foster high-speed traffic and increase traffic volumes where they are unwanted, impeding access along and across the facility for non-highway users and potentially stifling the very economic development and community vitality that the project is attempting to foster. In these cases, agencies have sometimes been forced to retrofit overdesigned roads with traffic constraints, further increasing costs.

Rather than a one-size-fits-all approach, states can adopt an approach that ties project planning and design to core transportation needs. With this approach, designs are context sensitive, taking into account the surrounding community and environment rather than designing in a vacuum and treating design and mobility standards as rigid minimum requirements. This approach will encourage DOTs to make smart, cost-effective, and community-supported design decisions.

What Is It?

In essence, context sensitive solutions (CSS) and practical design are efforts to encourage planners and designers to consider the particular circumstances and needs of each project and to exercise greater flexibility and creativity in reaching design solutions. At the most basic level, they are simply attempts to recognize that a roadway passing through an urban or suburban area clearly has different purposes than a rural highway.

The two approaches outlined in depth here—context sensitive solutions and practical design—differ somewhat in focus and methodology (in ways described below), but both are aimed at the goal of introducing a more flexible, practical, and, ultimately, cost-effective approach to design. They put the focus on the end results of improving safety and access to destinations, making the most of limited funding, creating projects appropriate to their surroundings, increasing public engagement, and improving public satisfaction. A state DOT would not necessarily have to adopt either of these approaches whole cloth, though this is a viable option because each approach has been refined and has a body of materials and experience to rely upon. For instance, the U.S. DOT has been actively promoting CSS, primarily via the FHWA's Context Sensitive Solutions project.[11]

Context Sensitive Solutions

CSS, sometimes known as context sensitive design, is a methodology that aims to better understand a given infrastructure project's context to enable the project to take account of community desires and to preserve local resources. Designers collaborate with a range of stakeholders to reach solutions that are tailored to the local environment, neighborhood needs, and traffic patterns in a cost-effective manner. The FHWA defines CSS as follows:

> The concept of context sensitive solutions (CSS) has been evolving in the transportation industry since the National Environmental Policy Act of 1969 required transportation agencies to consider the possible adverse effects of transportation projects on the environment… Context sensitive solutions (CSS) is a collaborative, interdisciplinary approach that involves

11 Federal Highway Administration. "Context Sensitive Solutions." Retrieved 9/12/2013 from http://www.contextsensitivesolutions.org.

all stakeholders in providing a transportation facility that fits its setting. It is an approach that leads to preserving and enhancing scenic, aesthetic, historic, community, and environmental resources, while improving or maintaining safety, mobility, and infrastructure conditions.[12]

These core CSS principles apply to transportation processes, outcomes, and decision-making.

1. Strive toward a shared stakeholder vision to provide a basis for decisions.
2. Demonstrate a comprehensive understanding of contexts.
3. Foster continuing communication and collaboration to achieve consensus.
4. Exercise flexibility and creativity to shape effective transportation solutions, while preserving and enhancing community and natural environments.[13]

The CSS methodology uses early and ongoing public and stakeholder involvement to help design projects that meet the core needs of the relevant community, and to identify and resolve potential problems and value conflicts before they cause dissatisfaction or delay. Ultimately, this results both in higher customer satisfaction and, in most cases, greater cost-effectiveness. A CSS approach relies upon broadly informed innovation and flexibility in planning, design, construction, and operations and maintenance decision-making to balance competing objectives and arrive at right-sized solutions.

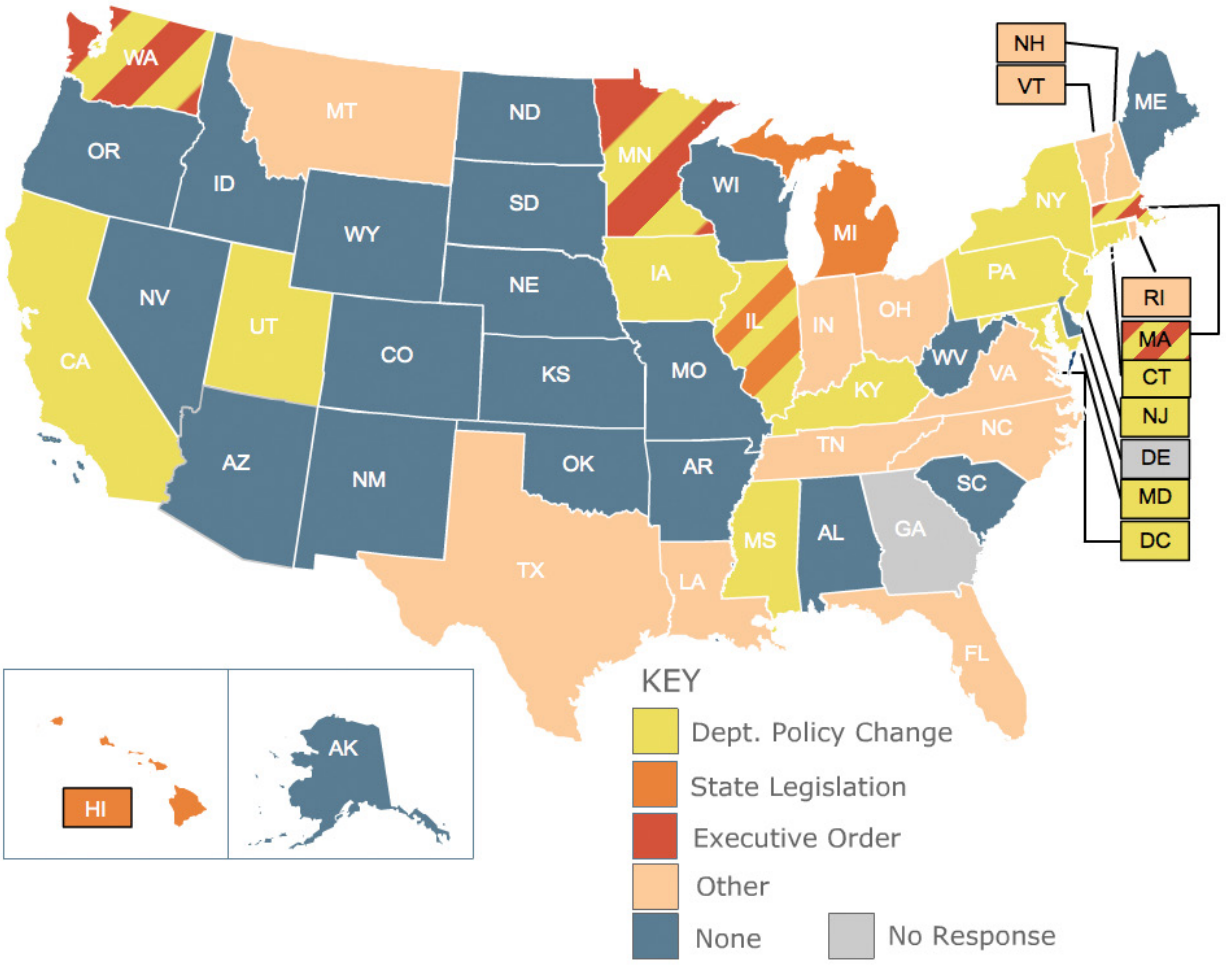
At this point, many states either have departmental guidance promoting context sensitive design—though these vary as to their strength and comprehensiveness—or have instituted department-wide training programs in CSS (see Figure 4.1 below). Only a handful of states have legislation enshrining CSS; a few more have issued executive orders.

Figure 1

12 American Association of State Highway and Transportation Officials & Federal Highway Administration. (2007, March). *Results of Joint AASHTO / FHWA Context Sensitive Solutions Strategic Planning Process*, Summary Report. Retrieved from 9/12/2013. http://contextsensitivesolutions.org/content/reading/results_of_joint_aashto_fhwa_co_/resources/portlandsummary_final_050107.pdf/.

13 *Ibid.*

States with FHWA Context Sensitive Solutions Policies



Source: http://contextsensitivesolutions.org/content/gen/state-profiles/sp-policy

Practical design

Like CSS, the aim of "practical design" (something of a catch-all term for a range of approaches) is to allow for additional flexibility in infrastructure design and to move away from adherence to a single set of design standards and the automatic tendency toward maximum design parameters. Both rhetorically and in application, the practical design movement is driven more by budgetary constraints than by community, environmental, or aesthetic concerns. The approach also focuses strongly on the system or network, aiming "not to build perfect projects, but to build good projects that give you a good system" and to focus spending where it's most effective.[14] As with CSS, there is an increased emphasis on documentation of the design process, and of reasoned, on-the-record decision making. The approach is often credited to the Missouri DOT (MoDOT, see below).

Examples of the application of practical design are many, including:

- Deviating from standard right-of-way widths and acquiring only what is necessary to build and maintain a facility;
- Changing materials;

14 "America's highway infrastructure needs money, manpower—and a new vision: How We Can Save Our Roads." (2009, March). *Parade*. Retrieved 9/12/2013 from http://www.parade.com/news/2009/03/how-we-can-save-our-roads.html?index=1. Quoting MoDOT CEO Pete K. Rahn.

- Reducing asphalt depths where practical; and
- Reusing old materials such as bridge piers or barriers if they are still in good condition.

Another, more systemic example of the application of practical design is to improve overall safety by making certain improvements system-wide, rather than by making upgrades at individual crash sites. The approach deploys low-cost solutions over an entire system instead of a high-cost solution to an isolated problem.

Performance metrics and level of service

One component of implementing more practical design is use of flexible or redesigned performance metrics for roadways and other infrastructure elements. For instance, transportation engineering and planning have long emphasized LOS, a mobility metric. Agencies sometimes set an unnecessarily high standard for LOS, for instance, using automobile delay in the peak 15 minutes of the peak traffic period to gauge overall performance,[15] and in many cases they do not balance the LOS of the facility with other goals. Judging performance via LOS at peak periods is likely to require costly transportation projects built to serve a narrowly-defined condition that is not representative of typical infrastructure use (for more information, see the section of this Handbook titled "Reform Level of Service.")

Legal liability as a driver of overdesign

Another reason often given by DOTs for building to the highest possible design specifications is to preclude potential tort liability for the entity responsible for the project. Given the gradual rollback of state sovereign immunity by the courts and legislatures, this tends to be an issue of some concern to transportation agency personnel. In particular, both DOTs and contractors fear that if a crash occurs on a road that deviates from the highest design guidelines set forth in the American Association of State Highway and Transportation Officials' (AASHTO) Policy on Geometric Design of Highways and Streets (commonly known as the "Green Book"), a victim will be able to claim that the DOT and/or contractor were negligent in failing to design the road in the safest way possible.

This concern is largely overstated, and proper recognition and incorporation of the factors that actually drive tort liability for design would allow for a more flexible approach to design and a reduction in the costs associated with overbuilding roadways. In fact, designers are likely to be at greater risk during litigation when they adhere uncritically to design standards than when they exercise sound engineering judgment and document their decision-making.[16] That said, states can foreclose any remaining doubt by passing statutes explicitly limiting the liability of state DOTs that adopt a CSS or practical design methodology and/or make reasonable policy decisions to design to less-than-maximum specifications. Even absent such explicit exemption, there is a range of actions DOTs can take on their own initiative encouraging use of CSS principles, training staff in their application, and making clear the factors that actually give rise to liability (which do not include failure to build to the highest specifications).

Implementation

Creating design flexibility and incorporating context sensitive principles into the design process can be accomplished entirely via internal departmental policy changes, though it has frequently been initiated via state legislation or executive order (see below), and these latter approaches may be

15 Although not always defined this way in state policy, the Highway Capacity Manual, the traffic engineer's standard for determining road infrastructure performance measures, bases traffic characteristics in the peak hour on the 15-minute period within that hour that represents the greatest degree of peak conditions. The FHWA's Traffic Analysis Toolbox series (Volume VI, which focuses on measures of effectiveness, is available online at http://ops.fhwa.dot.gov/publications/fhwahop08054/fhwahop08054.pdf) and discusses conventional traffic engineering methodologies for determining levels of performance.

16 Parker, T. L. & McDaniel, J. B. (2012). "Tort Liability Defense Practices for Design Flexibility." *NCHRP Legal Research Digest*, 57. Retrieved 11/8/13 from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_lrd_57.pdf.

useful in establishing and maintaining the necessary political commitment. As with all such changes in policy, the more significant lift involves a commitment to changing both agency culture and the way the agency communicates with the public. Finally, flexible design may require the review and update of existing state design standards or the introduction of new context sensitive design standards (discussed in Focus Area 5).

1. **Incorporation of design flexibility via departmental guidance.** Most changes in design methodology are instituted at the departmental level. This can be accomplished via a range of memos (e.g., Kentucky[17]), secretarial directives (e.g., California[18] and Washington[19]), technical memoranda (e.g., Minnesota[20]), or other docs (e.g., Tennessee[21]), and embodied in guides (e.g., Florida[22] and Connecticut[23]). Many and perhaps a majority of states now offer at least some training in CSS.[24] A few useful models include:

    - **Connecticut.** The Connecticut DOT has promoted context sensitive solutions through statewide awareness training, training courses for its managers, and development of an ongoing training course for engineers through collaboration with the Connecticut Transportation Institute at the University of Connecticut.
    - **Maryland.** The Maryland DOT State Highway Administration was an early adopter of CSS. It developed an initiative called "Thinking Beyond the Pavement" to guide implementation, conducted charrettes to identify project development process strengths, designed a project evaluation instrument, and established teams to review and implement project improvement strategies.[25]
    - **Minnesota** (see below in case studies).
    - **New Jersey**. The New Jersey DOT has implemented a training program for highway engineers and other transportation professionals, along with stakeholders in New Jersey host communities, to ensure context sensitive design awareness. This program emphasizes the use of effective public involvement techniques and the implementation of design flexibility, and introduces the concept and importance of "Placemaking."

    While there is great variation in both quality and methods in these trainings, the best results are achieved when training is mandatory for personnel, or is at least as widely applied as possible.

2. **Incorporation of design flexibility via executive order.** Many of the same ends can be

17 For an example, see: http://transportation.ky.gov/Organizational-Resources/Policy Manuals Library/SHEPolicyDoc.pdf.

18 California Department of Transportation. (2001, November 29). *Director's Policy: Context Sensitive Solutions.* Retrieved 8/21/12 from http://www.dot.ca.gov/hq/oppd/context-solution.pdf.

19 Washington State Department of Transportation. (2011, March 17). Secretary's Executive Order Number E 1028.02, Context Sensitive Solutions. Retrieved 8/21/12 from http://www.wsdot.wa.gov/publications/fulltext/design/CSD/E0_10/1028.pdf.

20 Minnesota Department of Transportation. (2006, October 17). "Engineering Services Division Technical Memorandum No. 06-19-TS-07." Retrieved 8/23/12 from http://dotapp7.dot.state.mn.us/edms/download?docId=700077.

21 Tennessee Department of Transportation. *Tennessee Environmental Procedures Manual.* Retrieved 8/23/12 from http://www.tdot.state.tn.us/epm/manual/02_2.shtml.

22 Florida Department of Transportation. *Project Management Handbook.* Retrieved 8/23/12 from http://www.dot.state.fl.us/projectmanagementoffice/PMhandbook/P1_Ch09.pdf.

23 Connecticut Department of Transportation. *Highway Design Manual: 2003 Edition* (Including Revisions to July 2012). Retrieved 8/23/12 from (http://www.ct.gov/dot/lib/dot/documents/dpublications/highway/cover.pdf.

24 See FHWA's context sensitive solutions site: http://contextsensitivesolutions.org/content/gen/state-profiles/sp-training, which lists 35 states as offering some form of CSS training.

25 Maryland Department of Transportation. (1998). *Thinking Beyond the Pavement: A National Workshop on Integrating Highway Development with Communities and the Environment while Maintaining Safety and Performance*. Retrieved 9/12/2013 from http://www.sha.maryland.gov/OCE/tbtp.pdf.

achieved through executive order. In Michigan, for instance, Governor's Executive Directive 2003-25[26] directed the Michigan DOT (MDOT) to "pursue a proactive, consistent and context sensitive solutions process" in making decisions to "plan, construct, operate, and maintain infrastructure." The MDOT was instructed to develop or revise procedures and guidelines to do so. In response, it:

- Released a new project Scoping Manual which now contains a section on CSS.
- Issued new Guidelines for Stakeholder Engagement,[27] which provides the MDOT staff with techniques to engage local stakeholders early and often during project development. It has been formulated to allow the most flexibility in the approaches the department takes in order to maintain a consistent process for implementing stakeholder engagement statewide.
- Implemented a training program in 2006. As of 2008, over 900 MDOT staff and 60 consultants had been trained.

3. **Incorporation of design flexibility via state statute.** State legislation regarding design can be a helpful spur to, and useful political cover for, departmental reform. Take, for instance, Illinois Public Act 093-0545, which instructs the Illinois DOT to incorporate CSS principles into its operations. The bill instructs that "the Department of Transportation shall embrace principles of context sensitive design and context sensitive solutions in its policies and procedures for the planning, design, construction, and operation of its projects for new construction, reconstruction, or major expansion of existing transportation facilities."[28]

   As a result of its passage, the state DOT took a number of steps, including issuing departmental guidance clarifying (somewhat) that its use of CSS principles applies to all modal divisions within the DOT (Highways, Aeronautics, and Public and Intermodal Transportation) as well as to the Office of Planning and Programming.[29] Each of these divisions and offices has developed specific CSS implementation procedures. The DOT also instituted a staff training program in CSS principles,[30] including a half-day overview class designed to provide an introduction to CSS, a two-day approach class that provides hands-on training in the activities needed to implement CSS on a project, a similar class for local agencies, and an online CSS training course designed to educate stakeholders and others about CSS. Community impact assessment classes and facilitation training are included in the training.

   Connecticut Public Act No. 98-118 is very similar in both wording and effect. Passed in 1998, the law led to a top-down internal review process, followed by a series of stakeholder meetings and ultimately a meeting of the Connecticut DOT's (ConnDOT) senior managers, chief executive officers (CEOs) of consulting and contracting firms, FHWA division office staff, and members of non-governmental stakeholder groups to develop an implementation plan for CSS.[31] In 1999,

---

26 Michigan Department of Transportation. (2005, May 26). *Governor's Executive Directive 2003-25*. Retrieved 8/20/12 from http://www.michigan.gov/documents/MDOT_CSS_Policy_159545_7.pdf.

27 Michigan Department of Transportation. (2009, January). *Guidelines for Stakeholder Engagement.* Retrieved 8/20/12 from http://www.michigan.gov/documents/mdot/MDOT_Guidelines_For_Stakeholder_Engagement_264850_7.pdf.

28 Illinois General Assembly. Public Act 093-0545. Retrieved 9/12/2013 from http://www.ilga.gov/legislation/publicacts/fulltext.asp?name=093-0545.

29 Illinois Department of Transportation. (2005, August 1). "Departmental Policies: Context Sensitive Solutions." Retrieved 8/20/12 from http://www.dot.il.gov/css/SignedCSSDeptPolicy.pdf.

30 Illinois Department of Transportation. Context Sensitive Solutions Training. Retrieved 9/12/2013 from http://www.dot.il.gov/css/training.html.

31 U.S. Department of Transportation. (Updated 2008, December 3). "State Profiles: Connecticut." Retrieved 8/3/12 from http://contextsensitivesolutions.org/content/gen/state-profiles/CT.

ConnDOT revised its Highway Design Manual[32] to incorporate CSS principles. According to a report by the Michigan Environmental Council, "[t]heir focus on public communication led them to develop useful tools such as video simulations and models of road projects."[33] ConnDOT also issued an internal memorandum in 2002 clarifying the department's use of CSS. Finally, it developed a series of trainings, including institutionalized CSS training, for transportation engineering students and a class for stakeholders through the University of Connecticut's Technology Transfer Center. As of 2008, approximately 1,800 people from Connecticut and the Northeast region have received some sort of formal training in CSS from ConnDOT.[34]

The Hawaii legislature went a step further, passing S.B. No. 1876[35], legislation that both directs the state DOT to establish new guidelines that take into account the need for flexibility in highway design, and also limits the liability of the state and counties in the application of flexible highway design standards.

Case Studies

Minnesota DOT

In 1999, the FHWA designated Minnesota as one of five pilot states to help advance institutionalization of a context sensitive solutions approach in transportation nation-wide. The Minnesota DOT (MnDOT) issued technical memoranda to all engineering staff (see, e.g., Technical Memorandum 00-24-TS-03, Technical Memorandum No. 06-19-TS-07)[36], instructing them to employ a context sensitive approach that "incorporates flexibility within design standards, safety measures, environmental stewardship, visual quality, and community sensitive planning and design." MnDOT's approach to context sensitive solutions promotes six key principles:[37]

1. Balance safety, mobility, community, and environmental goals in all projects
2. Involve the public and affected agencies early and continuously
3. Address all modes of travel
4. Use an interdisciplinary team tailored to project needs
5. Apply the flexibility inherent in design standards
6. Incorporate aesthetics as an integral part of good design

MnDOT's application of CSS has been notable for both the range of materials developed and the extent to which it drives agency decision-making and project design at every level. In particular, the department has been quite aggressive about training—providing training to hundreds of state, county, city, and consultant staff over the years. MnDOT has also collaborated with the University of

32 Connecticut Department of Transportation. (2012, July). *Highway Design Manual, 2003 Edition* (Including Revisions to July 2012). Retrieved 8/21/12 from http://www.ct.gov/dot/lib/dot/documents/dpublications/highway/cover.pdf.

33 Michigan Environmental Council. (2005, December). *Community, Character and Cash: How You Can Reform Transportation with Context Sensitive Solutions.* Retrieved 8/21/12 from http://www.environmentalcouncil.org/mecReports/css_report.pdf.

34 U.S. Department of Transportation. (Updated 2008, December 3). "State Profiles: Connecticut." Retrieved 8/3/12 from http://contextsensitivesolutions.org/content/gen/state-profiles/CT.

35 State of Hawaii. (2005). S.B. No. 1876. Retrieved 8/20/12 from http://www.capitol.hawaii.gov/session2005/bills/SB1876_cd1_.htm.

36 Minnesota Department of Transportation. (2006, October 17). Technical Memorandum No. 06-19-TS-07. "Design Policy – Design Excellence Through Context Sensitive Design and Solutions." Retrieved 8/20/12 from http://dotapp7.dot.state.mn.us/edms/download?docId=700077.

37 *Ibid.*

Minnesota's Center for Transportation Studies[38] to produce a number of training programs, including the use of visualization technologies to support CSS.[39] These trainings offer both basic introduction and high-level technical orientation and promote acceptance of both the CSS approach in particular and flexible design in general. The department has also developed a wide range of resource materials on CSS.

MnDOT's emphasis on CSS has resulted in a much more creative approach to project design, whether with regards to project materials — as with projects that employed brick facings or transparent noise barriers[40] — or to employment of "passive blowing snow control," i.e., living snow fences.[41] Rather than working from the book and requesting design exceptions, these projects approached challenges creatively — and with an eye to savings — from the beginning. One of the key findings over the years has been to allow flexibility in design speed selection, so that engineers can design highways for less than maximum travel speeds. One MnDOT training says that "[n]othing influences a highway's design more profoundly."[42] As a result, MnDOT is a widely recognized leader in CSS, and the department has earned national awards for projects and programs that demonstrate the benefits of applying CSS principles.

Washington State DOT

Washington State DOT's (WSDOT) implementation of CSS is also considered to be a model of departmental adoption, in terms of both the breadth of its application and the range of tools developed by the department to implement it. The policy was established by Departmental Order 1028.02,[43] which was itself an outgrowth of an earlier effort to promote livable communities, providing in key part that "Washington State Department of Transportation (WSDOT) employees are directed to use the Context Sensitive Solutions approach for all projects, large and small, from early planning through construction and eventual operation." In furtherance of this directive, WSDOT employed a number of approaches, including establishing a CSS Interdisciplinary Group, which, in turn, drafted one of the most comprehensive state-level CSS guides[44] in the country.

Missouri DOT: Practical Design

In late 2004, MoDOT, like many state DOTs, faced current and projected funding shortfalls and little public appetite for gas tax increases. In response, it developed what has come to be known as the concept of "practical design." As discussed above, the signature components of the approach were flexibility in design/designing to true need ("Start at the bottom of the standards and go up to meet the need. When you meet the need, you stop," according to MoDOT CEO Pete K. Rahn[45]), emphasis on cost savings, and emphasis on a system-wide rather than project-by-project approach.

---

38 University of Minnesota. (2012). "Context Sensitive Solutions." Retrieved 9/12/2013 from http://www.cts.umn.edu/contextsensitive/index.html.

39 Minnesota Department of Transportation. See http://www.dot.state.mn.us/onlinelearning/engineeringservices/css/.

40 Minnesota Department of Transportation. (2010). *A Mn/DOT Forum: Integrating Context Sensitive Solutions in Construction, Operations, and Maintenance, Final Report*, p. 7-8. Retrieved 8/20/12 from http://www.cts.umn.edu/contextsensitive/workshops/documents/CSSForumSummary.pdf.

41 *Ibid.*, p. 9.

42 Oregon Peer Exchange. (2009, July 28). "Design Flexibility in Minnesota," p. 10. Retrieved 9/12/2013 from http://www.oregon.gov/ODOT/HWY/TECHSERV/docs/pdf/3Minnesota.pdf?ga=t.

43 Washington Department of Transportation. (2011, March 17). *Secretary's Executive Order Number E 1028.02, Context Sensitive Solutions*. Retrieved 8/21/12 from http://www.wsdot.wa.gov/publications/manuals/fulltext/policies/1028.pdf.

44 Washington Department of Transportation. (2005, April 26). *Understanding Flexibility in Transportation Design – Washington*. Retrieved 9/12/2013 from http://www.wsdot.wa.gov/publications/fulltext/design/CSD/UnderstandingFlexibility.pdf.

45 Swift, Earl (2009, March 8) "America's highway infrastructure needs money, manpower—and a new vision: How We Can Save Our Roads." *Parade*. Magazine website Retrieved 9/12/2013 from http://www.parade.com/news/2009/03/how-we-can-save-our-roads.html?index=1. Quoting MoDOT CEO Pete K. Rahn.

In the process, MoDOT abandoned many long-held practices. For example, in the past, if a bridge had to be repaired or replaced because of deterioration, design standards would dictate that the replacement structure be wider, higher, and longer than the one being replaced. Occasionally these increases would as much as double the size of the bridge. Under the new approach, the purpose of the improvement would be no more complicated than providing for a safe crossing. If MoDOT could effectively replace a deteriorating bridge with one half its size, the agency would do so, and apply the cost savings to replacing another bridge elsewhere in the highway system.

Previously, MoDOT tended to upgrade other highway features in the general vicinity of projects such as bridge replacements. In some cases, it would build miles of new highway alignment in the vicinity of one or two small bridge replacements. But fully upgraded, modern roadway facilities in the few miles immediately adjacent to a bridge made little sense when the remainder of the route, hundreds of miles in some cases, existed under a much older and lower standard.

MoDOT's take on practical design, while without the specific focus on or process for community involvement inherent in CSS, did incorporate local input on key elements. In crafting its system priorities, the department worked with the five Regional Planning Commissions (RPCs) and the two Metropolitan Planning Organizations (MPOs) to determine the highest priority projects. The department also instituted mechanisms for incenting and sharing cost savings: to wit, money saved when a project came in under budget would be returned to the district for future projects in that district. Likewise, if a project went over budget, the money would be taken from the district budget (an exception was made for major river bridges where the economies of scale made it impractical).

MoDOT's implementation of what was largely a change in culture entailed a combination of forced organizational changes, enterprise-wide collaboration, and inspired leadership. On the latter, for instance, MoDOT's chief engineer famously told districts and consultants at the outset of the change to put away their design manuals for a year and rely solely on common sense.[46] MoDOT also improved communication channels with FHWA, the state legislature, and the public. The department asked stakeholders to help prioritize the construction program and solicited local input on solutions during design processes; it communicated all such results to state leaders, FHWA, and other stakeholders. In addition, however, MoDOT also made some significant, unilateral structural changes, including mandating divisional reorganization and a single engineering policy group to handle standards for the entire agency.[47]

The results of MoDOT's changes were impressive. The department estimates that, in the first two years of its implementation, practical design saved Missouri taxpayers $400 million (across a $3.1 billion program).[48] Not only did the changes save money, they are credited with improvements in safety and performance as well. Six years ago, only 44% of Missouri's highways were rated in good condition. Today, 83% of the state's highways are rated as good.[49] MoDOT also realized a 24 percent reduction in fatal crashes between 2005 and 2008; with no open container or primary seatbelt law passed in the state during that period, MoDOT leaders believe that the system-wide safety approach must factor into that trend.

---

46 Jones, J. (2010, February) "Practical Design." Public Roads. (Publication Number FHWA-HRT-10-002)(Volume 73, Issue 4). Federal Highway Administration. Retrieved 8/3/12 from http://www.fhwa.dot.gov/publications/publicroads/10janfeb/06.cfm.

47 *Ibid.*

48 Allen, T. & Brendel, B. (2006). "Practical Design at MoDOT." *Achieving Value.* Value Engineering. Retrieved 8/3/12 from http://www.value-eng.org/knowledge_bank/attachments/Practical%20Design%20at%20MDOT.pdf.

49 "America's highway infrastructure needs money, manpower—and a new vision: How We Can Save Our Roads." (2009, March). *Parade.* Retrieved from http://www.parade.com/news/2009/03/how-we-can-save-our-roads.html?index=1.

Tennessee DOT: "Right Sized" Solutions

Tennessee DOT (TDOT) began incorporating context sensitive solutions (CSS) principles in 2003 and, in 2006, adopted a formal commitment to CSS all projects.[50] Since then, the department has offered CSS training to its staff, consultants, and partners and made its training modules available online. [51] In recent years, under leadership from Commissioner John Schroer, CSS has played a key role in efforts to use agency resources more wisely. A report released by TDOT and Smart Growth America in 2012 recognized that the agency's existing project load was nine times greater than its available funding would cover.[52] TDOT has since begun to audit projects already underway and evaluate planned projects in order to achieve "right-sized" solutions, favoring operational improvements and return-on-investment over additional lane capacity. This approach, which TDOT has labeled "Expedited Project Delivery," has led to numerous project revisions, including some in which the planning process was already far along. It is also expected to reduce highway project costs by more than 95% of their original estimates, resulting in total savings of $170 million for five projects under consideration.

Tennessee's State Route 126 is one notable example of a project that has been revised considerably during the audit process. TDOT was in the process of planning improvements along the dangerous eight-mile highway corridor for more than ten years and had arrived at two design alternatives. After seeking extensive public input and reviewing the project alternatives, TDOT decided upon a third, new option. This smaller-scale option adds fewer new lane miles and reduces impacts to adjacent properties, while meeting it performance objectives.[53]

Resources

The American Association of State Highway and Transportation Engineers. (2004). A Guide to Achieving Flexibility in Highway Design. ***Not available online.***

> AASHTO's guide to CSS is a useful overview of the topic and touches on a wide range of design issues, from project development to specific roadway design elements. It is intended as a complement to the AASHTO Green Book.

The Federal Highway Administration's Context Sensitive Solutions Website. http://contextsensitivesolutions.org/.

> The FHWA's CSS website provides a wide range of information and links about CSS projects, case studies, background, and additional information.

Michigan Environmental Council. (2005). Michigan Environmental Council research findings: Ten state case studies of CSS implementation. http://www.environmentalcouncil.org/mecReports/tenstates.pdf.

> This report provides short profiles of ten state CSS implementation efforts, based on personal interviews with each, and offers a good summary of a range of approaches.

---

50 US Department of Transportation (Last Modified 2012, September 17) "Tennessee | Context Sensitive Solutions.org." webpage. Retrieved 11/12/2013 from http://contextsensitivesolutions.org/content/gen/state-profiles/TN.

51 Tennessee Department of Transportation (2011) "2-Day Basic Training on Context Sensitive Solutions" Context Sensitive Solutions webpage. Retrieved on 11/12/2013 from http://www.tdot.state.tn.us/environment/planning/training.htm.

52 Tennessee Department of Transportation (2012 August 20). *Removing Barriers to Smarter Transportation Investments Final Repor*t. Retrieved on 11/12/2013 from http://www.tdot.state.tn.us/documents/RemovingBarrierstoSmarterTransportationInvestments.pdf.

53 Tennessee.gov (Updated 2013 May 30) "Decision Made for State Route 126 Project." TN.gov Newsroom & Media Center webpage. Retrieved 11/12/2013 from https://news.tn.gov/node/10790.

Minnesota DOT. (1999). Hear Every Voice: A Guide to Public Involvement at Mn/DOT. Available at http://contextsensitivesolutions.org/content/reading/hear-every/resources/hear-every/; see also update at http://www.dot.state.mn.us/publicinvolvement/pdf/HEVII.pdf.

This report is a thorough guide to soliciting and incorporating public and community involvement at every stage of the planning process, from project development through construction and operation, from a state DOT considered a leader in that area. It includes extensive descriptions of a wide range of techniques, from small group meetings and open houses to civic advisory committees to media strategy, as well as case studies.

Missouri DOT. Practical Design Implementation Manual. http://www.modot.org/business/documents/PracticalDesignImplementation.pdf.

This is the guidebook for Missouri's program.

National Coordinated Highway Research Program. (2002). NCHRP Report 480: A Guide to Best Practices for Achieving Context Sensitive Solutions. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_480a.pdf.

This guidebook comprehensively covers how state DOTs and other transportation agencies can incorporate context sensitivity into their project development work. It was primarily written for transportation agency personnel who develop transportation projects.

State Smart Transportation Initiative. (2011). SSTI Review of PennDOT's Smart Transportation Initiative. http://ssti.us/wp/wp-content/uploads/2011/02/SSTI_Review_of_PennDOT_Smart_Transportation.pdf.

This report is one of the most comprehensive evaluations of PennDOT's reform program, exploring both internal PennDOT operations and external outreach and connections to partner agencies. Chapter 9 of this study focuses on new approaches to project delivery and features the U.S. 202 project as a particular example.

University of Kentucky, Kentucky Transportation Center. (2008). Practical Solution Concepts for Planning and Designing Roadways in Kentucky. http://www.ktc.uky.edu/Reports/KTC_08_30_SPR_369_08.pdf.

Kentucky's program, based on practical design principles similar to Missouri's program, emphasizes project delivery based on reasonable, prudent design approaches over meeting maximum standards. This document describes principles communicated to agency project managers in pursuing lower-cost, efficient designs.

Washington State DOT. (2005). Understanding Flexibility in Transportation Design—Washington. http://www.wsdot.wa.gov/publications/fulltext/design/CSD/UnderstandingFlexibility.pdf.

One of the earlier and best state guides to CSS, this report provides a comprehensive set of agency approaches to project development, community involvement, and environmental and design considerations. It also includes an appendix with a dozen or so very useful case studies.

Improve Street Connectivity

The Opportunity

Approximately 50 percent of all trips made nation-wide are three miles or shorter, and 28 percent are one mile or shorter.[54] When road networks lack multiple routes designed to serve the same destinations, these short local trips must use major corridors designed for regional and freight traffic, exacerbating regional congestion.

The Victoria Transport Policy Institute defines street connectivity as the density of connections in a path or road network and the directness of links within the network.[55] Improving local street connectivity can be a relatively inexpensive alternative to traditional capacity expansion projects. Providing travelers with multiple routes from which to choose for short trips protects a state's investment in the existing transportation network by lowering maintenance costs and reducing or delaying the need for expensive, publically funded projects to widen major corridors. Better connectivity also improves access to destinations, reduces emergency vehicle response times, and adds economic benefit by increasing development opportunities (and thus the tax base) on land that the connecting network serves. Dense, well-connected street networks also produce short block lengths that enable walking and biking and have higher safety ratings for all road users, including drivers.[56],[57]

What Is It?

Congestion on state roadways, especially those serving as primary commercial streets, is often an indicator of the disconnect between land use and transportation systems. Local governments approve new development along these corridors, generating additional traffic volume beyond the roadway's intended capacity. Without a secondary network of functional, connected local streets, local development is dependent on—and limited by—capacity on state facilities. Meanwhile, any projects that expand the capacity of these streets are doomed to be of limited utility, as new development quickly follows new traffic capacity.

By expanding their scope to encompass the local street network, state transportation agencies gain access to a relatively low-cost means to break this cycle of capacity additions. Without expanding their legal jurisdiction, state agencies can partner with local governments to design complementary, integrated transportation networks that increase development capacity for local governments while protecting the state's investments by distributing traffic volume across a more complete network.

The most direct way for states to influence local decisions may be to invest directly in local roadways, creating a mechanism to ensure that local governments account more effectively for the impact of their decision making on state facilities. A more affordable, and potentially more effective, approach to partnerships with local governments is to work together to achieve greater regional connectivity by enhancing local networks alongside state facility projects. States can develop standards to create a

54 Federal Highway Administration. (2010, January). "2009 National Household Travel Survey." Retrieved 9/12/2013 from http://nhts.ornl.gov/publications.shtml.

55 Victoria Transport Policy Institute. (Updated 2012, January 5). TDM Encyclopedia. *Roadway Connectivity: Creating More Connected Roadway and Pathway Networks.* Retrieved 8/6/12 from http://www.vtpi.org/tdm/tdm116.htm.

56 Marshall, W. E., & Garrick, N. W. (2010). "Effect of Street Network Design on Walking and Biking." *Transportation Research Record: Journal of the Transportation Research Board*, 2198: 103–115.

57 Marshall, W. E., & Garrick, N. W. (2011). "Evidence on Why Bike-Friendly Cities Are Safer for All Road Users." *Environmental Practice*, 13(1): 16–27.

complete local network that integrates well with state roadways; they can also define standards that allow them to accept a privately funded road into the state system if the state maintains control over an extensive portion of the road network. By doing this in concert with additions to the local network that are intended to support private development, states can develop a network that preserves the capacity and functional lifespan of all of their investments.

Implementation

A local street network must provide ample interface with the state roadway network in order to function as a local traffic distribution tool. Two primary means for achieving this are: 1) local government development standards that make local street requirements clear to development applicants, so that the private streets they provide as a "fair share" development contribution actually help support and complete the local network, and 2) state access rules and policies that take a more flexible approach to access points on state roadways when these access points are based on public streets (and not only private property driveways).

Specific policy mechanisms that states can use include the following:

1. **Consider a broader scope of project options for addressing traffic congestion problems by partnering with local governments.** Many states opt to widen their roadways or add capacity to the same roads they already have when roads suffer from congestion and inadequate capacity. They also sometimes pursue bypass projects, especially when the congested roadway they seek to address serves as a main street or other primary commercial street for a town or city. Instead, states can increase capacity on an overall corridor route by continuing to maintain the route on a main street and adding improvements on parallel and nearby streets that can increase service to the overall community and corridor area. This is often the least costly option.

2. **Revise state access management requirements to focus on public streets instead of private property driveways.** Many state agency access management standards seek to minimize the speed and turning conflicts presented by private driveways and cross streets by setting minimum distances for driveway and intersection spacing. One outcome of this approach is that it reduces the number of local streets that can feed into state roads along a given stretch. As a result, local travelers must use state roads more frequently for short trips, leading to higher traffic volumes, additional movements at intersections, and generally reduced capacity. Making access management standards more flexible, so that minimum distances are relaxed if the access points are cross streets rather than driveways, allows land development to access cross streets instead of the principal roadway and facilitates greater network connectivity. While this may result in overall reduced speeds along the state roadway, its application in strategically focused areas, such as major commercial centers or downtowns, can improve operations along an entire corridor by alleviating some of the corridor's most acute pressure points.

3. **Adopt selected roadways into state jurisdiction.** State transportation agencies faced with fiscal challenges are typically not inclined to add roads to their maintenance responsibilities, but a focused, strategic addition of critical segments may help a DOT add capacity to the state system without undertaking a costly improvement project on an existing state roadway.

4. **Take a more proactive role in development review.** States may also focus efforts on building partnerships with local governments to work toward a goal of development-added roads that provide true local circulation, not just access to and from a state roadway. This may

include participation in development review discussions or incentives for local governments to adopt better zoning ordinances or subdivision regulations. In the short term, this is likely to include direct assistance to the local government to develop plans, amend local zoning and land development legislation, and generally educate agency and developer stakeholders on the benefits. In the long term, a state may need to take a more direct and proactive approach to development review, aligning its own priorities for project investment with those local governments that have revised their development controls so that new land development does not concentrate access and impact on state roads.

Because secondary roads are often not owned by the state, reorienting a state agency's attitude toward them frequently requires a high-level policy action. Such a directive should be issued by a DOT executive, though if it requires enabling legislation, the appeal for such legislation should be led jointly by the DOT executive and the governor. In either case, the DOT will want its staff and the staff of partner local agencies to be involved in writing new guidance to build buy-in and to ensure the guidance is workable. Two essential points to communicate in promoting this initiative are:

- The high resource and political costs of capacity-adding projects that have negative community impact will not be sustainable for the agency in the long run, and
- The DOT will need to partner with local government representatives so as to help manage expectations and ensure that affordable projects can be delivered according to community needs.

With this in mind, the following implementation steps represent different approaches to pursuing such a system. Note that they do not need to be taken in the order listed, and some states may find that only selected steps need to be followed in the short term.

1. Revise state access policies, including access management guidelines, to respond more flexibly to local street/state roadway connections. This may also require changing other design policies, such as intersection and traffic signal spacing requirements.
2. Develop local street connectivity guidance for local governments to use in guiding private development review.
3. As appropriate or necessary, tie state priorities and funding assistance to state roadway projects where local governments have followed this guidance. This helps to reward those communities that have taken steps to assist in the capacity and operations of the state system by prioritizing state investment there.
4. Create a designation for essential local streets and roads that have strategic importance to the state system and prioritize state funding assistance to local governments based on these roads.
5. Re-designate state roads (e.g,. change the route on which a state highway designation is assigned, or add a duplicate route for business/local traffic to separate it from regional traffic) to take better advantage of the roadway network.
6. Work with local governments to improve zoning, development, and subdivision regulations so that development begins to shift its access and transportation impacts away from being exclusively on the state's roadway system.

Case Studies

Virginia

A few states maintain control over nearly their entire roadway network, including local streets and roads. Virginia is one such state, and it has sought to ensure that local networks contribute to the overall transportation system by defining standards for local streets that interact with the state system. In an effort led by then-Governor Tim Kaine, the Virginia General Assembly enacted legislation in 2007 that required the Commonwealth Transportation Board to develop Secondary Street Acceptance Requirements.[58] These requirements defined the conditions and standards that must be met before secondary streets constructed by developers, local governments, and entities other than the Virginia DOT (VDOT) will be accepted into the state secondary system for maintenance by VDOT. VDOT had long-established standards regulating roadway design and construction, but until this point, it had not regulated the form or spatial relationship of streets that weren't constructed under a VDOT-led project.

The Secondary Street Acceptance Requirements were based on a series of principles that recognized the value of a connected street network, including improvements in the flow of through-trips on collector and arterial streets, a reduction in vehicle miles traveled (VMT) and congestion, a reduction in emergency response times, the promotion of alternative transportation options (especially biking, walking, and transit), and improvements in access to community facilities and shopping areas. They defined quantitative standards under which certain thresholds must be met, such as a connectivity index, defined as the ratio of street network links to the nodes connecting them (or a basic formula of calculating network efficiency that returns higher values for street networks with few dead-end and disconnected streets).

The Secondary Streets Acceptance Requirements were modified substantially in 2011. The legislature directed the Commonwealth Transportation Board and the DOT to solicit public comments and consider revisions to the original requirements, resulting in the removal of some of the strongest provisions for promoting local street networks such as the connectivity index and the division of the state into tiers for different levels of compliance,[59] due to a perception that these measures were too rigid. Having stronger local support for the idea, developing it with VDOT staff and partners, and piloting applications to demonstrate network effectiveness could potentially have helped to sustain the regulations as a strong policy tool.

New Jersey

In the late 1990s, New Jersey inaugurated its Futures in Transportation initiative (NJFIT), a program administered by the New Jersey DOT (NJDOT) in partnership with the state's Office of Smart Growth and other state agencies.[60] Faced with an increasing backlog of maintenance obligations and declining revenues from conventional transportation funding sources, NJDOT sought alternatives to the conventional transportation approaches to addressing growth. The goal of NJFIT was to move away from the capacity-adding projects the agency recognized were fiscally unsustainable and toward a cooperative approach to land use and transportation planning that emphasized lower-cost solutions that continued to meet community needs.

---

58 State of Virginia. Va. Code Ann. §33.1-70.3 (A). Retrieved 9/12/2013 from http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+33.1-70.3.

59 Virginia Department of Transportation. (2012, February 16). "Secondary Street Acceptance Requirements." Retrieved 8/2/12 from http://www.virginiadot.org/projects/ssar/.

60 New Jersey Department of Transportation. (2011, January 11). "NJFIT: Future in Transportation: Overview." Retrieved 8/20/12 from http://www.nj.gov/transportation/works/njfit/.

Implementation of NJFIT was initially based on a series of pilot transportation projects that featured a prominent land-use planning component. To alleviate long-standing congestion issues on Route 31 in Hunterdon County, NJDOT had initially proposed building a limited-access bypass around the town of Flemington, but the high cost of this project and community resistance drove NJDOT to consider a broader, more context sensitive series of alternatives.[61] Assistance and resources from NJDOT and the Office of Smart Growth ultimately allowed the Flemington Township to design a plan for greater local street connectivity that would accommodate growth in the region over time and relieve some of the pressures on Route 31. This plan leaves the responsibility for the bulk of the local street network to private development, to be guided by a street master plan that outlines key network street alignments and identifies key connections that must be made. NJDOT's primary responsibility is the state roadway itself, although the revised plans from the joint planning exercise are estimated to cost approximately half of the amount estimated for the original proposed bypass.[62]

New Jersey's approach offers several lessons. States can establish programs such as the Local Technical Assistance Program to provide technical assistance to local governments, but perhaps more importantly, they can use particular projects that have long been in planning but have never been constructed due to budgetary limitations as opportunities to begin discussions on how to reach resolution. The NJFIT Route 31 pilot project represents a case of a state agency moving forward on a project long-promised to a community, though with a revised approach and an introductory message that ongoing (and increasing) resource constraints have made it all but necessary to reevaluate the project.

Delaware

The Delaware Department of Transportation (DelDOT) is currently working to improve land use and transportation decision-making in the state, including road network connectivity, by demonstrating to local communities how coordination between transportation and land-use planning can both improve livability and reduce the need for costly capacity expansion projects. To this end, the agency recently developed the Land Use and Transportation Scenario Analysis and Microsimulation (LUTSAM) tool to evaluate and demonstrate the benefits of roadway connectivity, bicycle, and pedestrian investments and more efficient land use strategies.[63]

LUTSAM integrates industry-standard geographic information systems, travel demand, and three-dimensional (3-D) microsimulation tools to dramatically reduce the time required for scenario analyses and ease the process of making 3-D simulations for public outreach. This enables a greater variety of scenarios to be tested and, because auto, bicycle, transit, and pedestrian travel can be modeled at a finer level of detail, demonstrates the benefits of greater street and sidewalk connectivity with detailed estimates of how it will impact the number of trips, VMT, emissions, and hours of delay in the area.[64]

DelDOT is now using the application for analyses in support of town planning and will be sponsoring a research project at the University of Delaware in the fall of 2012 to examine the effects of new subdivisions built on the suburban cul-de-sac model versus those built on a grid system.

---

61 New Jersey Department of Transportation. (2010, October). "NJFIT: Future in Transportation: Route 31 project Hunterdon County." Retrieved 8/1/12 from http://www.state.nj.us/transportation/works/njfit/route31.shtm.

62 Michaelson, J., Toth, G., and Espiau, R. (2008). "Route 31 in Flemington, New Jersey." *Great Corridors, Great Communities: the Quiet Revolution in Transportation Planning*, p. 30. Project for Public Spaces. Retrieved 9/12/2013 from http://www.pps.org/pdf/bookstore/Great_Corridors_Great_Communities.pdf.

63 Thompson-Graves, S., et al. (2012). "Development of the State Smart Transportation Initiative's DelDOT 3-D Micro Model Process—A scenario planning tool to evaluate urban form, land use, and multimodal investment impacts on mobility." State Smart Transportation Initiative. Retrieved 9/12/2013 from http://www.ssti.us/2012/06/lutsam/.

64 *Ibid.*

Resources

Institute of Transportation Engineers. (2011). Planning Urban Roadway Systems.
This manual from ITE offers guidance in planning, modifying, and expanding roadway networks to develop an effective transportation system.

New Jersey Futures in Transportation Program Description. Online at: http://www.nj.gov/transportation/works/njfit.
This website provides a description of the NJFIT initiative.

Smart State Transportation Initiative. (2012, June). Land Use and Transportation Scenario Analysis and Microsimulation (LUTSAM) Tool. Online at: http://www.ssti.us/2012/06/lutsam/.
This page provides information and links to a recorded webinar, paper, and user's guide.

Victoria Transport Policy Institute. (Updated 2012, January 5) TDM Encyclopedia. Roadway Connectivity: Creating More Connected Roadway and Pathway Networks. Online at: http://www.vtpi.org/tdm/tdm116.htm.
This chapter of the Victoria Transport Policy Institute's TDM Encyclopedia provides additional information on the concept of connectivity, describes the benefits and costs of improving connectivity, and provides examples of indices for measuring connectivity.

Virginia DOT. Secondary Street Access Requirements. Online at: http://www.virginiadot.org/projects/resources/SSAR_Final_Registrar_Regulation.pdf.
Secondary Street Access Requirements is a result of legislation adopted by Virginia in 2007. These requirements determine the "conditions and standards" that have to be met by developers, localities, and entities other than VDOT before secondary streets can be constructed.

Modernize Access Management Standards

The Opportunity

Access management broadly defines a set of strategies that state DOTs and local governments can use to manage how and where vehicles are able to access a roadway. Since development clusters around available transportation, without an access management program a road can become a victim of its own desirability, as an ever-increasing number of private driveways and entrances to commercial/business establishments dot the highway. The increasing number of turning movements and vehicles entering a high-speed roadway leads to increases in crashes and congestion and premature calls for adding travel lanes to reduce traffic problems.

Effective access management not only saves road capacity (and therefore money), but it also can improve safety and access to transportation across modes at the same time. An effective way to manage access to a roadway while continuing to provide access to multiple modes is to develop a comprehensive access management plan. This approach allows political leaders to promise improvements for both private auto users and other users of the street such as freight, bicycles, pedestrians, public transportation, and emergency vehicles—all while expanding the useful life of the existing capacity. When done correctly, access management achieves a delicate balance that incorporates enough standards to make it effective, but also gives local governments sufficient access in communities where it is needed.

What Is It?

As defined by the Transportation Research Board, access management is the "systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway."[65] It also includes certain roadway design elements such as median treatments, auxiliary lanes, and traffic signal spacing. Access management limits the number of driveways and intersections on highways and arterial roadways, improving safety and reducing congestion. Limiting driveway access can be used to support Transportation Demand Management (TDM) outcomes, as development will cluster near access to transportation.[66]

Without effective access management plans and policies, the function and character of major roadways can deteriorate quickly. An absence of access management plans and policies may result in the following negative scenarios:

- Increased crashes at access points due to vehicles entering and exiting the same road at different speeds;
- Increased impacts to property owners by a continuous cycle of widening roads;
- Increased fiscal and political costs of property takings and right-of-way acquisition; and
- Increased commute times, fuel consumption, and vehicular emissions, as numerous driveways and traffic signals intensify congestion and increase delays along major roads.

Since access management policies largely impact urban and suburban communities through which

65 Transportation Research Board of the National Academies, Committee on Access Management. (2003). *Access Management Manual*. Retrieved 9/12/2013 from http://www.accessmanagement.info/pdf/nchrp_rpt_548.pdf.

66 Victoria Transport Policy Institute. (2010, February 8). "Access Management: Coordination Between Roadway Design and Land Use Development to Improve Transportation." Transportation Demand Management Encyclopedia. Retrieved 9/12/2013 from http://www.vtpi.org/tdm/tdm1.htm.

arterials and highways pass, successfully modernizing standards will typically involve working cooperatively with local governments to develop access management plans that coordinate subdivision and development rules with state access management policies.

It is important to note that strategies for controlling and limiting access points are only appropriate in cases where mobility is the primary function of a roadway. In cases where access is an important function, free-flowing traffic can be an impediment to non-motorized road users and can pose safety concerns. In high access areas, improved street connectivity and traffic calming strategies are important tools for providing the greatest system efficiency, while accomodating all road users and roadway functions. Achieving the most appropriate solution in these cases requires a careful evaluation of local project goals and possibly a reform of the level of service principle (also discussed in Focus Area 4). Access management strategies allow DOTs to distinguish between areas of access and areas of mobility, and prioritize those functions in each.

Implementation

When done well, a good access management plan and policy can improve the safety and efficiency of the roadway system for multiple travel modes. Effective asset management requires thinking flexibly about developing access management standards as a tool to identify and pursue a variety of transportation and land use outcomes.

Access management standards should focus on efforts to maximize efficiency for all users, and can help to achieve multiple traffic management goals. As noted above, it can encourage TDM projects, reduce congestion, improve accessibility for bikes and pedestrians, and improve transit operations. A high-quality access management plan may affect land use by increasing densities and reducing vehicular traffic.

Coordination within and among government agencies is critical at every stage of access management, from program development to permitting decisions. Moreover, agencies and landowners must communicate regularly and openly to understand the needs and interests of both sides.

Provide a structure for internal decision-making within the DOT

Access management decisions require input from several divisions within a state agency, including planning, environmental management, traffic operations, legal, right-of-way, design, construction, and maintenance. Strategies for internal coordination include:

- Creating cross-organizational task teams or working groups to clarify division responsibilities
- Developing viable coordination procedures or protocols between divisions
- Encouraging project management and permit review coordination
- Establishing a project manager and review team to improve coordination in the management of complex transportation and development projects
- Reviewing the work program for scheduled projects that could incorporate access management improvements

Coordinate with local governments

A successful effort will also involve close partnerships with local government agencies. Strategies for intergovernmental coordination include:

- Develop policies that ensure that standards for access management are compatible. This may involve developing a statewide map or other means to recognize different access

needs and where access standards may be applied differently (or, at least identifying key corridors and engaging local partners within them).
- Develop corridor access management plans to facilitate intergovernmental coordination and consistent decision-making along sections of state highways where extensive development is anticipated.
- Develop formal agreements or resolutions—either through resolution, memorandum of understanding, or intergovernmental agreement—on state and local roles and responsibilities for access management.
- Require advance notification for significant developments to take advantage of access management opportunities, and ensure that local development requirements create local networks for local traffic, rather than relying on state facilities for all local movements.
- Hold regular access permitting meetings to provide a forum for coordination between state and local governments.
- Build a tiered review process for coordinating development applications requiring access to state highways.

Case Studies

Maine

U.S. Route 1 in Maine's coastal region varies in function throughout its approximately 100-mile length, serving as a small-town main street, a major truck route, and a scenic byway. It passes through small villages and towns and vacation destinations as well as significant regional employment centers.

The Maine DOT (MaineDOT) faces fiscal constraints and has also encountered opposition to conventional capacity projects due to their significant community and environmental impact.[67] MaineDOT realized the most effective way to address Route 1's challenges was to prevent further degradation of the road.

In 2005, MaineDOT, the Maine State Planning Office, and 20 communities on the Route 1 corridor inaugurated a joint effort to address corridor-wide land use and transportation challenges. The primary goal was to preserve the rural character of Route 1. The resulting effort of the collaboration was the Gateway 1 Corridor Action Plan and a memorandum of understanding expressing corridor-wide commitment to develop a plan and implement its recommendations.[68] The goal of Gateway 1 is to minimize the impact of future development on Route 1, while supporting and connecting economic development and new housing as well as multimodal transit opportunities. Gateway 1 proposes strategic transportation investments along the corridor, and asks municipalities to make adjustments to their local comprehensive plans and zoning ordinances to support more densely built core growth areas, to protect specific view sheds and wildlife habitats, and to create a more defined level of roadway access management. As part of an interlocal agreement, communities will share unprecedented decision-making authority through a corridor management committee composed of representatives from the municipalities and MaineDOT.

Gateway 1 provides that local agencies will regulate access on state highways in core growth areas on roadways with posted speeds of 35 miles per hour or less. MaineDOT regulates access on other state

67 Maine Gateway 1 Coalition website. "A Brief History." Retrieved 8/7/12 from http://www.mainegateway1.com/history.html.

68 Maine Gateway 1 Coalition Steering Committee. (2009, July). "Gateway 1 Corridor Action Plan: Brunswick to Stockton Springs." Retrieved 8/20/12 from http://www.mainegateway1.com/Gateway 1 Action Plan.pdf.

highways and, in some special examples, as in the communities of Damariscotta and Newcastle, has purchased access rights along sections of the Route 1 corridor. MaineDOT pursues the preservation of high speeds and mobility outside of these core growth areas, meaning that access management is stronger and land development intensity is limited. Per conventional access management practice, Gateway 1 greatly emphasizes driveway regulations and has been eliminating those driveways with safety issues, traffic hazards, or limited sight distance.[69]

North Carolina

The North Carolina Strategic Highway Corridors (SHC) initiative is a collaborative effort among the North Carolina DOT (NCDOT), the Department of Commerce, and the Department of Environment and Natural Resources to preserve and maximize mobility and connectivity on a core set of highway corridors throughout the state. Its central effort is to develop a long-range, consensus-based vision for each corridor to guide decisions related to funding, project planning, design, driveway permit approvals, and local land use. Adopted in September 2004, the primary purpose of the SHC initiative is to provide a network of high-speed, safe, and reliable roadways throughout the state. The initiative promotes both good environmental and fiscal stewardship by maximizing the use of existing facilities and moving people and goods quickly and efficiently. The initiative offers NCDOT, partnering agencies, and other stakeholders an opportunity to consider a long-term vision when making land use decisions as well as design and operational decisions on the highway system.

Implementation of the SHC initiative focuses on six areas: (1) Education, (2) Long-Range Planning, (3) Project Planning and Design, (4) Land Use, (5) Corridor Protection, and (6) Driveway Permits and Traffic Signals. Access management and the purchase of access rights are identified as key strategies under Corridor Protection. In addition, under Driveway Permits and Traffic Signals, alternative solutions to traffic signals and driveway consolidation and sharing are highly encouraged.

As part of the SHC initiative, four facility types—freeways, expressways, boulevards, and thoroughfares—and associated Control of Access Definitions were developed to create a set of understandable and consistent definitions for all roadways for NCDOT and its partners to use in planning, design, and operations. The definitions are based primarily on the function of the roadway, level of mobility and access, and whether the facility has traffic signals, driveways, or medians. These definitions were developed by a committee composed of members from FHWA and NCDOT's Traffic Engineering, Highway Design, Project Development, and Transportation Planning branches.[70] Table 1 shows a comparison of NCDOT facility types.

69 Federal Highway Administration, Office of Operations. (2007, January). *Domestic Access Management Scan Tour Summary Report.* Retrieved from http://www.accessmanagement.info/2006SCAN/section_3.htm.

70 Gluck, J. S. & Lorenz, M. R. (2010). "State of the Practice in Highway Access Management: A Synthesis of Highway Practice," pp. 92-93. National Cooperative Highway Research Program. Transportation Research Board. Retrieved 8/20/12 from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_404.pdf.

Table 1: Comparison of NCDOT Facility Types

	Freeways	Expressways	Boulevards	Thoroughfares
Functional Purpose	High Mobility, Low Access	High Mobility, Low to Moderate Access	Moderate Mobility, Low to Moderate Access	Moderate to Low Mobility, High Access
AASHTO Design Classification	Interstate or Freeway	Arterial	Arterial or Collector	Collector or Local
Posted Speed Limit	55 mph or greater	45 mph to 60 mph	30 mph to 55 mph	25 mph to 55 mph
Control of Access	Full	Limited or Partial	Limited or Partial	None
Traffic Signals	Not Allowed	Not Allowed	Allowed	Allowed
Driveways	Not Allowed	Limited Control of Access	Limited Control of Access	Allowed with Full Movements; Consolidate or Share Connections, if Possible
Cross-Section	Minimum Four Lanes with Median	Not Allowed	Not Allowed	Minimum Two Lanes; No Median; Includes Facilities with Two-Way Left Turn Lane
Connections	Provided Only at Interchanges; All Cross Streets are Grade-Separated	Partial Control of Access—One Driveway Connection per Parcel; Consolidate and/or Share Driveways and Limit Access to Connecting Streets or Service Roads,	Partial Control of Access—One Driveway Connection per Parcel; Consolidate and/or Share Driveways and Limit Access to Connecting Streets or Service Roads;	Primarily At-Grade Intersections
Median Crossovers	Public-use Crossovers Not Allowed; U-turn Median Openings for Use by Authorized Vehicles Only When Need is Justified	Restrict to Right-in/Right-out	Restrict to Right-in/Right-out	*Not Applicable*

Source: North Carolina Department of Transportation, Strategic Highway Corridors. https://connect.ncdot.gov/projects/planning/TPB%20%20Strategic%20Highway%20Corridors/NCDOT%20Facility%20Types%20-%20Control%20of%20Access%20Definitions.pdf.

Resources

Gluck, J. S., & Lorenz, M. R. (2010) State of the Practice in Highway Access Management: A Synthesis of Highway Practice. National Cooperative Highway Research Program. Transportation Research Board: Washington, DC. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_404.pdf.

This report provides an overview of access management practices and specific case studies in states around the country.

Maine Gateway 1 Steering Committee. Gateway 1 Corridor Action Plan. http://www.mainegateway1.com/Gateway%201%20Action%20Plan.pdf.

This plan defines the vision developed by MaineDOT and the 20 communities along the Route 1 corridor, specifying commitments by local governments and the state.

Transportation Research Board of the National Academies, Access Management Committee (AHB70) homepage, www.accessmanagement.info.

This is an online resource for planning and engineering corridor access management. It includes animated reference material, links to research and presentations, and up-to-date tools and techniques.

Transportation Research Board of the National Academies. (2003). Access Management Manual. Committee on Access Management. Washington, DC.
http://www.accessmanagement.info/manual.html.

This manual has been a standard resource on access management for state and local DOTs, covering planning, design, and implementation of access management.

Victoria Transport Policy Institute. (2010, February 8). "Access Management: Coordination Between Roadway Design and Land Use Development to Improve Transportation." Transportation Demand Management Encyclopedia. http://www.vtpi.org/tdm/tdm1.htm.

This section of the Victoria Transport Policy Institute's TDM Encyclopedia describes the benefits, costs, and travel impacts of access management strategies.

Use Transportation Demand Management

The Opportunity

Transportation is a matter of supply and demand. If states can manage the demand, they will be less reliant on costly projects that increase the supply of transportation infrastructure. Managing how and when a state's transportation system is used can improve the effective capacity of the system at less cost than capital projects that add physical capacity. Reduced demand also translates into lower emissions, less congestion, and less personal cost to travelers.

What Is It?

TDM includes a broad array of strategies and tools intended to alleviate congestion and shorten travel, often specifically focused on single-occupant vehicle trips generated by major employment or activity centers. It is often undertaken at the local level, by cities, MPOs, transportation management associations (TMAs), or major employers. But state DOTs have a strong interest in managing demand as well, and TDM can be a demand-side tool along with pricing, land use, intelligent transportation systems (ITS), and provision of non-auto mode choices. Some DOTs have launched their own TDM efforts that can serve as models, and innovation in this field is likely as economic and environmental pressures make traditional capacity-based solutions less attractive.

TDM strategies rely on such measures as:

- **Ridesharing.** Ridesharing includes carpools, vanpools, and any other form of arrangement in which two or more travelers occupy a single passenger-driven vehicle. Programs can provide ride-matching, routing service, or "premium" parking for carpoolers. They may also provide van service.

- **Bicycle use and walking.** Bicycle travel, in particular, is growing rapidly in cities that have invested in appropriate infrastructure. Programs can provide routing services, secure bike parking, or showers to facilitate bike commuting. In the longer term, TMAs and other larger programs can help provide cycle tracks and sidewalks to provide good bike-pedestrian connectivity.

- **Flexible work hours.** These arrangements allow workers to commute to their jobs during off-peak hours, or four days a week instead of five.

- **Telecommuting.** Similar to flexible work hours, telecommuting allows would-be commuters to work from a remote location, often from home, to avoid traveling. A recent poll published by online communications provider TeamViewer found that people value the ability to work from home, and many are willing to make sacrifices for that ability; 17 percent of those surveyed said they would give up a salary increase, and 15 percent said they would give up half of their vacation days if they were able to telecommute.[71]

- **Transit assistance.** Commuters can reduce SOV travel by using transit, even occasionally. Programs can provide subsidies or full coverage for transit passes as well as transit

71 Mielach, D. (2012, February 9). "Employees would give up showers and spouses to work from home." *Business News Daily.* Retrieved from http://www.businessnewsdaily.com/2005-telecommuting-reasons.html.

information and routing service. Employers can also facilitate transit ridership by locating in sites where transit is readily available.

- **Emergency ride service.** Commuters will be more willing to arrive at their workplace without a car if they know they can get home readily to care for a sick child or take care of another emergency. This service may take the form of a free or reduced-price taxi ride available a handful of times of year.

In addition to these overarching TDM measures, emerging technologies have enabled a wider range of Active Demand Management strategies. These strategies, which require real-time monitoring and responses, include the following:

- Dynamic pricing of roads, parking and transit,
- Dynamic managed lanes,
- Dynamic routing and way-finding, and
- On-demand transit and ridesharing.

Active travel and parking demand management strategies respond to daily travel patterns in order to redistribute traffic and encourage mode shifts, thereby reducing total traffic volumes, particularly on congested routes during peak periods. Washington DOT launched a dynamic ridesharing pilot program in 2010, recruiting close to 1,000 participants. That program allowed Seattle-area commuters to request a nearby carpool using mobile applications. Caltrans also initiated a dynamic rideshare program that is now being implemented in the San Francisco Bay area by a private vendor. The San Francisco Municipal Transportation Authority launched a federally-funded pilot in 2011 to test dynamic parking management. That project incorporates real-time parking availability information, demand-responsive pricing, and pay-by-phone technology to manage parking demand and mitigate traffic impacts from parking searches. These measures can also be used in conjunction with Active Traffic Management strategies (outlined in the following section) to reduce overall delay.

Implementation

TDM programs are relatively inexpensive strategies state DOTs can use to reduce congestion on their existing networks. They may choose to operate programs or provide assistance to MPOs and local governments who operate them. Many states' TDM programs focus on ridesharing and car- and vanpools. Larger programs typically receive special funding through a transportation agency (or another state agency) and have staff dedicated to program management and administration.

But DOTs have a bigger role to play as well. When considering mitigation for new development or when conducting project EIS or corridor plans, they can consider TDM in lieu of roadway capacity. Similarly, they can encourage local governments to require that TDM be included in new development applications. These strategies allow for needed economic development while simultaneously addressing the increased transportation demand triggered by that development. TDM can also be a cost-effective tool for developers, reducing mitigation costs and potentially on-site parking costs.

Models for assessing the impact of TDM measures to reduce demand include U.S. EPA's COMMUTER, and Florida DOT's Worksite Trip Reduction Model. See the link in Resources below.[72]

72 University of South Florida. (2010). "Models to assess the efficacy of TDM measures in reducing demand." Retrieved 9/12/2013 from http://www.nctr.usf.edu/clearinghouse/software.htm.

Where is TDM already being applied?
New Jersey, Massachusetts, Washington, and Vermont have central, statewide TDM programs and management, but their approaches differ. New Jersey focuses its efforts on technical assistance to local and district-specific TMAs that perform the day-to-day tasks of identifying demand management opportunities and coordinating various stakeholders and participants.[73] Washington uses more formal and direct cooperation with employers and local governments in its efforts to reduce traffic and energy use, and provides financial assistance to enact local TDM plans.[74]

Massachusetts allows TDM in lieu of highway capacity expansion in development cases where mitigation is required,[75] and the Washington and Colorado DOTs have included TDM strategies as part of corridor work in the Puget Sound and Denver areas, respectively.[76]

Case Study

Washington

The Washington Legislature passed the Commute Trip Reduction (CTR) Law[77] in 1991 because of growing traffic congestion, especially in the Seattle metro region.[78] The 1991 law was intended to improve air quality, reduce traffic congestion, and decrease VMT with employer-based programs that encourage the use of alternatives to driving alone. At the same time, proponents argued that the legislation offered strategic advantages for businesses, as reduced employee travel time (and especially time driving alone) and a transportation system with overall greater reliability could improve employee productivity and business performance. Identifying shared goals between the state and employers was a critical component of the legislation's successful passage.

Increasing local involvement
The CTR law's first major overhaul, the 2006 CTR Efficiency Act, took advantage of sunset clauses in the original 1991 legislation as mechanisms for reorganizing the way the state pursued TDM.[79] The 2006 Act more explicitly targeted a reduction of drive-alone trips and vehicle miles traveled per capita (seeking reductions of ten percent in single-occupant vehicle trips and 13 percent in VMT); it also built upon employers' roles and expanded responsibility for the program's success to local governments that work with employers.[80] Focusing on local governments responded to a general need to tie the management of travel demand on the state roadway system to local land use planning. Instead of working exclusively through employers, local CTR plans and programs are now integrated with local land use and transportation plans to align policies and investments.

---

73 National Cooperative Highway Research Program. (2010). "Research Results Digest 348: State Department of Transportation Role in the Implementation of Transportation Demand Management Programs." Retrieved 9/12/2013 from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rrd_348.pdf.

74 Washington State Legislature. (1991). "Transportation demand management—Findings." RCW 70.94.521. Retrieved 9/12/2013 from http://apps.leg.wa.gov/rcw/default.aspx?cite=70.94.521.

75 National Cooperative Highway Research Program. (2010). "Research Results Digest 348: State Department of Transportation Role in the Implementation of Transportation Demand Management Programs." Retrieved 9/12/2013 from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rrd_348.pdf.

76 Victoria Transportation Policy Institute. (2012). "Success Stories: Examples of TDM Programs that Work." Retrieved 9/12/2013 from http://www.vtpi.org/tdm/tdm71.htm.

77 Washington State Legislature. (1991). RCW 70.94.521, Transportation Demand Management – Findings. Retrieved 8/21/12 from http://apps.leg.wa.gov/rcw/default.aspx?cite=70.94.521.

78 *Ibid.* The law encompasses Sections 521 through 551 of Title 70, Chapter 94 of the Revised Code of Washington.

79 Washington Substitute SB 6566. (2006). 2006 Commute Trip Reduction Efficiency Act. Retrieved 9/12/2013 from http://www.wsdot.wa.gov/NR/rdonlyres/01C32E8B-4273-482A-9F09-86083556AFFF/0/6566SPL.pdf.

80 *Ibid.*

Growth and Transportation Efficiency Centers (GTECs) also became a part of the CTR program through the 2006 legislation. GTECs effectively give responsibility for the implementation of the CTR program to local governments.[81] This allows CTRs to respond to the needs of local communities, particularly in urban centers (an established concept under Washington's growth management legislation). The CTR program utilizes state resources to expand a community's pool of participants and, with the law's new provisions, CTR programs can now go beyond employers and look for ways to address non-work-related trips. The GTEC model has enhanced the CTR program because it provides additional resources from WSDOT, and implementation is more flexible.

In the 2011-13 legislative session, the legislature funded the CTR program at approximately $5.5 million. Of this, $3.9 million is distributed to local governments, based on allocation decisions by the CTR board.[82] Local governments use this funding to assist employers in the development and implementation of their worksite programs. The balance of the state investment primarily gives direct assistance to employers to help establish TDM programs. WSDOT has also used this funding to provide technical support and program tools to local governments, and to measure, evaluate, and report on the program's performance. A small portion of the balance funds program administration, monitoring, and reporting.

Impact

A 2005 report to the Washington state legislature analyzing the impacts of the program found that it resulted in:[83]

- A significant decrease in the number of people driving alone to CTR worksites in the state—from 70.8% in 2003 to 65.7% in 2005—leading to nearly 20,000 fewer vehicle trips each morning statewide,
- $24 million in reduced cost of delay in the Puget Sound region (calculated using 2003 data),
- Savings of $13.7 million in fuel costs for employees commuting to CTR worksites, and
- Reduction of the equivalent of 74,200 tons of carbon dioxide.

As of 2010, approximately 574,000 employees at roughly 1,100 worksites in nine counties had access to employer CTR programs. An additional 535,000 commuters had access to services and programs offered through seven designated GTECs. In 2006, the latest year for which data is available, employers invested $45 million in their CTR programs, more than $16 for each dollar invested by the state.[84]

The Washington CTR program reflects a joint effort by WSDOT and legislators to use resources to reduce overall demand and distribute travel more evenly across the day, delaying the need for costly new capacity projects. The coordinated response to growing vehicle travel demand has built a broad base of supporters (made up of both local government agencies and private employers) who recognize its economic and social value and continue to benefit from the program over 20 years after its inception.

---

81 *Ibid.*

82 Washington State Commute Trip Reduction Board. (2011). CTR Report to the Washington State Legislature. Retrieved 9/12/2013 from http://www.wsdot.wa.gov/NR/rdonlyres/05054197-8764-4026-A011-C480E686BBF5/81137/CTRBoard_Report_2011Web.pdf.

83 Washington Commute Trip Reduction Task Force. (2005). Report to the Washington State Legislature. Retrieved 8/16/12 from http://www.wsdot.wa.gov/NR/rdonlyres/172087A9-85D1-416B-86C4-33281C7BDE68/0/CTR_Report_05.pdf.

84 Washington State Commute Trip Reduction Board. (2011). Report to the Washington State Legislature. Retrieved 9/12/2013 from http://www.wsdot.wa.gov/NR/rdonlyres/05054197-8764-4026-A011-C480E686BBF5/81137/CTRBoard_Report_2011Web.pdf.

Resources

National Cooperative Highway Research Program. (2010). Research Results Digest 348: State Department of Transportation Role in the Implementation of Transportation Demand Management Programs. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rrd_348.pdf.

This report provides survey results and case studies from state DOTs regarding their involvement in TDM programs.

University of South Florida Software to assist TDM programs. (n.d.) http://www.nctr.usf.edu/clearinghouse/software.htm.

This website gives summaries and links to demand-reduction models, a business-benefits calculator, and other software.

Victoria Transportation Policy Institute Online TDM Encyclopedia. http://www.vtpi.org/tdm/index.php.

This encyclopedia is "[T]he world's most comprehensive information resource concerning innovative transportation management strategies," and contains cases and analysis from around the world, with links to papers and other materials.

Washington State Commute Trip Reduction Board. (2011). CTR 2011 Report to the Washington State Legislature. http://www.wsdot.wa.gov/NR/rdonlyres/05054197-8764-4026-A011-C480E686BBF5/81137/CTRBoard_Report_2011Web.pdf.

This report details activity and success of the WSDOT CTR program, with recommendations for expansion.

Invest in System Management

The Opportunity

Compared to highway capacity projects, system management offers a low cost way to improve transportation network performance. A large segment of the public believes transportation infrastructure investments can be more productive. A recent survey found that 64 percent of voters say that how the government currently spends money on building and maintaining our transportation infrastructure is inefficient and unwise, including one in four (26%) who say it is very inefficient.[85]

State DOTs can respond to public concerns through the use of Transportation System Operations and Management (TSO&M) programs. These strategies can help alleviate traffic congestion and travel delay, thereby improving the performance of our existing transportation networks and helping to improve air quality, reduce energy consumption, and grow the economy. TSO&M has also become a formalized focus of federal, state, and regional funds through MAP-21.

Many states are already using (or are in the process of developing) transportation system management approaches to achieve the benefits of capacity expansion at a fraction of the cost. By one measure, operational improvements in 2011 resulted in a savings of more than 370 million annual hours of delay nationwide.[86] A report for the Minnesota DOT concludes that the return on investment for active traffic management (ATM) is anywhere from 700 to 1,000 percent.

What Is It?

TSO&M encompasses a range of practices and technologies used to maximize the safety, reliability, and efficiency of existing transportation systems. Used alone or in conjunction with traffic demand management (TDM) strategies, discussed in the previous section, these methods can greatly reduce congestion and improve travel times. Common TSO&M tools include coordinated traffic signals, variable signage advising motorists of delays or detours, telephone- or internet-based resources with information on real-time traffic and roadway conditions, and the use of managed lanes and mobile toll collection methods like EZ Pass. These strategies depend on facilities and staff equipped to collect, process, and redistribute real-time travel data.

Many common TSO&M approaches are designed primarily to address recurring or routine congestion associated with capacity constraints and daily fluctuation in demand. However, transportation agencies are increasingly turning their attention to addressing nonrecurring congestion (NRC). Nearly 50 percent of traffic congestion on the U.S. highway system is due to traffic incidents, road work zones, weather events, special events, and other exceptional circumstances.[87] TSO&M programs are also evolving to overcome barriers to coordinating activities across geographic, jurisdictional, and modal boundaries.

---

85 Transportation for America. (2010 March 2). *Future of Transportation National Survey*. Retrieved 11/22/2013 from http://t4america.org/wp-content/uploads/2010/03/031010-Future-of-Transportation-Poll-Summary.pdf.

86 Schrank, D. & Lomax, T. (2012). Urban Mobility Report 2009. Texas Transportation Institute. Retrieved from http://tti.tamu.edu/documents/mobility-report-2012.pdf.

87 Parsons Brinckerhoff Consulting (2011). *Guide to Improving Capability for Systems Operations and Management*. SHRP 2 Report S2-L06-RR-2 Prepared for Transportation Research Board. Retrieved on 10/25/2013 from http://onlinepubs.trb.org/onlinepubs/shrp2/SHRP2_S2-L06-RR-2.pdf..

Transportation Systems Management Technologies at a Glance

- **Coordinated traffic signals** dynamically adjust the timing of signals along a corridor depending on traffic flow to mitigate recurring or nonrecurring congestion.
- **Traffic signal sensors and cameras** detect vehicles waiting at intersections and adjust signals in response.
- **Parking space sensors** can be used to provide real-time information about parking availability to travelers in congested areas.
- **Dynamic message signs** display real-time traffic, weather, and road condition information to travelers.
- **Websites and mobile phone applications** for travelers provide real-time travel information on traffic delays and detours, transit service timing, and parking availability.
- **Ramp meters** manage traffic by controlling the rate of vehicle entry onto highways via on-ramps during peak travel periods.
- **Electronic toll collection** uses sensors at toll plazas and electronic transponders in cars to maintain traffic flow.
- **Weigh-in-motion truck inspection systems** automatically weigh and validate trucks, potentially eliminating the need to stop at inspection stations.

Implementation

Key partners include the usual agencies responsible for other transportation modes and transportation system components, such as transit authorities, MPOs, and local governments. Effective TSO&M strategies should include the entire transportation system, so that public transportation, for example, can help reduce pressure on the roadway system. MPOs are also an important partner because they can identify opportunities for the regional application of TSO&M strategies. Local governments, especially in larger metropolitan regions where travel demand and traffic extend beyond local jurisdictional boundaries, can work more closely with local employers and residents to develop policies on TDM, a companion strategy to TSO&M that can make state-level TSO&M approaches more successful.

Specific transportation projects allow state DOTs to test different TSO&M tools such as the signalization of expressway ramps or the use of dynamic message signs. Because TSO&M solutions typically have a smaller environmental impact than traditional capacity expansion projects, they can often pass quickly through the environmental review process and be completed much faster than solutions requiring large-scale construction.

Generally speaking, TSO&M programs are more complex and varied in urban environments because there is more congestion and a greater variety of transportation facilities. The following programs and policies, some broad and some more focused, can help state DOTs implement TSO&M strategies and integrate them into existing programs:

- **Active traffic management (ATM),** which encompasses many real-time TSO&M strategies, can reduce congestion and improve travel time reliability using variable speed limits, temporary shoulder use, ramp metering, dynamic signage and other tools outlined above.
- **Traffic incident management** programs improve emergency response to traffic accidents and reduce the time needed to clear lane closures through the use of safety service patrols, surveillance, and improved emergency communication and coordination.
- **Work zone management** can reduce delays in work zones through the use of temporary traffic controls, variable speed limit signs, dynamic lane merge systems, and other tools.

- **Special event planning** can mitigate and manage traffic impacts of large-scale events such as sporting events. Examples include Michigan's Palace of Auburn Hills and the Kansas Speedway.
- **Road weather management** involves coordinated weather monitoring, road clearing operations, road closures, and dissemination of relevant weather-related information to road users.
- **Transportation management centers (TMCs)** are central hubs for collecting, analyzing, and redistributing data to optimize transportation system performance.
- **Multi-agency operations planning** involves the coordination of two or more agencies to implement TSO&M approaches at a scale appropriate for the transportation corridor or system; this can include MPOs, local governments, or multiple state agencies. Examples are given below.
- **Least cost planning** (or "value and cost informed planning"), though not system management strategy itself, improves efficiency by ensuring the TSO&M solutions are considered as an alternative to infrastructure expansion projects. One example is Oregon DOT's MOSAIC – a least cost planning tool for evaluating the costs and benefits of various transportation strategies, including TSO&M.
- **Identify and track meaningful metrics,** such as crash clearance for incidents that cause lengthy delays, rather than trying to assess all cases or the median case. One example is the Washington State DOT (WSDOT) joint operations policy agreement with the State Patrol and the Washington fire chiefs, established in 1999, which focuses partly on tracking incident response times on major crashes and has reduced the average time required to clear disabled vehicles from 17 to 10 minutes.

To successfully integrate TSO&M programs, state DOTs may benefit by reviewing their internal organizational structure and improving their general business practices. The Strategic Highway Research Program (SHRP2) has identified four key traits common to mature TSO&M programs, including a cultural commitment to providing customer mobility, the integration of TSO&M as a core program at all levels of staff, dedicated sources of funding, and the consolidation of TSO&M functions through TMCs.[88]

Multi-State Initiatives

TSO&M strategies, especially ITS applications, are in use in many states and benefit from national and interstate coordination among agencies. Examples of voluntary multi-state initiatives include the I-95 Corridor Coalition, the I-80 Winter Operations Coalition, and the North/West Passage Corridor.

Some states have also taken important steps in making their respective highway tolling systems interoperable. To a large extent, the thirteen Northeast and Great Lake states are already interoperable through their common use of EZ Pass. North Carolina DOT has led further efforts by pushing for interoperability among its own Quick Pass system, the EZ Pass system, and, more recently, Florida's Sun Pass system. Georgia's Peach Pass is the next system expected to join this network.[89] MAP-21 provides further impetus by setting a 2016 deadline for nationwide tolling interoperability.

In addition, the U.S. DOT is in the process of developing and national system for data collection and system monitoring in real time. The program uses information provided by states and is being designed

88 *Ibid*.

89 Atlanta Regional Commission (2012 December 22) "North Carolina and Florida Announce Toll Interoperability Agreement; Georgia to Follow." Transportation Spotlight webpage. Retrieved 11/20/2013 from http://transportationspotlight.wordpress.com/2012/12/22/north-carolina-and-florida-announce-toll-interoperability-agreement-georgia-to-follow/.

to incorporate data from existing systems such as the Highway Performance Monitoring System. The system is expected to cover the interstate highway system by 2014 and expand to include regionally significant highways in metropolitan areas by 2016.

Case Studies

California

Due to dramatic increases in population growth and vehicle traffic in the last half-century, California has been one of the early leaders in advanced traffic control methods on its state highway system, especially its expressways. With nearly 2,500 ramp meter signals (more than 60 percent of the U.S. total), California leads the way in expressway ramp metering.[90]

Ramp meters help control the flow of traffic entering expressways, especially during peak periods of travel. They preserve the overall flow of the expressway and manage the spot congestion that occurs when entering traffic attempts to merge with higher-speed mainline traffic.

The California Department of Transportation (CalTrans) has conducted multiple studies of various TSO&M strategies to measure their impact on performance and overall roadway efficiency. For example, the total cost of a proposed series of TSO&M capital enhancements (including additional ramp meters, monitoring and information display technology, and the professional technical services associated with data collection, reporting, and distribution) for nearly 20 miles on the Interstate 15 corridor in San Diego is estimated at $12 million over the ten-year lifespan of these investments.[91] In contrast, adding one lane in each direction to the expressway could cost approximately ten times as much.[92] A study by the Metropolitan Transportation Commission (the MPO for the San Francisco Bay area) found that use of ramp meters and other TSO&M technology reduced travel times by up to 20 minutes on some expressway corridors and accounted for as much as a 60 percent reduction in delay.[93]

Minnesota

In an unusual case in 2000, the Minnesota state legislature mandated that the Minneapolis-St. Paul metropolitan area temporarily deactivate the region's 400 ramp meters to allow the MnDOT to perform a before-and-after evaluation of their effectiveness. This study concluded that the expressway system generally provided lower levels of performance without the meters in place. Without the ramp meters, the expressways carried nine percent less traffic volume, expressway travel times were 22 percent greater, and crashes increased by 26 percent.[94]

---

90 California Department of Transportation. (2011, December). *Ramp Metering Development Plan*. Retrieved from 9/12/2013 http://www.dot.ca.gov/hq/traffops/systemops/ramp_meter/RMDP.pdf.

91 U.S. Department of Transportation, Research and Innovative Technology Administration, Intelligent Transportation Systems Joint Program Office. "Integrated Corridor Management Pioneer Sites – San Diego, California." Retrieved from http://www.its.dot.gov/icms/pioneer_sdiego.htm. Cost estimate retrieved 8/2/12 from http://www.itscosts.its.dot.gov/its/benecost.nsf/SummID/SC2011-00219?OpenDocument&Query=Home.

92 Victoria Transport Policy Institute. *Transportation Cost and Benefit Analysis II – Roadway Costs*. Retrieved 9/12/2013 from http://www.vtpi.org/tca/tca0506.pdf.

93 Metropolitan Transportation Commission. (2011, May). "Freeway Performance Initiative: Regional System Efficiency and Integration in the Works." Retrieved 9/12/2013 from http://apps.mtc.ca.gov/meeting_packet_documents/agenda_1666/05d_1_FPI_Fact_Sheet_Final_5.2.11.pdf.

94 Minnesota Department of Transportation. (2001, February 1). *Twin Cities Ramp Meter Evaluation: Final Report.* Retrieved from http://www.dot.state.mn.us/rampmeter/pdf/finalreport.pdf.

Georgia

TMCs that are developed for a specific purpose can be used for system management in "normal" conditions and, in fact, can make it easier to add TSO&M infrastructure and facilities later. The Georgia DOT's (GDOT) NaviGAtor management system was originally developed for the 1996 Olympic Games in Atlanta to facilitate incident management, monitor traffic congestion, and dispatch assistance to drivers. Since the Olympics, it has been used as a centralized place to collect and distribute information from the Atlanta metropolitan area. The TMC has been the foundation for several other TSO&M strategies, such as recent ramp metering on Atlanta expressways, the development of high-occupancy vehicle lanes, and the conversion of one of these lanes to a high-occupancy toll lane (as well as the variable pricing on this lane in response to real-time travel conditions).[95]

In the late 1990s, GDOT estimated that five incidents per hour—including accidents, breakdowns, or other exceptional circumstances—occurred on the Atlanta expressway system, causing significant congestion and reducing the system's reliability.[96] The TMC provided a central location to monitor travel conditions and used technology such as variable signage to alert motorists of incidents well in advance, allowing them to select alternative routes or adjust time expectations accordingly. Because of other simultaneous changes to the expressway system, GDOT has been unable to isolate the impact of the TMC.

In conjunction with its TMC, GDOT also operates a Highway Emergency Response Operators (HERO) program. This program is offered in the Atlanta metropolitan area and is funded through a private-public partnership with a major insurance company. The HERO program offers basic motorist assistance in the event of breakdowns and manages incidents that interrupt traffic operations on expressways and major highways, allowing GDOT to monitor and distribute information on traffic congestion as well as alleviate congestion when caused by non-recurring incidents.[97] According to TMC Operations Manager, Ron Boodhoo, the HERO program has made a "tremendous difference [in] reducing response times and incident clearance times."[98]

Resources

California Department of Transportation. Transportation Management Plan Guidelines. (2009). http://www.dot.ca.gov/hq/traffops/systemops/tmp_lcs/files/TMP_Guidelines.pdf.

This report provides guidance on preparing transportation management plans and information about transportation management strategies.

The Federal Highway Administration. (2010). Best Practices in Traffic Incident Management. Available online at: http://ops.fhwa.dot.gov/publications/fhwahop10050/fhwahop10050.pdf.

This study provides a review and assessment of various transportation incident management policies, procedures, and technologies in use in the United States to identify best practices.

Minnesota DOT. (2001). Twin Cities Ramp Meter Evaluation Final Report. http://www.dot.state.mn.us/rampmeter/pdf/finalreport.pdf.

---

95 Metropolitan Transportation Management Center. (1999). *A Case Study: Georgia NaviGAtor- Accurate and Timely Information to Navigate Georgia Roads*. Retrieved 9/12/2013 from http://tmcpfs.ops.fhwa.dot.gov/cfprojects/uploaded_files/11124.pdf.

96 *Ibid.*

97 Georgia Department of Transportation. "HERO Units Overview." Retrieved 9/12/2013 from http://www.511ga.org/hero-overview.html. .

98 Personal communication. (2012, June 15).

In this study, Mn/DOT details the changes in effectiveness of the overall freeway system during a six-week shutdown period mandated by the Minnesota state legislature.

Parsons Brinckerhoff. (2011). Guide to Improving Capability for Systems Operations and Management, SHRP Report S2-L06-RR-2. Available online at: http://onlinepubs.trb.org/onlinepubs/shrp2/SHRP2_S2-L06-RR-2.pdf.

This report offers guidance for implementing TSO&M strategies through imrpoved business practices and organizational architecture at state DOTs.

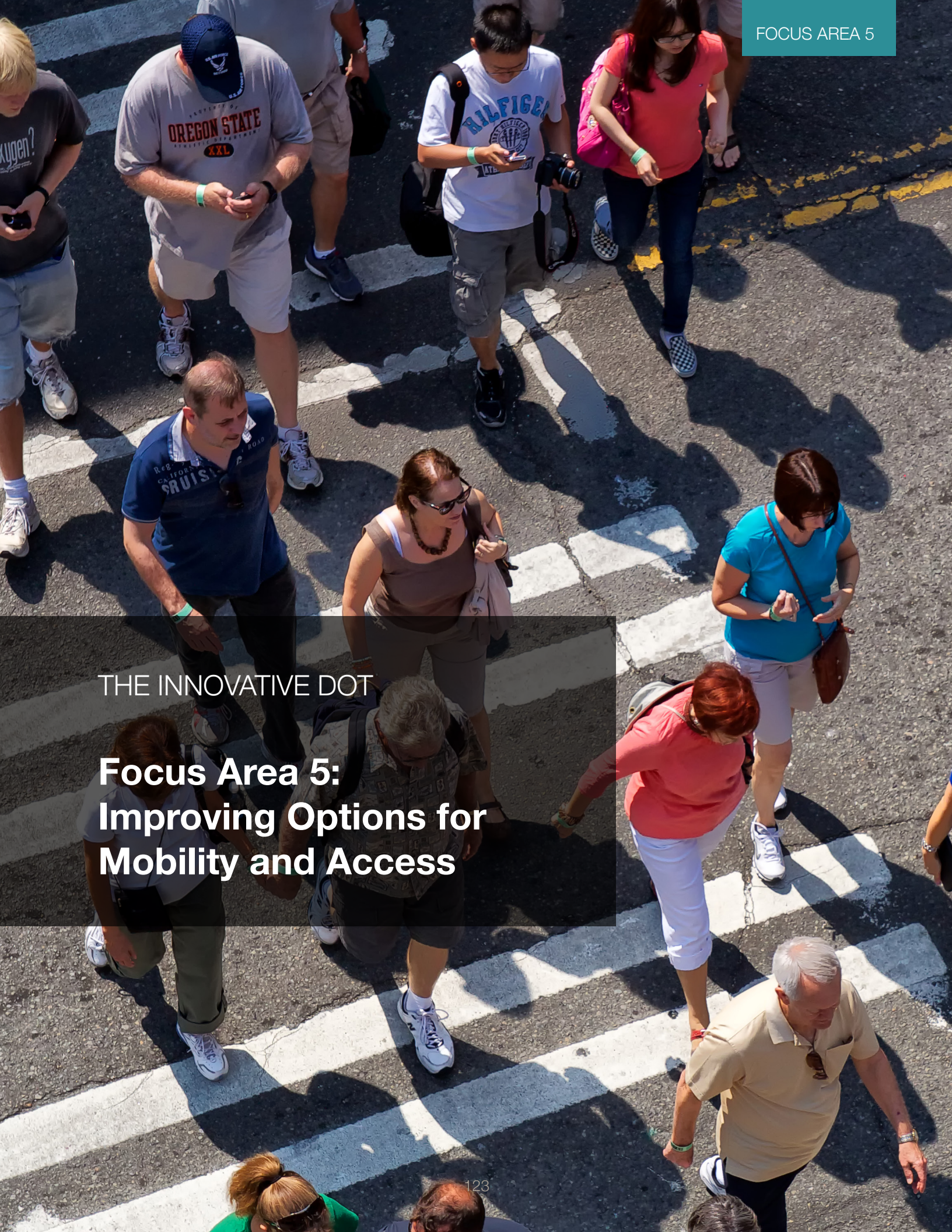
U.S. DOT. (2009). Investment Opportunities for Managing Transportation Performance Through Technology. Available online at: http://www.its.dot.gov/press/pdf/transportation_tech.pdf.

This report provides potential benefits, costs, and ranges of benefit/cost ratios for 15 different categories of system management activities, such as traffic incident management, road weather information systems, and transit signal prioritization.

Victoria Transport Policy Institute. (updated 2010). Least-Cost Transportation Planning: Creating an Unbiased Framework for Transportation Planning, TDM Encyclopedia. http://www.vtpi.org/tdm/tdm21.htm.

This chapter of VTPI's TDM encyclopedia describes least cost planning, how it can be implemented in the realm of transportation, and its benefits, costs, and equity impacts. It also provides case studies and examples of places that use least cost planning for transportation.

This chapter of VTPI's TDM encyclopedia describes least cost planning, how it can be implemented in the realm of transportation, and its benefits, costs, and equity impacts. It also provides case studies and examples of places that use least cost planning for transportation.



THE INNOVATIVE DOT

Focus Area 5: Improving Options for Mobility and Access

Focus Area 5: Improving Options for Mobility and Access

State transportation departments are tasked with improving travel options and experiences for everyone, not just drivers. Sometimes walking, cycling, or public transportation can provide access to destinations more efficiently and cost-effectively than automobiles. These modes are critical to providing access to jobs, school, and other destinations for those who cannot or prefer not to drive.

In this section:

- Make Urban and Metropolitan Transit a Key Partner
- Support Statewide Transit for Job Access and Economic Growth
- Enact Policies That Support Complete Streets
- Provide Leadership in Promoting Bicycle and Pedestrian Travel
- Update Design Policies and Standards

Make Urban and Metropolitan Transit a Key Partner

The Opportunity

In most American cities and metropolitan areas with transit service, stand-alone transit agencies are responsible for funding their own capital projects and operating service, whether through funds generated from their own revenue sources or through assistance from their state legislature, the federal government, or local governments. With very few exceptions, state departments of transportation (DOTs) have not taken on a role of providing transit service.

However, current trends in state DOT budgets are making it clear that states can no longer meet mobility needs predominantly through expanding road and highway capacity, nor does the public want this from DOTs. In a poll led by Transportation for America, over 59 percent of respondents said that increasing transit was the best way to address traffic congestion, instead of continuing to build and expand roads.[1] Americans are even willing to pay for this investment, as evidenced by the ballot measures that have passed in cities and metropolitan areas such as Charlotte, Denver, Dallas, and Los Angeles.[2] By working more closely with their partners in the transit world, DOTs may be able to achieve better system performance with smaller investments and meet their constituents' desire for more choices.

This is not necessarily about state DOTs providing funding for transit—though many do, and it is sometimes the least costly way to solve a transportation problem. Funding aside, basic changes to project development policies and adoption of design standards that better enable state roads to accommodate transit can greatly assist transportation agencies in meeting their service mandates.

What Is It?

Investing in and planning for transit represent relatively new undertakings for many state DOTs. By and large, they focus on roadway infrastructure, both for passenger and freight service, and providing metropolitan and urban transit is not typically one of their core responsibilities. In many states, highway and transit responsibilities are in separate divisions within the DOT In some cases, similar to restrictions on the use of motor fuel taxes, laws prohibit direct DOT sponsorship of or an act of assistance to a transit agency, other than as a distributor of federal transit funding assistance. In the past, DOTs and transit agencies—especially larger transit agencies—pursued projects somewhat independently of one another, sometimes leading to inefficiencies and a lack of coordination that raised project costs or thwarted desired outcomes.

However, most states do provide some state level of funding to transit agencies, in addition to acting as a pass-through for federal funding.[3] Improved partnerships between state DOTs and metropolitan transit can result in both better transit service and a reduced need to provide additional vehicle capacity.

---

1 Transportation for America. (2010, March). *Future of Transportation National Survey.* Retrieved 1/12/14 from http://t4america.org/maps-tools/polling/2010survey/.

2 Conley, L. (June 2012)."Paying for Infrastructure." *American City and County.* Retrieved 8/15/12 from http://americancityandcounty.com/finance/paying-infrastructure.

3 National Conference of State Legislatures. (2011, May). "A 50-State Review of State Legislatures and Departments of Transportation." Retrieved 8/1/12 from http://www.ncsl.org/documents/transportation/FULL-REPORT.pdf.

The key is for the state DOT to better understand and identify where transit offers strategic benefits and mobility potential. As discussed in further detail later in this section, this is possible through a variety of approaches. In some cases, travel demand is concentrated between particular origins and destinations, such as between college towns and larger metropolitan areas, or to and from major employment centers or corridors. The state DOT can focus investment in transit service in these areas—even if it is through assisting a non-DOT agency with operations—to forestall the need for expensive roadway capacity projects to serve a relatively confined travel demand.

DOTs can also focus efforts on strategic highway and street corridors under their purview where transit agencies are already providing service. Many routes that are highly useful for transit service—because of their direct connections between major centers of employment, commerce, and activity throughout cities and metropolitan regions—are controlled by state DOTs, and better design and operation to make transit a convenient and desirable travel option can greatly increase these routes' effectiveness.

Implementation

At its heart, this initiative involves partnerships between transit authorities and state DOTs. Even in the rare cases where state DOTs are also responsible for urban transit operations, such as in Maryland and Delaware, planning for road projects and for transit does not always occur in the same room. Planning and designing road projects with transit in mind involves a paradigm shift away from movement of vehicles and toward movement of people.

Nearly all state transportation agencies were formed from multiple predecessor agencies focused on individual elements of an overall transportations system, such as highways, ports, and aviation. The dominance of automobiles and trucks in American personal and commercial travel patterns has kept highways and roads in the top position in many integrated transportation agencies. Support for transit does not need to mean directly providing transit service, but rather can mean bringing transit to the table in discussing approaches for meeting urban and metropolitan area mobility needs.

Detailed Steps

With this in mind, state transportation agencies can take the following actions:

1. **Align project selection criteria and design principles and standards to include transit as a potential roadway user.** In many cases, the addition of transit service can increase the number of people a transportation facility serves, especially on corridors nearing the limits of their vehicle-carrying capacity and facing the need for capacity expansion.

   Maximizing impact means not only advancing projects that will serve potentially successful transit lines, but also including transit-facilitating features in the project design and ensuring that these features are consistent with the transit agency's operational policies. State roads that will accommodate transit service should be designed and constructed so that transit can use them efficiently; this includes attention to the following elements:

   - Enhanced sidewalks and crosswalks that allow pedestrians appropriate access to transit
   - Bicycle lanes or parallel facilities so that transit's reach to non-motorized travelers can be expanded
   - Auxiliary lanes or other features, such as turn lane storage or enhanced roadway shoulders, that allow buses and other transit vehicles priority at traffic signals and ways to move past long queues of traffic (commonly referred to as "queue jumps")
   - Lanes for exclusive bus use along the full length of a corridor

- Appropriate locations and right-of-way for enhanced stops and stations, recognizing in particular the needs of passengers waiting for service and for transit vehicles to re-enter roadway traffic once they have completed a stop
- Designing and timing traffic signals to prioritize bus movement at intersections. In its most basic form, this may entail the use of queue jump lanes to allow a bus or other transit vehicle to reach the front of a traffic queue, although more advanced systems of signal priority feature two-way communication between signal equipment and transit vehicles.

2. **Identify the gaps in the cost of transit-enhanced DOT projects and available funding.** This is the key to avoiding a 'go-it-alone' strategy that forces state DOTs and transit agencies to spend different amounts of money on separate projects serving separate travel purposes when pooling resources would actually provide a greater benefit. Adding transit facilities to a state infrastructure project may increase that project's cost, but it is likely that the incremental increased cost would be less than what a transit agency would spend on new capital construction for premium transit routes. Working with the transit agency to determine funding gaps, state DOTs can provide the additional necessary funding to transit agencies as a cost-sharing opportunity and a relatively low-cost way to advance a transit project.

3. **Provide technical assistance to transit agencies to determine appropriate facilities.** In the case of smaller transit agencies, a state DOT already has an oversight role in how some operational funding is used (specifically funding provided by the federal government). The DOT can provide helpful technical services to allow the transit agency to make better decisions on where to focus its resources for corridor improvements and service enhancements. These technical services include transit demand modeling and forecasting, traffic simulation, and traffic signal timing support. Modeling and forecasting services in particular can be useful to a transit agency determining the potential for transit use and where the most effective projects may be advanced.

4. **Provide direct highway access to transit facilities.** Providing this access allows a DOT to utilize the capacity already offered by a transit system and conserve resources by shifting auto travel to transit within a corridor. It also offers the potential for increased transit ridership, which allows transit agencies to recover a greater share of their costs for a given level of service provided. Interchange and ramp projects from regional expressways to transit stations with parking facilities are one way to provide this access. The Atlanta region, for example, provides direct freeway ramp access from the Georgia 400 expressway to the MARTA North Springs station's park-and-ride facility, and the Washington, DC, region has a comparable example, with its direct ramp access to the Greenbelt Metro rail station.

Case Study

Greater Washington, DC Region

The Washington Metropolitan Area Transit Authority (WMATA) has developed a plan for a network of enhanced bus routes (the Priority Corridors Network, or PCN) that, because of the multi-state nature of the Washington region, uses state arterial roads to carry transit service.[4]

4 Washington Area Metropolitan Transit Authority. (2011). *Priority Corridor Network Plan*. Retrieved 9/19/13 from http://www.wmata.com/pdfs/planning/110926_PCN_Report_Final.pdf.

Priority bus service was a topic of discussion in the Washington region for several years prior to the formal development of the PCN, but insufficient funding from WMATA and a lack of targeted focus from state agencies kept the idea largely confined to a conceptual understanding. Perhaps the most significant move toward implementation of the idea was WMATA's receipt of a Transportation Investment Generating Economic Recovery (TIGER) grant in 2009 for a variety of projects that will make priority bus operations along surface arterial roads competitive with vehicle travel. Implementing these TIGER grant-funded improvements has required partnership with the various state DOTs that control the roads in the PCN.[5]

The TIGER grant covered a range of proposed improvements, including:[6]

- **Wisconsin Avenue Bus Priority Improvements (street controlled by the DC Department of Transportation).** Capital improvements include transit signal priority at multiple intersections and real-time bus arrival display technology at select express service stop locations. The amount awarded from the TIGER grant was approximately $700,000.

- **Addison Road Improvements (road controlled by Maryland State Highway Administration (SHA)).** This includes upgrades to bus shelters along the existing WMATA P12 bus route with real-time arrival prediction displays at bus stops. The amount awarded from the TIGER grant was approximately $200,000.

- **University Boulevard Bus Priority Improvements (road controlled by Maryland SHA).** Improvements include four queue jump lanes, transit signal priority at nearly 20 intersections, and a number of bus stop enhancements, such as real-time arrival prediction displays. The amount awarded from the TIGER grant was approximately $1.3 million.

- **U.S. Route 1 Bus Priority Improvements (road controlled by Maryland SHA).** Capital improvements include queue jump lanes and transit signal priority at multiple intersections. The TIGER grant amount was just under $1 million.

- **Viers Mill Bus Priority Improvements (road controlled by Maryland SHA).** Capital improvements include a queue jump lane and real-time bus arrival displays at several stations along the route. The amount awarded from the TIGER grant was approximately $300,000.

- **Potomac Yard Transitway (road controlled by the Virginia DOT).** One of the largest individual corridor enhancements in the TIGER package, this includes the design and addition of a bus transit-way in the median of U.S. 1 within Alexandria's city limits, providing exclusive right of way for buses. While additional funding is needed to fully construct the proposed passenger amenities, the bulk of this TIGER grant amount (approximately $8.5 million) has been dedicated to the transit-way.

- **VA 7 (Leesburg Pike) Bus Priority Improvements.** Improvements include real-time arrival displays at several express service bus stops and transit signal priority at a number of intersections along the corridor. The TIGER grant amount was approximately $1.3 million.

5 Metropolitan Washington Council of Governments. "$59 million TIGER Grant Awarded to the National Capital Region." Retrieved 9/19/13 from http://www.mwcog.org/uploads/committee-documents/lV1eW15d20120207152335.pdf.

6 *Ibid.*

The Maryland SHA has voiced its support for this collaboration,[7] with specific roadway enhancements to include timing traffic signals to prioritize buses using the PCN and constructing queue-jumper lanes and facilities so buses may continue to achieve timely operations. Coordination between SHA and WMATA to design and implement these improvements is ongoing at the time of this publication, with completion expected in 2013.

Resources

Cambridge, Massachusetts: Cambridge Systematics, Inc. Requested by the American Association of Highway and Transportation Officials. (2006, April). The Role of State DOTs in Support of Transit-Oriented Development. http://www.fta.dot.gov/documents/Project_25-25_Task_20_final_report.pdf.

The research described in this report addresses the role that state DOTs can play in supporting transit-oriented development.

Chrisholm-Smith, G. (2011, September). Research Results Digest 361: State DOT Public Transportation Performance Measures: State of the Practice and Future Needs. National Cooperative Highway Research Program. Transportation Research Board: Washington, DC. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rrd_361.pdf.

This report provides a survey of state DOTs using transit performance measures to inform investments and decision-making. It also provides a summary of best practices and case studies.

Ehl, L. (2011, November 28). "Innovations—State DOT and Transit Agency Partner to Ease Congestion, Increase Transit Use." Transportation Issues Daily. http://www.transportationissuesdaily.com/innovations-state-dot-and-transit-agency-partne/.

This article describes the Interstate 55 Bus-on-Shoulder Demonstration Program, a pilot program in the Chicago area that would convert shoulders on the interstate to express bus lanes during heavily congested times of day to improve transit service. The program involves a partnership between the Illinois DOT, the Regional Transportation Authority, and Pace Suburban Bus. For more information, see the program website: http://www.dot.il.gov/busonshoulder/index.html.

Kennedy, S. & Eichler, M. Transit-Oriented Development and Bus Rapid Transit: Improving Lives, Improving Communities. http://www.vhb.com/SiteObjects/published/4FCC5B454FF7253000FE9B66206DA365/2BA35AC57A40C7997466E5A055E3634F/file/PCN%20Conference%20Paper_Lambert.pdf.

This white paper discusses strategies for corridor improvement from the WMATA's Priority Corridors Network, in which both Maryland's and Virginia's state transportation agencies have played a role.

Wisconsin DOT Programs for Local Governments—Public Transportation. Retrieved 8/7/12 from http://www.dot.wisconsin.gov/localgov/transit/index.htm.

This website describes a number of funding assistance programs the Wisconsin DOT offers to local governments to support the provision of transit.

7 Maryland Department of Transportation, State Highway Administration. (2010, February 5). Letter from Maryland State Maryland Department of Transportation, State Highway Administration. (2010, February 5). Letter from Maryland State Highway Administrator Neil Pedersen to Diana Zinkl, Chair of the Riders' Advisory Council. Retrieved 9/19/13 from http://odd.greatergreaterwashington.org/files/2010/shapcnresponse.pdf. This letter of support for the corridor from Maryland State Highway Administrator Pedersen mentions signal priority and congestion management projects on PCN arterials as key strategic approaches to modifying state highways to better serve transit operations.

Support Statewide Transit for Job Access and Economic Growth

The Opportunity

States have a great deal to gain from seamless public transportation between cities, in rural areas, and between rural areas and cities. While state transportation agencies have traditionally focused on roadway projects, public transportation investments can often be the most efficient and cost-effective way to improve intercity and rural travel for both riders and drivers. Intercity and rural transit provides job access for those who do not drive — currently 30 percent of Americans[8] — as well as access to hospitals, schools, shopping, and social services for those who cannot or choose not to drive, or cannot afford to drive.

By operating separately from transit providers, most state DOTs miss opportunities to integrate different transportation modes that support intercity and rural transit. Partnering with regional transit authorities, intercity bus providers, and Amtrak to provide better-integrated transit service between cities and along corridors will encourage local and long-distance transit travel with more frequent and reliable service, relieving pressure on highways and improving travel options for residents in rural areas.

What Is It?

States can support intercity and rural transit by directly funding rail and bus systems, by providing technical assistance to small city and rural transit agencies, and by coordinating service providers. Strategies will vary by state according to structural, legislative, and funding contexts. States that already hold some control over the funding or operations of transit systems will have more autonomy and flexibility to work with transit agencies, whereas other states will need to build solid partnerships between roadway and transit authorities. In most cases, state DOTs will first need to modify their practices to integrate transit into the decision-making process. Specific policies that can support intercity transit development include the following:

Partnering with regional transit authorities, intercity bus providers, and Amtrak to better integrate transit service. State DOTs can coordinate activity between public transportation service providers across the state. In many cases, it is helpful for the state to act as a central database for statewide transit information and contacts. States can also provide a central source of information about public transportation to help riders who use multiple systems and lead efforts to coordinate fare payment with a universal pass program. In addition, through direct contracts with private transportation providers, states can help bridge gaps in a statewide network.

Supporting development around intercity passenger rail and bus stops. To maximize the economic potential of public transportation investments, states and local municipalities should actively encourage development around rail and bus stations and create incentives to attract job creation and housing within walking distance. For example, it is often necessary to provide parking for rail and bus stops, and most states have found it helpful to construct structured parking to preserve land area for private development. States can partner with local public and private organizations to directly fund parking construction. They can also work with local agencies to identify ways to improve roadway and non-roadway access in the station area.

8 Federal Highway Administration. (2010, January). "2009 National Household Travel Survey." Retrieved 8/21/12 from http://nhts.ornl.gov/publications.shtml.

Using conventional DOT funds for roadway projects that support transit. State DOTs that are not directly involved in transit operations can still provide and enhance highway connections to intermodal hubs and use highway and automobile capacity-based funds to provide parking.

Directing funding or in-kind assistance to transit providers. States can support intercity transit by committing operating funds, purchasing existing rail tracks and right-of-way, or purchasing new right-of-way for dedicated transit alignments.

Implementation

For some state DOTs, direct involvement in transit may be perceived as an expansion of their scope of work, and may therefore require high-level policy reform. If reform only requires DOT action, the transportation executive can allow the DOT to collaborate on transit activities or authorize a particular reform. If state legislative action is required, the transportation executive should work together with key political actors, including the governor and members of the state's transportation legislative committee.

Once the framework is established and the state's role in transit is recognized, states can support intercity transit projects by taking the following steps:

- **Modify policy to officially recognize the role transit plays in the greater transportation system.** This should identify areas near transit stations and along transit corridors where critical access to existing transit infrastructure is currently lacking, and adopt evaluation and decision-making metrics that favor projects in those areas that improve transit access (such as infrastructure to support walking and biking).

- **Identify and implement a funding mechanism for transit projects.** It is important to anticipate the costs of intercity transit and to secure funding for activities such as improving station areas, building intermodal facilities, assisting with direct operating costs for improved service, and coordinating activities between state partners.

- **Convene public and private transit providers and develop a statewide framework for interagency operations.** It may be necessary to create an independent, statewide transit authority to oversee this work.

Case Studies

Maine: Intercity Transit Spurs Economic Development

The Northern New England Passenger Rail Authority (NNEPRA)[9] was created by state legislative action in Maine in 1995, at the request of former Governor Angus King, Transportation Commissioner John Melrose, the state Chamber of Commerce, the Maine DOT, and local business leaders, to establish and operate modern passenger rail in the state. This action was in response to a citizens' initiative known as TrainRiders/Northeast, which collected 90,000 signatures calling for passenger rail service between Portland and Boston.[10]

Intercity passenger rail was viewed as an important symbolic and logistic connection with Boston, the economic center of New England. Even those who did not use the rail themselves viewed it as a key

9 Amtrak. "About NNEPRA." Retrieved 8/22/12 from http://www.amtrakdowneaster.com/about.

10 Pence, H. A. "The People's Train: Amtrak's Downeaster." Community Transportation Association. Retrieved 8/21/12 from http://web1.ctaa.org/webmodules/webarticles/articlefiles/Amtrak_Downeaster.pdf.

link to southern New England, which attracted investment in Portland and throughout the southern Maine coast.

Today, NNEPRA is responsible for marketing, food service, and station-area activities, and negotiates with Amtrak to operate the trains. Funding for NNEPRA comes through ticket revenue and state and federal support. Though the service runs through New Hampshire and Massachusetts, only Maine contributes direct funding. Local municipalities are responsible for maintaining and operating transit stations.

The Amtrak service, known as the Downeaster, has spurred development since service began in December 2001. The following stations have experienced significant growth and economic activity[11]:

- Old Orchard Beach, Maine. Traditionally only a seasonal destination, it is now home to a new $22 million residential and retail complex with over 800 new housing units for year-round residents and shoppers.
- Biddeford-Saco, Maine. Downtown Biddeford-Saco is being renovated with $300 million in development projects underway within walking distance of the Downeaster train station. New retail, office, residential, and restaurant facilities are built or are under construction, including a $2.2 million "green" transportation center that is home to the Biddeford-Saco Chamber of Commerce.
- Dover, New Hampshire. Transit-oriented development is occurring around the station and the state moved the Children's Museum from Portsmouth to Dover to be walking distance of the station.
- Durham, New Hampshire. The University of New Hampshire spent over $900,000 to renovate the historic train station to better serve passengers and students, and promotes the service as an asset to prospective students.

NNEPRA is planning to expand the service north of Portland to Freeport and Brunswick, two communities that have requested intercity transit service to encourage economic development, and is currently spending $44 million on capital improvements to the transportation system for this expansion.[12] In anticipation of the new service, Brunswick developers are investing more than $30 million in the Maine Street Station Complex, which includes a train station, restaurants, retail shops, office space, medical center, and a 52-room inn. In Freeport, a passenger platform will be constructed within walking distance of the popular shopping strip centered on the L.L Bean flagship store. A $2.5 million theater is being planned adjacent to the station site.[13]

Finally, the Downeaster service has reduced regional traffic congestion, and highway maintenance needs by shifting trips from the highway to the regional transit service.

The NNEPRA model is a realistic option in most states, though the time requirements should be acknowledged at the outset. In Maine, it took six years from the legislative action to the point where service was operational, and the investment described here occurred primarily over the next ten years.

---

11 Northern New England Passenger Rail Authority. (2011). *Building a Stronger Future.* Retrieved 8/20/12 from http://www.nnepra.com/sites/default/files/3.11BuildingStrongerFuture.pdf.

12 Atlantic Northeast. (2000). *Rails & Ports*. Retrieved 9/19/13 from http://atlanticnortheast.com/onl/iss/i020103_175053.pdf.

13 Northern New England Passenger Rail Authority (2011). *Building a Stronger Future*. Retrieved 9/19/13 from http://www.nnepra.com/sites/default/files/3.11BuildingStrongerFuture.pdf.

Wisconsin: The DOT Role in Supporting Intercity Transit

Along with the federal government, WisDOT has begun subsidizing intercity bus routes to cover shortfalls between revenue projections and operating costs. This is intended to provide mobility options between smaller population centers, such as Wausau and Green Bay, Wisconsin, and Dubuque, Iowa.

WisDOT is funding this bus service expansion through its Intercity Bus Assistance Program, established in recent legislation (Wisconsin Statutes 85.26) and inaugurated in early 2011. The legislation enabled WisDOT to provide direct subsidy assistance to private operators to maintain mobility options across the state, especially to smaller population centers and rural areas.

WisDOT understood that private intercity providers manage established route networks and retain knowledgeable operations staff, and that service quality declines when these routes are not profitable. Assisting these organizations helps maintain options for intercity travel, especially for people without access to private automobiles, and in the long term reduces demand for vehicle trips.[14]

Resources

Lewis, C. A., Higgins, L., Perkins, J. Zhan, F. B., & Chen, X. (2009, January) Regional Transit Coordination Guidebook. Texas Transportation Institute: College State, Texas, and the Center for Transportation Training and Research, Texas Southern University: Houston, Texas. Available at http://tti.tamu.edu/documents/0-5345-P1.pdf.

> This guidebook provides tools, strategies and organizational structures for improving coordination between transit providers, based on success stories from regions across the country.

Kapper, J. (2010, December). "Wisconsin Intercity Bus Assistance Program." Grassroutes: A Wisconsin Rural and Specialized Transportation Newsletter, Volume 22, Number 4. http://www4.uwm.edu/sce/resources/cted/grassroutes/Grassroutes_December_2010.pdf.

> This program supports intercity bus service in the state and allows WisDOT to work with providers of intercity bus service and/or give grants to "political subdivisions" in support of intercity routes, instead of providing assistance only to local governments.

The Greater Portland Council of Governments and The Southern Maine Regional Planning Commission. (2007, May). Regional Transit Coordination Study. http://www.gpcog.org/home/RegionalTransitCoordinationStudy.php.

> This study explores strategies for better coordination between regional transit providers in the greater Portland, Maine, region to reduce costs and improve transit service, connections, and transfers, and provide information to riders.

U.S. DOT. (2011, September). Transit at the Table III: Washington Case Study. http://www.planning.dot.gov/documents/TransPlanning/TAT_III_CaseStudy_WA.pdf.

> This paper provides a case study of how rural transit agencies throughout Washington work with the Washington State DOT to plan rural transit. Because of the DOT's innovative funding strategy, the intercity bus service provides the "backbone" of transportation service in the state.

14 Kapper, J. (2010, December). "Wisconsin Intercity Bus Assistance Program." *Grassroutes: A Wisconsin Rural and Specialized Transportation Newsletter,* Volume 22, Number 4. Retrieved 7/20/12 from http://www4.uwm.edu/sce/resources/cted/grassroutes/Grassroutes_December_2010.pdf.

Enact Policies That Support Complete Streets

The Opportunity

Complete Streets policy initiatives offer a clear and popular route for state DOTs to begin systematically considering the needs of diverse road users in their own projects and in their work with other jurisdictions. Examining and modifying standard practices to ensure that projects include safe accommodation for users of all ages and abilities nets clear safety gains. Complete Streets policies also help a state DOT meet citizen demand for non-motorized and public transportation access under its existing budget. Integrating the needs of all road users across all departmental activities provides opportunities to make small changes in routine operations that will result in significant improvements at minimal or no cost.

Thoughtful Complete Streets policy initiatives are generally strongly supported by citizens and political leaders, who then become allies and resources throughout the implementation process. Many smaller communities are also supportive of Complete Streets policies because they support main street revitalization plans. In Washington State, careful implementation of a main street focused policy was found to reduce project delays, saving an average of $9 million per project.[15]

National, state, and local polls show strong, consistent support for ensuring that transportation projects include all modes; in fact, respondents generally support allocations for non-motorized and transit access at far greater than current levels.[16] Such support can translate into financial support when funding measures come up for either a popular vote or for consideration in the legislature. This support applies not only to special measures for specific projects, but also to support for core programs. Including all users in transportation projects broadens the range of constituents who will take action to support increased transportation funding, and it can also make such projects more competitive for funding from some sources.

What Is It?

State DOTs traditionally focus on improving the movement of motor vehicles over long distances, and historically have set and used standards and procedures that preclude consideration of other road users. Yet many, if not most, state roads are also used by people walking, riding bicycles, and using public transportation vehicles or school buses. This is particularly true in urban areas and along small town main streets. State DOT practices that are not responsive to these road users cause safety problems, project delays, and citizen opposition.

Over half of the states have adopted Complete Streets policies through legislative action or internal departmental directives.[17] At its core, a Complete Streets policy is a simple declaration that all future projects undertaken by an agency will seek to accommodate all users of the roadway; it doesn't necessarily have to use the term Complete Streets. Often the policy lists the users, including people of all ages and abilities who are walking, riding bicycles, driving, and catching public transportation, and notes the specific modal needs of public transportation and freight vehicles. Policies should aim

15 Washington Department of Transportation. (October 2009). "State highways as main streets: a study of community design and visioning." Retrieved 9/19/13 from http://www.wsdot.wa.gov/research/reports/fullreports/733.1.pdf.

16 National Complete Streets Coalition. (2011). "Transportation costs." Retrieved from http://www.completestreets.org/complete-streets fundamentals/factsheets/transportation-costs/.

17 National Complete Streets Coalition. (2011). "Complete Streets Policy Atlas." Retrieved 9/19/13 from http://www.smartgrowthamerica.org/complete-streets/changing-policy/complete-streets-atlas.

to change the mindset of everyday decision-making, so that all users are assumed to be present and expected to be safely accommodated along the corridor, with limited and explicit exceptions.

Beyond that core commitment to serve all users, successful policies include a compelling vision; language that directs best practices in issues such as design, network connectivity, and performance measures, and provides some structure for implementation. The development of the policy itself should be inclusive of both the public and the practitioners who will be implementing it. Often a very general policy passed by a state legislature is followed by a more detailed policy document from the DOT, such as a new design manual or new project development processes.

Implementation

The clarity and simplicity of a Complete Streets policy gives strength and direction to an implementation process that involves changing everyday procedures and practices inside a transportation agency. The innovation of Complete Streets is not in new designs, but in new ways of doing business and making decisions. Agencies with successful Complete Streets policies have reexamined their day-to-day procedures and changed them to ensure the needs of all users are taken into account as a matter of course. They have offered educational opportunities to personnel in how to achieve a balance for the mix of users on a particular street. They have usually made changes to design manuals, and they are coming up with new ways to measure the success of their transportation projects.

Implementation can be roughly categorized into five areas of action. These categories overlap; agencies may pursue activities in several concurrently, or they may focus more heavily on one aspect at a time. Undertaking activities in each of these categories will ensure routine, on-the-ground changes and institutionalization of the Complete Streets approach.

Structuring Implementation: Undertaking activities to assess current procedures and activities, and to plan for the full implementation of Complete Streets.

Once a Complete Streets policy is adopted, an agency can focus on the changes required inside a transportation agency to routinely account for the needs of all users. Many policies include a strong role for an advisory committee and/or designation of an internal champion. Some policies include reporting requirements and deadlines; this step may also include a benchmarking audit of current policies and processes, to determine if anything needs to be updated to reflect the Complete Streets directive. Some agencies have written detailed implementation plans, setting timelines and responsibilities across the department. Though this step is listed first, it can happen concurrently with other activities and over time.

Changing Processes and Procedures: Restructuring or revising related procedures, plans, regulations, and other processes to accommodate all users on every project. This includes incorporating Complete Streets into plans as they are updated, changing internal processes to support Complete Streets activities and related initiatives, modifying state aid standards and rules, shifting the cost burden for sidewalk construction from municipalities and/or modifying procedural documents such as checklists and decision trees.

Thorough implementation requires a review of current project development procedures, and may include the creation of new procedures, project-level checklists, and exceptions processes. For example, procedural changes may revise maintenance and operations procedures to help identify low-cost projects that can be completed within the existing scope of work. In many cases, agencies also initiate outreach beyond the departments immediately responsible for a project; this includes

cross-departmental collaboration or team creation to ensure all projects address the needs of all users, more collaboration with local and regional transportation agencies that may also be implementing local Complete Streets policies, and more sophisticated and on-going public involvement.

Reviewing and Updating Design Guidance: Updating or adopting new design guidance and standards that reflect current best practices in providing multimodal mobility.

A key activity under this step is to identify and address any design specifications that currently act as a barrier to creating multimodal projects. While some agencies, such as the Massachusetts DOT, have undertaken extensive re-writes of design manuals, much can also be achieved by using existing national resources, such as the latest guidance from AASHTO, or by encouraging a more flexible use of existing guidance. A number of innovative model design manuals are now available, including those issued by the Institute of Transportation Engineers and the National Association of City Transportation Officials.

Providing Training and Educational Opportunities: Offering workshops and other educational opportunities to transportation staff, community leaders, and the general public so that everyone understands the importance of the Complete Streets vision and the part they play in its implementation.

For state DOTs, instilling this knowledge across a large agency is a challenge that may require a formal training system reaching employees working across the state. Also, training is about far more than just helping engineers learn how to incorporate bicycle and pedestrian facilities into road projects. Planners, engineers, consultants, and other agencies need a thorough understanding of new procedures and an understanding that a multimodal approach has become core to their agency's mission. Often the best messengers during the training process are those within the same profession: engineers need to hear directly from other engineers, planners from other planners.

The education process should also include elected officials and the general public, who need ongoing engagement to understand how the general policy goal will be translated into projects on the ground. The public may support the concept of Complete Streets, but residents will have questions once the project is on their street or in their neighborhood.

Measuring Performance: Developing and instituting ways to measure progress and performance and collecting and disseminating data on how the streets are serving all users.

Measuring the impact of a Complete Streets policy is essential to its ultimate success, yet the development of new performance measures often lags behind other activities. Agencies may discover they have few existing tools to measure whether their network is becoming more multimodal. Some agencies stick to relatively simple measures, such as the number of facilities built; others create new questions in customer satisfaction surveys. Agencies can also measure safety improvements and mode splits. They can cooperate with local officials to document economic gains on newly redesigned main street highways. An important motivator for developing new performance measures should be their use in communicating with the public about the purpose and efficacy of the Complete Streets policy and showing the multiple benefits received from investing in projects that follow that policy.

Case Studies

Over half the states have adopted some form of a Complete Streets policy.[18] High-quality state Complete Streets policies are noted in the annual Complete Streets Policy Analysis report, and news about state Complete Streets activities can be found in the National Complete Streets Coalition's publications.

Massachusetts

Massachusetts was among the first states to require its state DOT to build every transportation project with all users in mind, through a simple two-sentence law passed in 1996.[19] The state initially struggled with the meaning of the law, issuing a too-prescriptive directive the following year that laid out very specific methods of accommodation, with little regard to context or need. Though several later documents provided further guidance, there was still a strong desire for more flexible design that responded better to community needs.

In April 2003, Governor Mitt Romney formed the Highway Design Manual Task Force as one part of a larger initiative to provide communities with more flexibility and input into transportation projects. Comprising representatives from municipalities, MPOs, advocacy groups, professional organizations, and state agencies, the Task Force sought to develop a new design guide. Though Governor Romney had requested a final version by October 1, 2003, the magnitude of the project forced a delay in its release until January 2006.

Three guiding principles emerged in the process: multimodal consideration, context sensitive design and a clear project development process. Here's an excerpt:

> Multimodal Consideration. to ensure that the safety and mobility of all users of the transportation system (pedestrians, bicyclists and drivers) are considered equally through all phases of a project so that even the most vulnerable (e.g., children and the elderly) can feel and be safe within the public right of way. This includes a commitment to full compliance with state and federal accessibility standards for people with disabilities.

These goals helped to shape the final document, the Project Development and Design Guide.[20] Throughout, the guide takes the approach that non-motorized modes are fundamental to the transportation network, and all modes—bicyclists, pedestrians, public transportation, and motorists—are integrated in every aspect of design.

Yet full implementation of the principles in the award-winning guide has been slow, and in 2012, Massachusetts worked with consultants and the National Complete Streets Coalition to provide three- and six-hour training sessions across the state for state and local engineers, planners, and consultants.[21] The workshops highlighted specific language in the guide and provided examples, a chance for discussion, and field exercises.

Complete Streets has become an important element in continuing support for transportation funding in Massachusetts. Discussion in the state senate of a $250 million bond for road repairs in 2011 included a proposal for a Complete Streets fund; the fund was not included, but lawmakers emphasized that

18 National Complete Streets Coalition. "State-Level Complete Streets Policies." Retrieved 8/4/12 from http://www.completestreets.org/webdocs/policy/cs-state-policies.pdf.

19 *Ibid.*

20 Massachusetts Department of Transportation. (2006, January). *Project Development and Design Guide*. Retrieved 9/19/2013 from http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/ManualsPublicationsForms/ProjectDevelopmentDesignGuide.aspx.

21 UMass Transportation Center. (2013, November). "Baystate Roads Program/Browse Workshops" webpage. Retrieved 11/22/13 from http://baystateroads.eot.state.ma.us/workshops/.

they expected to see a Complete Streets approach integrated across the agency's projects.[22] It has also been a key part of the state's GreenDOT sustainability initiative.[23]

California

Caltrans first directed the full accommodation of bicyclists and pedestrians in 2001 with the adoption of Deputy Directive 64, in part to comply with guidance drafted by FHWA under the federal transportation law TEA-21. Advocates in the state kept Complete Streets in the spotlight by pushing for passage of state law AB 1358, which requires local governments to include Complete Streets policies when they update their general plans, in 2008.[24] Also that year, Caltrans updated its policy to include transit and users of all ages and abilities, and to incorporate some other advances of the Complete Streets movement.

A core statement in DD64-R1 is "The Department views all transportation improvements (new and retrofit) as opportunities to improve safety, access, and mobility for all travelers and recognizes bicycle, pedestrian, and transit modes as integral elements of the transportation system."

After delays caused by budgetary issues and personnel turnover, Caltrans has pursued a very deliberate implementation process, creating a 73-step Action Plan[25] in 2010 that focuses on seven areas of implementation:[26]

1. Highest Focus Areas (design manual and project development manual revision)
2. Guidance, Manuals, and Handbooks
3. Policy and Plans
4. Funding and Project Selection
5. Raising Awareness
6. Training
7. Research

The state is producing a number of revised guides and manuals and has already issued a new Complete Intersections Guide,[27] a comprehensive and easy-to-follow tool that identifies actions that will improve safety for pedestrians and bicyclists at intersections and interchanges. Caltrans also commissioned a review of the potential for bicycle and pedestrian performance measures. An update to the state's Highway Design Manual that fully integrates Complete Streets is expected in 2012.[28] The state points to a number of recently completed projects:[29]

---

22 *Belmont Citizens-Herald*. (2011, March 28). "Road Fix Bill Advances." Retrieved 8/6/12 from http://www.wickedlocal.com/belmont/newsnow/x1608500490/Road-fix-bill-advances.

23 Massachusetts Department of Transportation. (2012). "GreenDOT." Retrieved 8/22/12 from http://www.massdot.state.ma.us/greendot.aspx.

24 National Complete Streets Coalition. "State-Level Complete Streets Policies." Retrieved 8/4/12 from http://www.completestreets.org/webdocs/policy/cs-state-policies.pdf.

25 California Department of Transportation. (2010, February 21). "Complete Streets Implementation Action Plan." Retrieved from http://www.dot.ca.gov/hq/tpp/offices/ocp/complete_streets_files/CompleteStreets_IP03-10-10.pdf.

26 California Department of Transportation. (2010, February). Complete Streets Implementation Action Plan: Implementation of Deputy Directive 64-R1: Complete Streets - Integrating the Transportation System. Retrieved 8/4/12 from http://www.dot.ca.gov/hq/tpp/offices/ocp/complete_streets_files/CompleteStreets_IP03-10-10.pdf.

27 California Department of Transportation. (2010). *Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians.* Retrieved 8/20/12 from http://www.dot.ca.gov/hq/traffops/survey/pedestrian/Complete-Intersections-A-Guide-to-Reconstructing-Intersections-and-Interchanges-for-Bicyclists-and-Pedestirans.pdf.

28 California Department of Transportation. Complete Streets Program website. Retrieved 8/6/12 from http://www.dot.ca.gov/hq/tpp/offices/ocp/complete_streets.html.

29 National Complete Streets Coalition. (2012, March 14). "Caltrans is Completing the Streets!" Retrieved 8/6/12, from http://www.completestreets.org/policy/state/caltrans-is-completing-the-streets/.

- A half-million dollar project to convert a four-lane undivided segment of State Route 225 in Santa Barbara to two lanes, with a new center turn lane and bike lanes.

- A partnership between Caltrans and the City of Arcata to make pedestrian and bicycle improvements on the Samoa Gateway project on State Route 255.

- The Mission Gorge Road detour in Santee, where Caltrans considered the needs of non-motorized users during construction by having staff pedaled bikes on the proposed detour to ensure it minimized out-of-direction travel before directing the public there. The cost of providing the detour, including a bike lane and signage, amounted to a fraction of the total project cost and increased work zone safety.

Resources

California Department of Transportation. (2010). Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians. http://www.dot.ca.gov/hq/traffops/survey/pedestrian/Complete-Intersections-A-Guide-to-Reconstructing-Intersections-and-Interchanges-for-Bicyclists-and-Pedestirans.pdf.

The Caltrans Complete Intersections Guide provides guidance for designing intersections to accommodate all travelers.

California Department of Transportation. (2012). Complete Streets Program website. http://www.dot.ca.gov/hq/tpp/offices/ocp/complete_streets.html.

The Caltrans Complete Streets page provides an overview of Complete Streets at Caltrans, including links to relevant plans and design guidance.

Massachusetts DOT. (2006). Project Development and Design Guide. http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/ManualsPublicationsForms/ProjectDevelopmentDesignGuide.aspx.

This guide serves as a national model for road and bridge development.

McCann, B. & Rynne, S. (2010). Complete Streets Best Policy and Implementation Practices. American Planning Association Planning Advisory Service. http://www.planning.org/apastore/Search/Default.aspx?p=4060.

This report is the most comprehensive resource available, with 33 case studies.

Minnesota DOT website. Complete Streets in Minnesota. http://www.dot.state.mn.us/planning/completestreets/.

MnDOT's Complete Streets page provides an overview of efforts to date to implement state Complete Streets legislation and the development of an internal policy for the DOT.

National Complete Streets Coalition. (2011). State-Level Complete Streets Policies. http://www.completestreets.org/webdocs/policy/cs-state-policies.pdf.

This table lists all state-level Complete Streets policies, with links.

National Complete Streets Coalition: Workshops. http://www.completestreets.org/workshops.

The coalition offers workshops for agency personnel aimed at introducing the Complete Streets concept, developing policy language, and implementing a policy.

New Jersey DOT. (2012). Complete Streets. http://www.state.nj.us/transportation/eng/completestreets.

NJDOT Complete Streets page provides an overview of efforts to implement the DOT's internal policy directive, including video and resources for local governments.

Seskin, S. & McCann, B., National Complete Streets Coalition. (2012). Complete Streets: Local Policy Workbook. http://www.completestreets.org/webdocs/resources/cs-policyworkbook.pdf.

Local Policy Development Workbook: While aimed at local governments, this workbook gives a detailed look at ideal Complete Streets policy language with many examples. A state level model policy guide is under development by the American Association of Retired Persons the National Complete Streets Coalition.

Provide Leadership in Promoting Bicycle and Pedestrian Travel

The Opportunity

Providing bicycle and pedestrian accommodations is inexpensive for local governments and state DOTs compared to the cost of roadway construction and maintenance, and is a good way to improve local economies. Where facilities are good and land uses relatively compact, these modes can relieve congestion, reduce the need for car parking, possibly forestall future road expansion, and allow more land to be used for housing, commercial, and retail space instead of parking, thereby boosting the tax base. They can also provide links to work and other destinations for those who cannot or choose not to drive.[30] Safe and convenient bicycling and walking are essential to a good transit system; many transit users begin or end their journeys with biking and walking trips that make use of crosswalks, sidewalks, curb ramps, bike racks, and other facilities.

What Is It?

Although walking and biking are an integral part of the transportation system, they are often overlooked when transportation decisions are made. Advancing policies that include provisions for bicycles and pedestrians on all roadways and state-funded projects enhances the efficiency and cost-effectiveness of the full transportation network. DOTs can also take responsibility for educating drivers, pedestrians, and bicyclists to ensure that all road users operate safely and know their legal status.

Engineering

Physical accommodations are often the first or only area that is considered with regard to improving bicycling and walking conditions. This is an important component, because allocating space in the public right of way is the first step to making it safer for those traveling by foot or bicycle.

Accommodating bicycling and walking is a cost-effective choice and adds minimal additional width to a roadway construction or reconstruction. Demand for bicycle infrastructure has become stronger in recent years, as the population seeks more active, environmentally friendly, and lower cost transportation options. In cities across the country, bike commute share has grown rapidly over the past decade, with triple-digit growth rates in a number of communities.[31] Non-work trips, which make up the majority of trip segments,[32] offer additional opportunity to diversify travel choices. For example, pedestrian and bicycle facilities near schools may encourage children to bike and walk to school, reducing congestion.

Non-motorized facilities can be either on-road or off-road. On-road facilities include dedicated space within the street right-of-way for bicycling and walking, such as sidewalks, median islands, well-marked crosswalks, bicycle lanes, cycletracks, shared lane markings, and paved shoulders. Off-road

30 Federal Highway Administration. (2010, January). "2009 National Household Travel Survey." Retrieved 9/19/2013 from http://nhts.ornl.gov/publications.shtml. Nearly ten million households don't have access to a car, and 30 percent of the U.S. population does not drive. Half of all trips are less than three miles, and 75 percent of those trips are made by car. Bicycling and walking are inexpensive, healthy, and often as fast or faster than driving for short distances.

31 Byrnes, M. (2011, September 21). "Is Bicycle Commuting Really Catching On? And if So, Where?" *The Atlantic Cities.* Retrieved from: http://www.theatlanticcities.com/commute/2011/09/substantial-increases-bike-ridership-across-nation/161/.

32 McKenzie, B., & Rapino, M. (2011, September). *American Community Survey Report 15: Commuting in the United States: 2009.* Retrieved 8/6/12 from http://www.census.gov/prod/2011pubs/acs-15.pdf.

facilities generally refer to separate multi-use paths where bicycles and pedestrians travel separately from motorized vehicle traffic.

For on-road facilities, states can provide sidewalks, bicycle lanes, and wide paved shoulders on state highways as part of a standard highway cross-section when they are constructed or reconstructed. Some roadways can also be retrofitted without reconstruction simply by changing the markings on the existing pavement. The Urban Bikeway Design Guide from the National Association of City Transportation Officials (NACTO), which the Federal Highway Administration recently endorsed,[33] provides guidance for appropriate bicycle facilities in urban areas,[34] as does the recently updated American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities.[35] The Designing Walkable Urban Thoroughfares recommended practice from the Institute of Transportation Engineers (ITE),[36] also endorsed by FHWA, provides guidance on multimodal design along major urban roadways.

Accommodating bicycle and pedestrian travel on state facilities will generally involve balancing convenience and capacity for drivers with the safety and convenience of non-motorized users. For example, wide roadways designed to allow cars to travel at high speeds take longer for pedestrians to cross than narrower ones. Curb extensions make it easier for people of all ages and abilities to cross the road and may also reduce the time drivers must wait for pedestrians at traffic signals. Signal detectors embedded in the roadway should be calibrated and located so that they detect bicycles. Intersection markings must also be clearly delineated to ensure motorist compliance and protect the safety of the most vulnerable roadway users. Clearly marked crosswalks and bike lanes that are positioned to avoid conflict with turning vehicles—such as to the left of an exclusive right turn lane—are examples of necessary design principles.

Off-road facilities should have fewer at-grade roadway crossings than adjacent streets and few or no driveway crossings. Paths built immediately adjacent to roadways, such as wide sidewalks, position bicyclists to be in conflict with turning vehicles at intersections and driveways. If no separate right of way is available for a path, on-road facilities may be preferable to a side path. Off-road facilities within urbanized areas should be planned to maximize non-recreational use, making them good choices for people commuting to work, children travelling to school, or families headed to the library.

Although state DOTs traditionally tend not to design state highways for non-motorized users, many destinations may be only accessible from a state highway. In addition, state highways may be the only connection between more preferable walking and biking routes, or they may serve as a community's "main street." Unless pedestrians and bicyclists are banned from a highway, as with many expressways, it should be assumed that they will use the road. If there is no safe way to accommodate pedestrians and bicyclists within the road right-of-way, an off-road option should be provided. In other cases, it may be necessary to provide an off-road connection to bridge an important gap in the roadway network or to cross major barriers such as rail lines, major highways, or rivers.

---

33 Memorandum from Federal Highway Administration (2013, August 20). Retrieved 11/26/2013 from http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/design_flexibility.cfm.

34 National Association of City Transportation Officials. "Urban Bikeway Design Guide." Retrieved 9/19/2013 from http://nacto.org/cities-for-cycling/design-guide/.

35 American Association of State Highway and Transportation Officials. (2012). *Guide for the Development of Bicycle Facilities*. Retrieved from https://bookstore.transportation.org/collection_detail.aspx?ID=116.

36 Institute of Transportation Engineers. (2010). *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach.* Available at http://www.ite.org/emodules/scriptcontent/orders/productdetail.cfm?pc=RP-036A-E.

Funding

A state DOT's role in funding and constructing bicycle and pedestrian infrastructure varies by state, according to legislation and policy. Some states are required to spend revenues raised from fuel taxes and motor vehicle licensing solely on state highway and bridge projects, while others have more flexibility. However, it may still be possible to fund on-road pedestrian and bicycle facilities as part of the "highway."

Funding these projects will help states enhance their overall transportation network and will provide more transportation choices at a lower cost. Where funding regulations prevent such investment, states can look to alternative options to support bicycling and walking such as the multiple funding sources offered in recent years by the federal government, including the Transportation Alternatives program in the new federal transportation bill, MAP-21.[37] One of the most important steps state DOTs can take is to use the Transportation Alternatives funds for non-motorized transportation, instead of invoking the flexibility to use their portion of this funding for other purposes.

Other federal funding programs can be used for bicycle and pedestrian programs, but are often overlooked.[38] Federal 402 funding to reduce traffic crashes, deaths, injuries, and property damage is one example.[39] The Congestion Mitigation and Air Quality Improvement program is used by many states for non-motorized transportation as well.

States can assume a leadership role, whether they control funding or not, by modifying requirements, providing technical assistance, and engaging local governments to consider all transportation modes in planning and design. Where funding is more flexible, DOTs can proactively solicit non-motorized projects for direct funding and ensure that state facilities include accommodations for all roadway users, including pedestrians and bicyclists. In addition, DOTs can partner with other state agencies to find new funding opportunities; for example, some Department of Natural Resources agencies have discretion over portions of the gas tax paid for fuel to be used in lawnmowers, ATVs, snowmobiles, motor boats, and other non-highway vehicles. These funds are often used for recreational trails; however, these trails can also be used as transportation corridors, or funds can be used to build important links to on-road facilities.

An investment in bicycle and pedestrian infrastructure can be a DOT's best transportation investment, providing new types of mobility at a fraction of the normal cost for both the DOT and the users, while also benefiting public health, increasing safety, and decreasing congestion. Research has shown that striping bicycle lanes makes the road safer for motorists as well as bicyclists.[40]

For further information on funding non-roadway projects, please see the section of this handbook titled, "Mechanisms for Funding Non-roadway Projects."

---

37 Federal Highway Administration. (2012). "Map ahead for progress in the 21st century act (MAP-21)." Retrieved 9/19/13 from http://www.fhwa.dot.gov/map21/summaryinfo.cfm.

38 Federal Highway Administration. "Bicycle and Pedestrian Provisions of the Federal-aid Program." Retrieved 9/19/13 from http://www.fhwa.dot.gov/environment/bicycle_pedestrian/overview/bp-broch.cfm. Note: This website does not reflect the alignment of funding programs in the federal transportation bill passed June 2012. However, many of the programs still exist and can continue to be used for bicycle and pedestrian funding..

39 League of American Bicyclists. "Section 402-State and Community Highway Safety Grant Program." Retrieved 9/19/2013 from http://issuu.com/bikeleague/docs/section_402.

40 Cockrell School of Engineering. (2006, September 17). "Bike lanes prevent over-correction by drivers, bicyclists reducing danger even on narrow roads." Retrieved 9/19/13 from http://www.engr.utexas.edu/news/releases/3709-bike-lanes-prevent-over-correction-by-drivers-bicyclists-reducing-danger-even-on-narrow-roads.

Education

DOTs provide safety education for many road users and cover a variety of situations. Education efforts to improve bicyclist and pedestrian safety can take many forms. Education may be aimed at non-motorized users to help them operate safely and understand their rights and responsibilities, or they may target other road users to assure a safe environment for bicyclists and pedestrians. States may use some combination of brochures, public service announcements, billboards, classes, or trainings for a variety of audiences. Further information on effective education to promote bicyclist and pedestrian safety can be found at the Pedestrian and Bicycle Information Center.[41]

Encouragement

Encouraging bicycling and walking can be part of a transportation demand management program, shifting users to facilities and modes that can generally absorb more users and maintaining capacity on congested facilities. See the section in Focus Area 3 of this document on Transportation Demand Management for further information. State health departments may also encourage active transportation modes and may provide additional support, funding, and partnerships to further these efforts. The Centers for Disease Control has resources about the health benefits of bicycling and walking.[42] Partnering with state health departments can provide additional expertise and additional funding, and potentially reach a wider audience.

Implementation

State DOTs can take a variety of steps to support bicycle and pedestrian travel and improve facilities for travelers, including the following:

- **Map existing infrastructure, including facilities under local jurisdiction, to identify gaps in the walking and bicycling network.** Identify state highways, state-owned lands (such as parks) that might support an off-road facility, and state-funded projects under local jurisdiction that can provide missing links in the network. These connections are especially important where employment centers, retail destinations, or residential developments are only accessible by using a state highway or state-funded roadway. Areas with a history of pedestrian and bicycle crashes should also be high priority.

- **Identify potential funding sources** for on-road and off-road non-motorized facilities, including restrictions on funding infrastructure such as trails and paths on state-owned roadways and bridges.

- **Examine existing transportation funding** for flexibility potential.

- **Establish state-sponsored funding program for bicycle and pedestrian projects and programs.** Local agencies should be allowed to apply for projects both on and off state facilities as well as to implement education and encouragement programming. Depending on a state's legislative requirements, these dollars may or may not come from transportation trust funds.

- **Enact policies requiring appropriate multimodal accommodation on all state-owned or state-funded roadways.** State transportation officials must work together to

41 Pedestrian and Bicycle Information Center. "Educate Drivers and Bicyclists." Retrieved 9/19/2013 from http://www.bicyclinginfo.org/education/. Or "Educate Drivers and Pedestrians." Retrieved from http://www.walkinginfo.org/education/.

42 Centers for Disease Control and Prevention. (2012, August 2). *CDC Transportation Recommendations*. Retrieved 9/19/13 from http://www.cdc.gov/transportation/.

set guidelines on what provisions are appropriate for a wide variety of contexts.

- **Establish technical training and leadership programs for local transportation agencies.** Training can include an explanation of multimodal transportation fundamentals, technical features of bicycle and pedestrian infrastructure, and funding opportunities from traditional and non-traditional sources.

- **Establish design guidance for local governments to use on non-state projects.** This should guide bicycle facility design along and across roads to ensure a complete system.

States can pursue several specific activities to provide leadership for pedestrian and bicycle planning, including:

- **Funding Non-Motorized Facilities.** States can directly fund the planning, design, and construction of bicycle and pedestrian infrastructure on their own and non-state facilities. These facilities can complement motor vehicle capacity needs. For example, in rural areas, simply providing wide paved shoulders can greatly improve the bicycling network and improve safety for drivers. Creating a comprehensive roadway network that is safe and comfortable for all users requires partnership with cities and counties. States should identify non-motorized priorities and evaluation measures for rating and selecting applicant projects. Criteria should include compliance with statewide bicycle plans, connections to key transit locations, environmental justice benefits, and overall utility (such as measuring the trips accommodated relative to the project cost).

- **Revise Policies to Support Multimodal Transportation.** States can enact policies that encourage bicycle and pedestrian transportation. Local and state transportation agencies have enacted Complete Streets policies to encourage roadway planning that accommodates all transportation modes, as appropriate for a given land use context. The National Complete Streets Coalition provides support to states looking to adopt Complete Streets policies, including sample language.[43] States can also eliminate policies that hinder bicycle and pedestrian travel, such as requirements that cyclists travel on side paths if they exist.

Case Study

Wisconsin

Bicycling and walking has benefitted from a number of WisDOT's policies, and Wisconsin has long supported bicycling as an important transportation option. Even before the passage of the original ISTEA bill, the Wisconsin legislature prescribed a "bicycling role" for WisDOT. According to State Statute 85.023,[44] amended in 1979, WisDOT is to provide assistance in the development of bicycle facilities: "The department (WisDOT) shall assist any regional or municipal agency or commission in the planning, promotion, and development of bikeways."

The first rail-to-trail conversion in the country, the Elroy-Sparta Trail in Wisconsin, opened in 1967.[45] Since then, WisDOT has worked diligently with the Wisconsin Department of Natural Resources and

43 National Complete Streets Coalition. (2012). "Complete streets FAQ." Retrieved 9/19/13 from http://www.completestreets.org/complete-streets-fundamentals/complete-streets-faq/.

44 Wisconsin Legislative Documents. Statute 85.023, "Planning for bicycle facilities." Retrieved 9/19/13 from: http://docs.legis.wisconsin.gov/statutes/statutes/85/023.

45 Elroy-Sparta State Trail Board. "The Elroy-Sparta State Trail." Retrieved 9/19/13 from http://www.elroy-sparta-trail.com.

local communities to convert many abandoned rail lines into non-motorized trails. These have formed the backbone of a bicycle highway system, serving both transportation and recreational purposes in large and small cities as well as rural areas.

The Wisconsin Rural Bicycle Planning Guide (2006)[46] assists rural communities and counties with their planning for bicycle travel. This is important because of the significant role tourism plays in the Wisconsin economy, including bicycle tourism[47] as a growing segment. In 2010, the Wisconsin legislature passed the Wisconsin Pedestrian and Bike Accommodation Law, State Statute 84.01(35), a Complete Streets Act, requiring all state and state-funded transportation projects to accommodate walking and bicycling, except in narrowly defined circumstances.

In 2010, the Wisconsin legislature passed the Wisconsin Pedestrian and Bike Accommodation Law, State Statute 84.01(35),[48] a Complete Streets Act, requiring all state and state-funded transportation projects to accommodate walking and bicycling, except in narrowly defined circumstances.

There are a multitude of plans and policies available to both regional offices and local communities that outline both a vision for walking and bicycling for the state and guidelines on implementation:

- The 1998 Wisconsin Bicycle Transportation Plan 2020[49] outlines a vision for bicycle transportation. It has since been supplemented by a number of other publications and policies, mentioned below.

- The 2002 Wisconsin Pedestrian Policy Plan 2020[50] fulfills the same role for pedestrians. It also outlines funding sources for local governments, guidance in design and planning, education and safety programs, and training opportunities.

- The Wisconsin Guide to Pedestrian Best Practices (2010)[51] serves as a companion document to assist with the implementation of the plan's goals, objectives, and actions and serves as a reference or guidebook for state and local officials.

- Wisconsin Bicycle Planning Guidance (2003)[52] advises local communities and metropolitan planning organizations (MPOs) on how to plan for appropriate facilities and outlines basic design guidance.

- The Wisconsin Bicycle Facility Design Handbook (2004; updated 2009)[53] outlines minimum standards for facilities, both on state roadways and for state-funded projects. The handbook also provides design guidance for local communities on a variety of topics.

46 Wisconsin Department of Transportation. (2006, April). Wisconsin Rural Bicycle Planning Guide. Retrieved 9/19/13 from http://www.dot.state.wi.us/projects/state/docs/bicycle-rural-guide.pdf.

47 Bicycle Federation of Wisconsin. *The Economic Impact of Bicycling in Wisconsin.* Retrieved 9/19/13 from http://www.dot.state.wi.us/business/econdev/docs/impact-bicycling.pdf.

48 Wisconsin Department of Transportation. (2010, December). *Bikeways and Sidewalks in Highway Projects*. Retrieved 9/19/13 from http://www.dot.state.wi.us/projects/state/docs/complete-streets-rules.pdf.

49 Wisconsin Department of Transportation. (1998, December). *Wisconsin Bicycle Transportation Plan* 2020. Retrieved 9/19/13 from http://www.dot.wisconsin.gov/projects/state/docs/bike2020-plan.pdf.

50 Wisconsin Department of Transportation. (2002, March). *Wisconsin Pedestrian Policy Plan 2020*. Retrieved 9/19/13 from http://www.dot.wisconsin.gov/projects/state/docs/ped2020-plan.pdf.

51 Wisconsin Department of Transportation. (2010). "Wisconsin Guide to Pedestrian Best Practices." Retrieved from http://www.dot.state.wi.us/projects/state/ped-guide.htm.

52 Wisconsin Department of Transportation. (2003, June). *Wisconsin Bicycle Planning Guidance*. Retrieved 9/19/13 from http://www.dot.state.wi.us/projects/state/docs/bike-guidance.pdf.

53 Wisconsin Department of Transportation. (2004, January). *Wisconsin Bicycle Facility Design Handbook*. Retrieved 9/19/13 from http://www.dot.state.wi.us/projects/state/docs/bike-facility.pdf.

For many years Wisconsin has had a policy of paving the shoulders of most state roads and roads utilizing state funding. Although this policy benefits non-motorized travel, WisDOT does not use limited pedestrian and bicycle funding, such as Transportation Enhancements/Transportation Alternatives funding for this purpose.

The Wisconsin Bicycle Map is also funded and supported by WisDOT.[54] All state and county roads are rated by how bicycle-friendly they are, and local roads, non-motorized trails, and other key information are included on the maps, which are also available to be downloaded on WisDOT's website. This tool is useful not only for road cycling, touring, and recreational rides, but also provides information to local planners on areas of the roadway system that are in need of upgrades in order to safely accommodate bicyclists.

WisDOT is also involved in education and trainings for citizens and law enforcement officials to enhance bicyclist and pedestrian safety and comfort.[55] Teaching Safe Bicycling is a one-day course offered free for those wishing to teach bicycle safety to children. It is offered in various locations each spring and frequently attracts participants from surrounding states who do not have similar opportunities locally. Enforcement for Bicycle Safety is offered through WisDOT—which also oversees the state highway patrol—as a 12-hour course to train officers on the most important law enforcement practices to reduce crashes.

Massachusetts

Over the past several decades, Massachusetts DOT (MassDOT) has shown a growing commitment to bicycle and pedestrian travel in the state. This commitment culminated recently in its Healthy Transportation Policy Directive, which prioritizes active transportation modes and identifies specific guidelines for bicycle and pedestrian design.

The state has had bicycle and pedestrian plans in place since 1998 and established a Bicycle and Pedestrian Advisory Board in 2004. The Bicycle Plan was updated in 2008 to reflect new design guidelines, a new long-range plan, and the state's vision as a leader in bicycle transportation. In 2006, prior to the release of its updated bike plan, MassDOT released its revised and expanded *Project Development and Design Guide*, which incorporates an integrated multimodal design approach and offers context sensitive design solutions. Those guidelines earned awards from the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the Institute of Transportation Engineers.[56] In 2011, MassDOT issued a Bicycle Inventory Report, demonstrating progress made toward documenting the state's bicycle network since 2008.[57] The agency has also demonstrated a commitment to the state's rails-to-trails program, issuing a policy in 2013 to permit the shared use of rail rights-of-way by rail lines and bicycle paths, provided the two uses are separated by appropriate fencing.[58]

54 Wisconsin Department of Transportation. "Wisconsin bicycle maps" Retrieved 9/19/13 from http://www.dot.wisconsin.gov/travel/bike-foot/bikemaps.htm.

55 Wisconsin Department of Transportation. "Bicycle safety education" Retrieved 9/19/13 from http://www.dot.state.wi.us/safety/vehicle/bicycle/education.htm.

56 Massachusetts Department of Transportation. (2006). *Project Development & Design Guide*. Retrieved 10/22/13 from http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/ManualsPublicationsForms/ProjectDevelopmentDesignGuide.aspx.

57 Massachusetts Department of Transportation. (2012). *Bicycle Facilities Inventory Report*. Retrieved 10/22/13 from https://www.massdot.state.ma.us/Portals/17/docs/2011_bike_ye_rpt.pdf.

58 Rails to Trails Conservancy (2013 September) *America's Rails-with-Trails: A Resource for Planners, Agencies, and Advocates on Trails Along Active Railroad Corridors*. Retrieved 10/30/2013 from http://www.railstotrails.org/

In 2010, MassDOT launched GreenDOT—a comprehensive long-term initiative to reduce environmental impacts, encourage healthy transportation and support smart growth in the state.[59] As part of this initiative, MassDOT established Mode Shift Goals aimed at tripling the share of trips made by walking, biking, and transit.[60] To achieve these goals, MassDOT issued a Healthy Transportation Policy Directive[61] in September 2013, which requires all projects to improve conditions for active transportation modes and encourage their use, unless alternative plans are approved by the Secretary or CEO. The directive also encourages the use of a broad range of guidelines within the department, which includes the NACTO *Urban Bikeway Design Guide* and others.

Resources

Guidance from U.S. DOT

The Federal Highway Administration (FHWA), Office of Planning, Environment, and Realty. (updated 2012, May 7) Accommodating Bicycle and Pedestrian Travel: A Recommended Approach. http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/design.cfm.

This report provides policy and design guidance for transportation agencies.

U.S. Department of Transportation. (2010, March 11). United States Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations. http://www.fhwa.dot.gov/environment/bicycle_pedestrian/overview/policy_accom.cfm.

This outlines the U.S. DOT's current policy on bicycle and pedestrian accommodation.

National Bicycle and Pedestrian Design Guides

American Association of State Highway and Transportation Officials. (2012). Guide for the Development of Bicycle Facilities, Fourth Edition. https://bookstore.transportation.org/collection_detail.aspx?ID=116.

This guide provides design recommendations for accommodating bicycle travel in a variety of contexts.

Institute of Transportation Engineers. (2010). Designing Walkable Urban Throughfares: A Context Sensitive Approach. Available at http://www.ite.org/emodules/scriptcontent/orders/productdetail.cfm?pc=RP-036A-E.

This recommended practice offers guidance and design parameters for major, multimodal roadways in urban areas.

National Association of City Transportation Officials. (2011). Urban Bikeway Design Guide. Available at http://nacto.org/cities-for-cycling/design-guide/.

This bicycle facilities guide is geared primarily toward urban areas.

---

resources/flipbooks/2013_rail-with-trail-report/index.html.

59 Massachusetts Department of Transportation. (2011). *GreenDOT* webpage. Retrieved 10/15/13 from https://www.massdot.state.ma.us/GreenDOT.aspx.

60 Massachusetts Department of Transportation (2012, October 9). "MassDOT Announces Mode Shift Goal to Triple the Share of Travel in Massachusetts by Bicycling, Transit and Walking." Retrieved 10/15/13 from http://www.massdot.state.ma.us/main/tabid/1075/ctl/detail/mid/2937/itemid/223/MassDOT-Announces-Mode-Shift-Goal-to-Triple-the-Share-of-Travel-in-Massachusetts-by-Bicycling--Transit-and-Walking-.aspx.

61 Massachusetts Department of Transportation (2013 September 9). "Blasting Adjacent to State Highways - MassDOT." Policy Directive P-13-0001. Retrieved 10/30/13 from http://www.massdot.state.ma.us/Portals/0/docs/GreenDOT/DirectiveHealthyTransportation.pdf.

Model State Bicycle and Pedestrian Plans

In addition Wisconsin, other states have developed useful bicycle and pedestrian plans and guides. Oregon had one of the first and best bicycle and pedestrian plans. Its planning guide is also a useful resource. Washington State's plan is also cited as example of a newer plan that incorporates the NACTO Bicycle Guide, the AASHTO Bicycle Guide, and guidance for local communities.

Oregon Department of Transportation. (1995). Oregon Bicycle and Pedestrian Plan. http://cms.oregon.gov/ODOT/HWY/BIKEPED/Pages/planproc.aspx.

Oregon Department of Transportation. (2011). Bicycle Pedestrian Design Guide. ftp://ftp.odot.state.or.us/techserv/roadway/web_drawings/HDM/Appendix_N_BikePedDesignGuide_Web.pdf.

Washington State Department of Transportation. (2008). Washington State Bicycle Facilities and Pedestrian Walkways Plan. http://www.wsdot.wa.gov/NR/rdonlyres/F061CF6D-7B96-4E61-BF20-50EAF2716997/0/BikePedPlan.pdf.

Additional resources for planning, education, policies, and programs

The Pedestrian and Bicycle Information Center has suggested policies and planning resources for improving state and local governments. For bicycle safety education programs, FHWA has a resource guide as well as a searchable database of programs and materials from around the country. Many more programs have been developed since the publication of the guide.

The Alliance for Biking and Walking. (2012). Bicycling and Walking in the United States: 2012 Benchmarking Report. http://www.peoplepoweredmovement.org/site/index.php/site/memberservices/2012_benchmarking_report/.

> This report provides state- and city-level data on bicycling and walking and discusses a number of policy measures and provisions to support bicycling and walking.

Policies and Planning Strategies to Support Walking
http://www.walkinginfo.org/develop/policies.cfm.

Policies and Planning Strategies to Support Bicycling
http://www.bicyclinginfo.org/develop/policies.cfm.

Bicycle Safety Education Resource Center, the Federal Highway Administration. (1998). Good Practices Guide.
http://www.bicyclinginfo.org/education/resource/bestguide.cfm.

Sample state, local, and regional bicycle and pedestrian plans can be found at the Pedestrian and Bicycle Information Center. Although there is a separate link for bicycle and pedestrian plans, there is considerable overlap in the two pages, since many agencies write combined bicycling and walking plans.

Sample Bicycle Plans
http://www.bicyclinginfo.org/develop/sample-plans.cfm.

Sample Pedestrian Plans
http://www.walkinginfo.org/develop/sample-plans.cfm.

Update Design Policies and Standards

The Opportunity

Policies that support Complete Streets and context sensitive solutions (CSS) are important first steps for involving more stakeholders and accommodating additional travel modes in transportation projects. A Complete Streets policy ensures that the entire right of way is planned, designed, operated and maintained to provide safe access for all users. This policy approach is intended to change the everyday decision-making processes and systems of the agency and lead to long-term changes to the built environment. Additionally, a CSS approach can improve stakeholder involvement at every stage of program delivery, helping to ensure that transportation facilities fit their surrounding context, preserve resources, and meet local needs.

Project outcomes, however, are still determined in large part by prevailing design standards within each agency. In many cases, state-level road design standards are best suited for designing high-speed rural and exurban highways, but have been applied in a wider range of contexts. This approach, sometimes referred to as "forgiving design," incorporates high design speeds, conservative design values, and focuses on achieving high vehicle capacities. Outcomes include wider lanes, larger turning radii, and large "clear zones" adjacent to roadways, which help reduce the risks associated with driver error but also contribute to excessive land consumption, poor accessibility (particularly for non-motorized users), and unsafe travel speeds in built-up, high activity areas.[62]

Context-specific design standards can address these issues and lead to accessible, lower-speed roadways that are appropriate for the surrounding context and serve a range of uses. These standards can help designers achieve the following outcomes:

1. Improved access, mobility, and safety for all modes of road user;
2. Roadways that serve additional functions along with the efficient movement of vehicles;
3. Cost-savings through "right-sized" projects and practical design.

In addition to easing the implementation of Complete Streets and CSS policies, these design standards can also support transportation demand management strategies and responsible growth initiatives.

Groups such as the American Association of State Highway and Transportation Officials (AASHTO), the Institute of Transportation Engineers (ITE), the National Association of City Transportation Officials (NACTO), and others have each produced guidelines and recommended practices for designing context sensitive roadways. Unfortunately, the design manuals used by many state DOTs incorporate conservative minimum design values that preclude flexible design approaches,[63] and engineers often lack the resources to explore a wider range of options, particularly those not sanctioned by the department. DOTs can achieve better context sensitive design outcomes by reviewing and revising their existing standards, allowing the use of a wider range of guidelines, and providing additional support to explore feasible design alternatives.

62 Dumbaugh, Eric, and Wenhao Li. "Designing for the safety of pedestrians, cyclists, and motorists in urban environments." *Journal of the American Planning Association* 77.1 (2010): 69-88.

63 Kueper, D. (2010). The Context Sensitive State Design Manual. ITE Journal, 80(11), 30–35.

What Is It?

Whereas a Complete Streets policy directs designers to take all road users into account, and a CSS initiative prepares them to work with stakeholders in a variety of contexts, design standards ultimately set the rules to which DOT staff are expected to adhere. Once designers recognize an optimal solution on a given project, they must be granted enough flexibility and given the proper guidance to achieve that outcome. In one extreme example where this occurred, a chief engineer at Missouri DOT asked district engineers not to rely on manuals for one year, but to focus on safety, communication, quality, and common sense. As a result, the engineers were able to come up with safer, more cost-effective design solutions.[64]

On many context sensitive projects, the most appropriate design solution might require working within a constrained right-of-way without infringing on surrounding land uses and incorporating features such as pedestrian and bicycle facilities, traffic calming measures, or on-street parking. The prevailing design standards must allow these types of measures in the appropriate settings. This sometimes begins with relaxing the range of acceptable design values and creating provisions to allow certain design features.

With that said, design elements cannot be chosen arbitrarily. Regardless of the standards being applied, designers are responsible for exercising sound engineering judgment and documenting their decision-making process to ensure protection from litigation.[65] Flexible design standards themselves do not increase the risk of tort liability, but designers may benefit by receiving appropriate training in order to fully understand the basis for different design practices and how design criteria relate to outcomes such as safety and mobility. Agency staff may wish to refer to widely recognized guidelines and recommended practices in choosing an appropriate design solution, or the agency may choose to develop its own standards that apply in different contexts. These internal agency guidelines can also be helpful to local and county engineers within each state. Typical design elements that play important roles in context sensitive design and must be treated accordingly include:

- Cross-sectional elements (including lane widths),
- Curb radii,
- Pedestrian crossings,
- Bicycle facilities,
- On-street parking,
- Access management,
- Traffic calming, and
- Intersections types.

In reviewing design guidelines and achieving context sensitive design solutions, designers must take into account the role that controlling principles and design parameters play. Common design controls are outlined below, along with their effects on design outcomes and approaches for handling each.

Functional classification. Design guidelines often treat functional classification as a starting point for road design. The functional classification of a roadway can sometimes provide useful information about its role in the roadway network, but roadways often serve multiple functions. These functions are determined primarily by the road's surrounding context and are not necessarily captured by their functional classification

64 Jones, Joseph (2010 January). "Practical Design." *Public Roads Volume 73, No. 4.*, Federal Highway Administration webpage. Retrieved 11/8/13 from http://www.fhwa.dot.gov/publications/publicroads/10janfeb/06.cfm.

65 Parker, Terri L. (2012). *NCHRP Legal Research Digest 57: Tort Liability Defense Practices for Design Flexibility*. Retrieved 11/22/13 from http://www.nap.edu/catalog.php?record_id=14656.

Location. Most state design guidelines differentiate between roadways in urban and rural areas. Some also specify suburban design standards. In many cases, these definitions do not accurately reflect the context on specific projects and, therefore, the applicable design standards may not be appropriate. To correct this, guidelines can include a more accurate variety of context areas or roadway types, as demonstrated below.

Desired level of service. Design criteria are often set to achieve a minimum desired LOS, given anticipated traffic volumes. Context sensitive design should balance the needs of all road users and recognize other road functions, such as economic development and social activities. Designers can accept a much lower LOS on certain projects and in many cases may be able to rely on network capacity for meeting mobility needs.

Design speed. Conventional practice encourages selecting the highest practical design speed, which then controls design. Instead, designers may determine a desired operating speed that is safe and appropriate in a given context, and then design the roadway to encourage travel at that speed. This single change in design philosophy can provide designers with considerable flexibility.

Design vehicle. The selection of a large design vehicle often leads to wide lanes and large turning radii, which limit pedestrian accessibility and encourage higher travel speeds. Design guidelines should acknowledge that occasional large vehicles often can be accommodated by encroaching into oncoming lanes, mounting curbs, or choosing alternative routes; then roads can be designed to accommodate a more typical design vehicle.

Implementation

In many cases, a Complete Streets or CSS policy may be the motivating force behind design standard reform and it can guide the reform process. These policies may be issued internally by a DOT, through state legislation, or by executive order. States might also choose to adopt new standards to address a particular concern, such as cost or safety, or standards that apply in specific contexts, such as urban areas or in transit oriented development (TOD) zones. To be successful, new standards should be developed with input from DOT staff and outside partners and customers to ensure "buy in" to the proposed changes.

Taking AASHTO policies and other recommended practices into account, agencies that review and revise their existing guidelines can introduce considerable flexibility. For example, a 2006 update of the Massachusetts *Project Development & Design Guide* includes key revisions such as a wider range of recommended design speeds for different roadway types (including lower acceptable values), lower minimum road width requirements, new multimodal cross-section types, and a new chapter on traffic calming measures.[66] The state's Complete Streets and CSS policies were guiding principles in that effort. Additional steps can be taken to develop guidelines for use in specific scenarios. For example, Delaware DOT released a Traffic Calming Manual,[67] for use in urban centers and master planned communities, which provides design guidance for traffic calming measures such as speed humps, traffic circles, diverters, and road narrowing.

The City of El Paso, Texas, requires the use of context sensitive street design standards—based on recommended practice from ITE[68] —in specially designated Compact Urban Areas. This

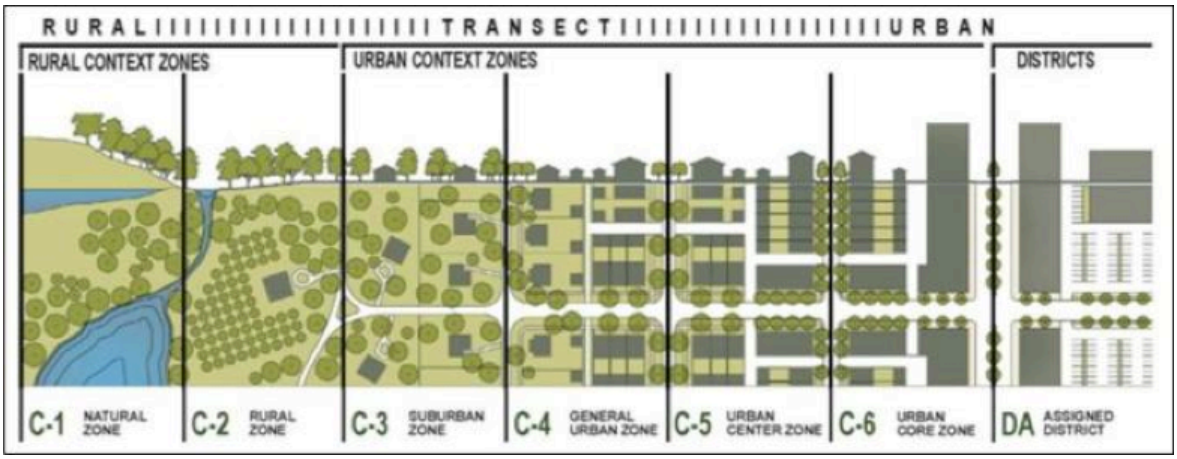
66 Massachusetts Department of Transportation. (2006). *Project Development & Design Guide*. Retrieved 10/22/13 from http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/ManualsPublicationsForms/ProjectDevelopmentDesignGuide.aspx.

67 Delaware Department of Transportation. (2007). *Traffic Calming Manual*. Retrieved 10/22/13 from http://www.deldot.gov/information/pubs_forms/manuals/traffic_calming/pdf/deldotfinal.pdf.

68 Institute of Transportation Engineers (2010, March). *Designing Walkable Urban Thoroughfares: A Context Sensitive.*

approach incorporates many of the principles outlined above, such as setting lower design speeds and encouraging lower operating speeds that are safe for bicycles and pedestrians. City staff and engineers are also trained to recognize difference context zones before beginning any project.[69] Each urban context zone (Figure 5.1) is associated with different cross-section types and design parameters. Other controls such as design vehicle and functional classification are also incorporated into this approach, but play considerably different roles than in conventional highway design.

Figure 1
Context zones ranging from rural to the most urban



Source: Institute of Transportation Engineers / Duany Plater-Zyberk and Company

Implementing these changes and encouraging the use of new design standards often requires additional staff training, increased stakeholder involvement on projects, and administrative support for engineers. Stakeholder involvement and staff training often come as part of a well-executed CSS policy (see Focus Area 4). However, implementation also may require a greater commitment of agency resources, new forms of data collection and management, and better public relations, either as part of an overarching policy or by executive order. This added commitment to achieving flexible design can ultimately lead to more efficient project delivery, improved project outcomes, and cost savings.

Case Study

New Jersey

In 2002, New Jersey DOT commissioned the Voorhees Transportation Policy Institute to review applicable design standards for state highways that pass through communities. The resulting report, F*lexible Design of New Jersey's Main Streets*, recommends relaxing minimum design criteria and allowing greater flexibility on non-controlling design elements and performance metrics. It also recommends specific strategies such as the reclassification of roadways, allowing design exceptions, and designating overlay zones.[70]

Retrieved 10/17/13 from http://www.ite.org/emodules/scriptcontent/orders/productdetail.cfm?pc=RP-036A-E.

69 McCahill, C. (2013, June 12). "Designing Walkable Thoroughfares" Congress for the New Urbanism. Retrieved 10/17/13 from http://www.cnu.org/cnu-news/2013/06/designing-walkable-thoroughfares.

70 Ewing, R. and King, M. (2002). *Flexible Design of New Jersey's Main Streets.* Prepared for New Jersey Department of Transportation. Retrieved 10/22/13 from http://www.state.nj.us/transportation/publicat/flexibledesign.pdf.

That report informed some components of the *Smart Transportation Guidebook*, published jointly by NJDOT and the Pennsylvania DOT in 2008.[71] The guidebook outlines a context sensitive approach to transportation planning and design in great detail. In addition to providing a framework for the CSS process, the guidebook provides specific design values that may be used on non-limited access roadways in different contexts. Values were derived from the AASHTO Green Book and from ITE's recommended practice, *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*.

The above measures were actually proactive steps taken prior to DOT's formal approval of its Complete Streets policy in 2009—a model policy, according to the National Complete Streets Coalition.[72] Since implementing that policy, the agency has created a complete streets checklist, offered training for DOT staff, and held workshops for communities to promote local complete streets policies. The agency has also worked with the Voorhees Transportation Center to host seminars and summits featuring nationally regarded experts on street design. Some of the events have focused on aligning the efforts of various consultants working on street design projects with those of counties and communities implementing complete streets programs. In 2012, the DOT released a *Complete Streets Guidebook*[73] aimed at helping communities write their own complete streets policies and in 2013 the DOT released a *Guide to Creating a Complete Streets Implementation Plan*.[74] This most recent publication is an important step for bridging the gap between policies and project outcomes, placing considerable emphasis on revised design guidelines. As of November 2013, more than 77 local jurisdictions in New Jersey had implemented their own complete streets policies—more than in any other state. Completed DOT projects include improved pedestrian crossings, added bicycle facilities, and traffic calming measures.

Massachusetts

Having faced numerous disputes over design elements within communities, the Massachusetts DOT undertook a uniquely comprehensive and collaborative review of its design manual beginning in 2003. The updated Project Development & Design Guide was released in 2006. The update was driven by essential guiding principles such as improving safety and mobility for all road users, incorporating principles of context sensitive design, allowing greater flexibility, and providing a clear process for project development.

The updated guide introduces considerably greater flexibility and sensitivity in the use of design criteria and specific design elements. For example, the range of acceptable design speeds was broadened to include values as low as 25 mph and, in some cases, the maximum was reduced. Minimum roadway widths were reduced to 30 feet or less, along with special provisions for roads with exceptionally low volumes.[75] The guide also represents a major departure from earlier versions in its processes and use of design controls. Key aspects include:

71 New Jersey and Pennsylvania Departments of Transportation (2008, March) *Smart Transportation Guidebook*. Retrieved on 10/22/13 from http://www.state.nj.us/transportation/community/mobility/pdf/smarttransportationguidebook2008.pdf.

72 AARP (2013, January). *Complete Streets in the States: A Guide to Legislative Action*. Retrieved 11/11/13 from http://www.smartgrowthamerica.org/documents/cs/resources/cs-aarp-statelegislationtoolkit.pdf.

73 New Jersey Department of Transportation. (2012). *Making Complete Streets a Reality: A Guide to Policy Development*. Retrieved 11/11/13 from http://www.state.nj.us/transportation/eng/completestreets/pdf/cspolicydevelopmentguide2012.pdf.

74 New Jersey Department of Transportation. (2012, December). *A Guide to Creating a Complete Streets Implementation Plan*. Retrieved 11/11/13 from http://www.state.nj.us/transportation/eng/completestreets/pdf/cscreateimplementationplan.pdf.

75 Massachusetts Department of Transportation. (2010, August 11). "CSS in Massachusetts: MassDOT Project Development and Design Guide." Retrieved 11/20/13 from http://www.cssnationaldialog.org/documents/Continuing/CSS-National-Dialog-Continuing-Conversation-DiPaolo.pdf.

- Greater emphasis placed on the actual role that a roadway plays, rather than its functional classification;
- A wider variety of context types (including high density suburban and central urban types) as design controls;
- Recognition of many types of road users including pedestrians, bicyclists, and transit;
- Selection of safe, context-appropriate design speeds ("target speeds") and the use of traffic calming measures;
- Selection of desired levels of service based on local stakeholder feedback;
- Recognition that travel demands may decrease over time;
- Contextual measures of effectiveness, including community enhancement, economic development, and accessibility.[76]

In addition to its content, the process through which this guide was developed is particularly unique. This process involved a task force made up of 28 individuals representing federal, state, regional, and local transportation agencies, the state legislature, the design profession, and a variety of interest groups. The manual has taken time to fully implement, given that many projects were well underway before its release; however, the agency's recent Healthy Transportation Policy Directive requires that even ongoing projects be reviewed for conformance with the state's goal of encouraging walking, bicycling and transit use.

Florida

In 2011, Florida DOT revised the Florida Greenbook, which contains road design guidelines for cities and counties to include an additional chapter specifically for context sensitive design of Traditional Neighborhood Development (TND) communities.[77] TNDs are characterized by features such as compact, pedestrian-scale development and low-speed, low-volume, highly connected streets. The design guidelines emphasize safe, continuous connections for all users, speed management, and careful attention to surrounding land uses. This chapter represents a fundamentally different approach than conventional transportation design, outlined in a supplemental publication, the *Traditional Neighborhood Development Handbook*.[78] These materials draw from documents such as:

- The American Association of State Highway and Transportation Officials' *A Guide for Achieving Flexibility in Highway Design*,
- The Institute of Transportation Engineers' *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*, and
- The Center for Applied Transect Studies' *Smart Code*.

This chapter was developed in response to a rising number of TND projects around the state and growing concerns among cities and towns that existing standards did not fit the context of these types of projects. In many cases, designers were already experienced in context sensitive design, but faced difficulty working with existing state regulations. Since its approval by the Florida Greenbook Committee, local authorities and private design firms can refer to this chapter, which has legal

76 Massachusetts Department of Transportation. (2006). *Project Development & Design Guide*. Retrieved 11/22/13 from http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/ManualsPublicationsForms/ProjectDevelopmentDesignGuide.aspx.

77 U.S. Department of Transportation. (2011). "Florida Greenbook Chapter 19: Traditional Neighbhorhood Development." Context Sensitive Solutions website. Retrieved 10/11/2013 from http://contextsensitivesolutions.org/content/reading/florida_greenbook_chapter_chapt/.

78 Florida Department of Transportation. (2011). *Traditional Neighborhood Development Handbook*. Retrieved 10/11/2013 from http://www.dot.state.fl.us/rddesign/floridagreenbook/tnd-handbook.pdf.

standing in Florida, as a resource for acceptable design practices. In many cases, this allows the designers to avoid cumbersome design exception processes and protects them from tort litigation. Moreover, the supplemental handbook offers guidance in the planning and design of transportation networks in TNDs, including considerations such as street network connectivity. This guidance can be applied to local or state projects, given that the project meets seven applicable TND principles.[79]

Resources

Policy and Design Guidelines

American Association of State Highway and Transportation Officials. (2004). A Guide for Achieving Flexibility in Highway Design.

> This guide serves as a complement to the AASHTO Green Book and instructs on the use of CSS principles to achieve greater flexibility during project development and design.

American Association of State Highway and Transportation Officials. (2012). Guide for the Development of Bicycle Facilities, 4th Ed.

> This AASHTO publication offers guidance in the context sensitive application of bicycle treatments in most riding environments, while also incorporating the needs of motorists and pedestrians.

Institute of Transportation Engineers. (2010). Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. http://www.ite.org/emodules/scriptcontent/Orders/ProductDetail.cfm?pc=RP-036A-E.

> This recommended practice from ITE offers guidance in the planning and design of major thoroughfares in walkable areas based on CSS principles and on the inherent flexibility of the AASHTO Green Book; the Congress for the New Urbanism co-authored this manual. FHWA endorsed this guide in a memorandum on August 20, 2013.

Los Angeles County. (2011). Model Design Manual for Living Streets. http://www.modelstreetdesignmanual.com/index.html.

> A national consortium of experts developed this multimodal street design manual for Los Angeles County through a collaborative charrette process. It was released as a customizable document to be used as-is or modified to meet local needs.

National Association of City Transportation Officials. (2012). Urban Bikeway Design Guide. http://nacto.org/cities-for-cycling/design-guide/.

> This guide incorporates lessons from cities around the world to outline state-of-the-art practices for bicycle facility design in urban areas. FHWA endorsed this guide in a memorandum on August 20, 2013.

National Association of City Transportation Officials. (2013). Urban Street Design Guide. http://nacto.org/usdg/.

> This guide offers parameters and templates for designing multimodal streets of various sizes in urban areas, including both interim and long-term design solutions.

79 Based on an interview with Billy Hattaway, District 1 Secretary, Florida DOT (2013, November).

THE INNOVATIVE DOT

Focus Area 6: Providing Efficient, Safe Freight Access

Focus Area 6: Providing Efficient, Safe Freight Access

With the emergence of just-in-time manufacturing and highly dispersed activity centers and markets, trucking has become a dominant freight mode. Increased truck traffic, in turn, adds wear and tear to infrastructure and can be a source of congestion and emissions.

Many DOTs are responding to this reality by looking for innovative ways to help shippers move freight more efficiently and with less impact on infrastructure and communities. Despite clear challenges, including finding funding sources and dealing with privately owned railways, DOTs are making strides in providing rail options for shippers, as well as integrating all modes in their planning. In addition, they are working with local governments, shippers, and others to optimize local freight pickups and deliveries and to reduce shipping times and local congestion. That's a win-win, reducing DOT expenses while at the same time benefiting freight service providers' bottom lines.

In this section:

- Support Freight Rail Service
- Support Intermodal Freight Connections
- Foster Win-Win Outcomes for Freight and Passenger Rail
- Encourage Innovative Freight Delivery

Support Freight Rail Service

The Opportunity

Improving rail service as an alternative to shipping goods by truck provides a number of benefits, including economic development, reduced highway maintenance costs, and reduced emissions. It is also a more efficient and generally more cost-effective means of transportation for shippers themselves, allowing these vital businesses to cut costs.

From an economic development standpoint, ensuring the availability of rail service increases the viability of industries reliant on the movement of heavy, low-value goods. Because of the relatively low profit per ton on goods such as coal, gravel, grain, and scrap material, the difference in cost between shipping by truck, at 16.5 cents per ton-mile,[1] versus shipping by rail, at three cents per ton-mile,[2] can make the difference between a business's success and failure.

From a public agency perspective, promoting the movement of freight by rail yields several key benefits. Shipping by rail instead of truck reduces highway congestion, preserves pavement, and produces fewer air emissions. The emissions that are produced tend to have fewer health effects, because fewer people live in close proximity to railroads than to highways.[3] Shifting freight from truck to rail also generates significant cost and operational advantages. Hundreds of trucks are required to move the same freight that can be carried by a single train.[4] With each truck yielding a congestion impact equivalent to roughly three passenger vehicles,[5] maintenance of rail service for freight-intensive industries has clear benefits in terms of reducing congestion.

In addition, while the congestion impact of an average truck may be equivalent to that of three cars, the impact of the pavement damage caused by an average truck is many times greater. Although the exact cost of pavement damage from trucks depends on a number of factors, including axle configuration and roadway design, estimates suggest that one fully loaded tractor-trailer generates pavement damage equivalent to hundreds of cars. The Federal Highway Administration (FHWA) estimates that a single tractor-trailer of 80,000 pounds (the legal limit on interstate highways) inflicts pavement damage on urban interstate highways equivalent to the damage inflicted by roughly 410 passenger vehicles,[6] while others estimate that a single 18,000-pound axle load inflicts 3,000 times more damage than a typical axle load.[7]

---

1 Bureau of Transportation Statistics. (2007). "National Transportation Statistics, Table 3-21: Average Freight Revenue Per Ton-mile." Retrieved 1/19/12 from http://www.bts.gov/publications/national_transportation_statistics/html/table_03_21.html.

2 *Ibid.*

3 Personal communication with Tracey Holloway, Associate Professor of Environmental Studies, Atmospheric and Oceanic Sciences, and Civil and Environmental Engineering, University of Wisconsin-Madison (2011, December 29).

4 Parsons Brinckerhoff Consulting (2009). Oregon Rail Study, Appendix L. Retrieved 1/19/2012 from http://www.oregon.gov/ODOT/RAIL/docs/Rail_Study/Appendix_L_Rail_Industry_Return_on_Investment_Calculations.pdf?ga=t.

5 *Ibid.*

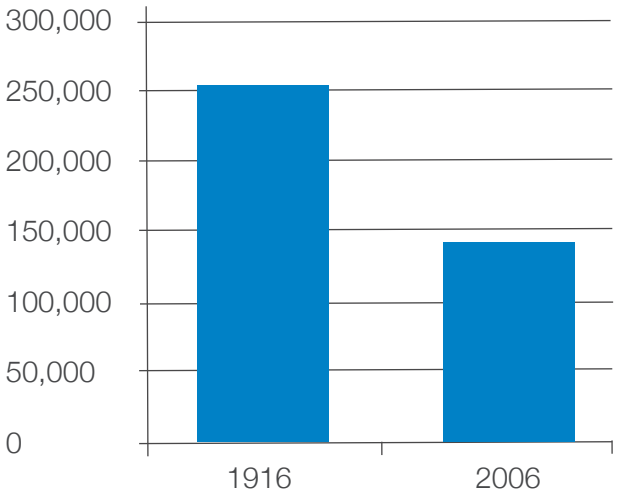
6 Federal Highway Administration. (2000, May). Addendum to the 1997 Federal Highway Cost Allocation Study. Retrieved 1/19/2012 from http://www.fhwa.dot.gov/policy/hcas/addendum.htm.

7 Advocates for Highway and Auto Safety. (2013, June). "The Dangers of Large Trucks." Retrieved 11/26/13 from http://saferoads.org/dangers-large-trucks.

What Is It?

While state DOTs generally focus on highways and roads, many of them are also involved in rail preservation activities. There are a variety of ways that states can improve freight rail service and accessibility: they can provide grants or low-interest loans to maintain or rehabilitate existing infrastructure in order to preserve rail service in places where it already exists, or they can provide funding to construct new infrastructure, such as industrial sidings or intermodal facilities. In addition, a number of states have acquired rail lines themselves. Because railroads are generally privately owned, some rail lines that might not be sufficiently profitable to justify private investment are worth maintaining or improving for economic development, congestion mitigation, or other purposes in the public interest.

Figure 1
Total U.S. Railroad Miles, 1916 and 2006



Railroads are and have long been an integral part of the national freight transportation system. However, due to both the growth of trucking as an alternative and changes in government regulations, rail service on lower volume lines throughout the United States is at risk of discontinuation. In many cases, rail lines that still provide public benefits could be abandoned without state support. Although private firms' decisions about freight shipment modes are ultimately based on cost, access, reliability, and travel time, providing financial support to maintain or improve freight rail service can help to divert freight movement away from highways. It also allows new businesses the option of shipping by rail when they might otherwise be forced to ship by truck.

Rail carries more than 40 percent of the United States' total freight ton-miles,[8] but since the deregulation of the railroads in 1980, the largest (Class I) railroads have focused on high-volume, long-haul movements—such as transporting intermodal containers from Pacific Coast seaports to inland rail hubs and coal shipments from Wyoming's Powder River Basin to power plants in the eastern half of the United States—that allow them to capitalize on economies of scale in operations and revenue generation. As these railroads have focused on the largest shippers, they have increased prices and reduced service for many smaller shippers and have sought to shed their less profitable lines. Many branch lines previously owned by Class I railroads are now operated by short line (Class II and Class III) railroads (those with gross operating revenues below about $400 million per year) that collect carload freight from smaller shippers and generally transfer it to a Class I railroad for the long-distance portion of its trip. In areas of sufficient demand, this arrangement has worked to provide adequate rail service for shippers, but in some areas of lower demand, rail service has ceased.

As shown in Figure 1, the number of railroad miles in the United States has declined by 45 percent, from a peak of more than 250,000 in 1916 to 140,000 in 2006.[9]

8 Association of American Railroads. (2008, May). *Overview of America's Freight Railroads*. Retrieved 11/23/13 from https://www.aar.org/keyissues/Documents/Background-Papers/Overview-US-Freight-RRs.pdf.

9 American Association of Railroads, as cited in: Weatherford, B. A., Willis, H. H., & Ortiz, D. S. (2008). *The State of U.S. Railroads: A Review of Capacity and Performance Data*. RAND Corporation. Retrieved 8/9/12 from http://www.rand.org/pubs/technical_reports/2008/RAND_TR603.pdf.

In areas where rail service has been discontinued, shippers who had previously been reliant on rail are forced to move their freight by truck for at least the first leg of the trip, transferring it to a Class I railroad at a logistics park, transload center, or grain consolidation facility. Although this situation is perfectly acceptable from the perspective of the Class I railroad, both shippers and the public feel the pinch. Shippers are forced to pay more for highway transportation, reducing the viability of businesses dependent on the movement of heavy low-value goods, and the public bears the cost of additional heavy truck traffic.

From the narrowest perspective of a state DOT interested primarily in maintaining highway assets, supporting freight rail service on lines facing abandonment or in need of rehabilitation may be a more cost-effective alternative than allowing rail service to cease and increasing funding for maintenance and/or highway capacity expansion to accommodate the additional freight shifted onto the state's highways. A study analyzing Kansas DOT's State Rail Service Improvement Fund (SRSIF), which provides loans and grants to support short line rail service in the state, estimated that each dollar spent on SRSIF program loans and grants resulted in more than two dollars of public sector benefits, including state and local tax revenues and reduced highway maintenance spending.[10] Even excluding public sector tax revenues, the highway maintenance cost benefits of SRSIF grants were found to outweigh expenditures.[11]

While states differ in the highway revenues they derive from combination trucks and the costs attributable to these vehicles, the FHWA has estimated that, at the federal level, there is a significant discrepancy between the revenues generated from highway-user fees on these vehicles and their share of highway agency costs. The Federal Highway Cost Allocation Study estimated that combination trucks pay only about 80 percent of their federal highway cost responsibility through highway-user fees, while passenger cars pay approximately 100 percent of their cost responsibility.[12] In addition, support for freight rail service by state DOTs can be justified as a way to spur economic development and reduce emissions.

Implementation

How and under what conditions states should provide financial assistance to railroads or involve themselves in providing rail service is a complicated issue. Railroads are unique among industries. They are extremely capital intensive, and are restricted to operating on tracks they own or on which they have operating rights. Moreover, the cost and regulatory obstacles associated with constructing new rail lines are often prohibitive. Railroads are also the only surface transportation mode that is almost entirely privately owned and operated. While highways and waterways are publicly maintained and generally accessible to a wide variety of private carriers, railroad track is generally maintained by the railroad companies themselves, which often require a high return on investment in order to justify expenditures to maintain or improve their infrastructure. Providing public funds for rail maintenance and improvements allows the public sector to support rail transportation services that are in the public interest but may not provide a high enough level of return to generate sufficient private investment.

Many states currently provide assistance to short line railroads and shippers, and occasionally to port authorities, communities, or other entities, in the form of low-interest loans and grants to support rail infrastructure improvements. These programs typically receive state funding to the tune of several million dollars annually. Matching funds from the applicant are generally required for state assistance.

---

10 Kansas Department of Transportation. (2005). *Review of the Kansas Railroad Rehabilitation Program*. Retrieved from http://ssti.us/wp/wp-content/uploads/2011/12/rehstudy2005.pdf.

11 *Ibid.* $11.96 million is the ten-year present value highway maintenance cost savings realized as a result of the acquisition of the Central Kansas Railroad by the Kansas and Oklahoma Railroad, facilitated by a grant of $11.5 million through the SRSIF program.

12 Federal Highway Administration. (2000). *Addendum to the 1997 Federal Highway Cost Allocation Study Final Report.* Retrieved 8/1/12 from http://www.fhwa.dot.gov/policy/hcas/addendum.htm.

Some states own railroad infrastructure to ensure continued maintenance and passenger and/or freight service. While Alaska is the only state that owns a fully functioning passenger and freight railroad, other states own track or right of way, which has often been purchased in order to preserve service for rail-dependent industries or to preserve a rail corridor for the resumption of rail service at some time in the future.

Case Studies

Kansas: Loans and Grants to Support Freight Service on Privately Owned Rail Lines

Kansas DOT's SRSIF, started in 1999, currently offers $5 million per year in loans and grants to improve rail access for businesses and preserve the condition of the state's short line rail network.[13]

Funding is available for projects that improve the condition or expand the capacity of short line railroads in the state or that can be used to recruit or expand businesses in the state by providing improved access to the state's rail network. Eligible applicants include local governments, short line railroads, port authorities, and shippers.

The local match for SRSIF funding is generally 30 percent, although other match amounts may be considered on a case-by-case basis.

Kansas requires that applicants for funding demonstrate:

1. That the benefit-cost ratio of the proposed project exceeds 1.0;
2. That operations will be made more efficient by raising the minimum operating speed on the line;
3. That the project will result in road or highway maintenance cost savings for the state and local government entities; and
4. A commitment of capital or a guarantee of a set amount of rail traffic by local shippers, government entities, or other interested parties to the applicant for the continued operation of rail service for which funding is sought.

In addition, completed projects must meet infrastructure standards set by the state as well as Federal Railroad Administration (FRA) and the American Railway Engineering and Maintenance-of-Way Association guidelines. In order to ensure that all projects have been built to required standards, all projects will receive a final inspection by a third-party FRA-certified track inspector.

Recipients of SRSIF loans and grants must agree to continue service for ten years on a line for which SRSIF program assistance was provided. If service on the line is discontinued after less than ten years, SRSIF loans must be repaid in full. If service is discontinued after less than ten years on a line that has been preserved using SRSIF grant funding, a pro rata share of the grant, based on the time the line remained in operation following the completion of the project, must be repaid.
Kansas' guidelines for SRSIF projects help to protect the interests of Kansas taxpayers by ensuring that there is an adequate need for funded projects, that the funded projects will benefit the state, and that the projects will be constructed to appropriate standards.
According to a 2005 study analyzing the efficacy of the SRSIF, the program has enabled higher train

13 Kansas Statute 75-5048: Rail service improvement program; rail service improvement fund; requirements; restrictions; funding. Retrieved from http://kansasstatutes.lesterama.org/Chapter_75/Article_50/75-5048.html.

speeds on short line railroad track, reduced derailments, extended the service life of existing rail lines, and improved capacity in rail yards. Based on the operational benefits accruing to shippers from rail rehabilitation projects during the first six years of the program, the benefit-cost ratio of the program was found to be nearly 9:1.[14] The combined ten-year present value of public sector benefits for state and local tax revenues and highway maintenance cost savings resulting from the program was estimated at $43.7 million, more than three times the state expenditure on SRSIF grants during this period and more than double the total SRSIF program expenditures for grants and loans combined.[15]

Alaska and North Carolina: State-Owned Railroad Companies

While a number of states own railroad track, only Alaska and North Carolina own railroad companies, the Alaska Railroad Corporation (ARRC) and the North Carolina Railroad Company (NCRR), respectively. Both of these companies function like private entities but because they are owned by their states, they do not have to pay dividends to private shareholders, allowing them to invest much more of their revenue into maintaining and improving their facilities for the benefit of their states. Amtrak and Norfolk Southern provide passenger and freight service on the NCRR track, while the ARRC provides passenger and freight service directly.

Alaska Railroad Corporation

Alaska is unique among states in owning and operating a railroad that provides both freight and passenger service, operating from Seward and Whittier in the south to Fairbanks in the state's interior. Unlike other State of Alaska agencies, the ARRC is incorporated and run like a private business.[16] The ARRC receives no operating funds from the state, nor are its employees state employees.

The ARRC has been owned and operated by the State of Alaska since 1985, and is governed by a seven-member board of directors appointed by the Governor of Alaska, according to the provisions of the Alaska Railroad Corporation Act (AS 42.40). Prior to 1985, the railroad was federally owned and operated.[17] It was first established in 1914 to move gold and other minerals from the state's interior to the coast for shipment south.

The railroad currently operates 467 miles of main line track, with an additional 184 miles made up of branch lines, sidings, and rail yard track. A 2005 report detailing the economic significance of the ARRC found that its average annual in-state expenditures of $108 million between 2001 and 2003 supported 799 railroad jobs and 1,100 non-railroad jobs in the state, with an annual payroll of $83 million.[18] Other benefits of the railroad to the state include lower transport costs for heavy bulk commodities and regular passenger services.

Revenue generated by the ARRC is retained and managed by the corporation for railroad and related purposes, in accordance with the Alaska Railroad Transfer Act.[19] Because the ARRC is operated for the benefit of the people of Alaska, the corporation is exempt from taxation.[20]

---

14 Kansas Department of Transportation (2005). Review of the Kansas Railroad Rehabilitation Program. Retrieved from http://ssti.us/wp/wp-content/uploads/2011/12/rehstudy2005.pdf.

15 *Ibid.*

16 For more information, see Alaska Railroad's website at http://alaskarailroad.com/.

17 Alaska State Legislature. (1982). Alaska Railroad Transfer Act. Retrieved 1/31/12 from http://alaskarailroad.com/Portals/6/pdf/corp/Corp_ARTA_2005.pdf.

18 Tuck, B. & Killorin, M. (2005, March). *Research Summary of Economic Significance of the Alaska Railroad.* Institute of Social and Economic Research, University of Alaska–Anchorage. Retrieved 1/4/12 from http://www.alaskarailroad.com/Portals/6/pdf/corp/ISER%20report%203-16-05.pdf.

19 State of Alaska. *Statute 42.40.530. Revenue*. Retrieved 1/31/12 from http://touchngo.com/lglcntr/akstats/Statutes/Title42/Chapter40/Section530.htm.

20 State of Alaska. Statute 42.40.910. Exemption From Taxation. Retrieved 1/31/12 from http://touchngo.com/lglcntr/akstats/Statutes/Title42/Chapter40/Section910.htm.

North Carolina Railroad Company

North Carolina's ownership of the NCRR may represent a more feasible model than the ARRC for states interested in railroad ownership but not in handling day-to-day operations.[21] While the NCRR functions like a private corporation, any dividends received by the state must be used by the North Carolina DOT for the improvement of railroad property, as recommended and approved by the railroad's board of directors. The improvements may include the following project types[22]:

1. Railroad and industrial track rehabilitation;
2. Railroad signal and grade crossing protection;
3. Bridge improvements;
4. Corridor protection; and
5. Industrial site acquisition.

Unlike the ARRC, the NCRR is not completely tax exempt. However, in 1995, it was reorganized as a Real Estate Investment Trust, to lower its federal tax burden, and with the passage of the Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users (SAFETEA-LU) the NCRR became largely tax exempt under Section 11146.[23] In 2010, the NCRR had net income of $1.7 million and paid only $60,000 in income taxes.

According to a 2007 study estimating the economic impact of the railroad, the NCRR contributes roughly $338 million to North Carolina's economic output each year.[24] In addition, the report estimated the value of improved road safety and reduced pavement damage and emissions to be at least an additional $65 million per year.

Although the State of North Carolina contributes to the maintenance and improvement of NCRR facilities, the fact that the NCRR is owned by the state and reinvests its profits in maintenance and improvements means the state can be confident that its investment is not simply a handout to a private company. While there is a risk that the railroad providing service on the NCRR track, Norfolk Southern, could receive excessive benefits as a result of the state funding maintenance and improvement activities, the terms of the operating lease can be renegotiated in the future to correct such imbalances.

While the ARRC is an historical anomaly and it is unlikely that another state would be interested in acquiring and operating a railroad, it represents a valuable example of a railroad being operated more akin to a public utility than a private company. The NCRR model potentially provides a more likely alternative for states that are interested in the acquisition of track to maintain freight or passenger rail service but not in handling day-to-day railroad operations. Through state ownership of a railroad company that can negotiate mutually beneficial service agreements with passenger and freight rail carriers, states can help to ensure that the public will benefit from its ownership of railroad infrastructure and reduce the potential that it will generate undue benefits for private interests.

---

21 For more information, see NCRR's website at http://www.ncrr.com/.

22 State of North Carolina. General Statutes §124-5.1 State use of North Carolina Railroad dividends. Retrieved 1/31/12 from http://www.ncleg.net/enactedlegislation/statutes/pdf/bychapter/chapter_124.pdf.

23 Available at: http://www.nhtsa.gov/nhtsa/Cfc_title49/PL109-59.pdf.

24 Heller, et al. (2007, May). *The Economic Impact of the North Carolina Railroad: Summary of Findings*. Prepared by RTI International and University of North Carolina—Charlotte for the North Carolina Railroad Company. Retrieved 7/24/12 from http://cai-dev.com/~ncrr/wp/wp-content/uploads/2011/10/Exec-Summary-final_printing1.pdf.

Resources

American Association of State Highway and Transportation Officials & American Short Line and Regional Railroad Association. State Financing Programs for Short Line Railroads. http://rail.transportation.org/Pages/rail_success.aspx.

This website provides brief descriptions of short line railroad support programs in many states and links to program websites.

CTC & Associates, for the California Department of Transportation, Division of Research and Innovation. (Revised 2011, June 21). Rail Preservation Programs: A Survey of National Guidance and State Practice—Preliminary Investigation, http://www.dot.ca.gov/newtech/researchreports/preliminary_investigations/docs/rail_preservation_preliminary_investigation_6-21-11.pdf.

This report provides detailed descriptions of state railroad support programs as well as descriptions of and links to a variety of resources, and is a good starting point for those interested in learning about state-level rail preservation programs.

National Cooperative Highway Research Program, Transportation Research Board. (2007). Preserving Freight and Passenger Rail Corridors and Service, NCHRP Synthesis 374. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_374.pdf.

This synthesis report details rail preservation strategies and profiles six `rail preservation success stories.

Support Intermodal Freight Connections

The Opportunity

Freight and the movement of physical goods remain the backbone of the American economy and a key area of focus for restoring the nation's economic health. We move goods by water, air, and land, but these modes have separate and isolated oversight, planning, and funding functions. Supporting a smooth and efficient transition between modes is essential to reducing public expenses for highway maintenance and expansion and boosting economic growth.

Freight markets extend far beyond individual cities and regions. A single shipment often moves via multiple modes before reaching its destination. Coordination is needed between states and regions, between public and private sectors, and across modes to increase the efficiency of intermodal transfer activities, reduce pressure on overburdened highway corridors, and increase economic competitiveness.

Increasingly, state and national leaders are focusing on rebuilding the manufacturing sector, and goods production is steadily recovering. States that target resources and leadership attention on comprehensive freight programs, integrated with land use and mobility policies, will be in a better position to recover from the current economic downturn and thrive in the economy of the 21st century.

What Is It?

Because many states plan and manage their highways, rails, waterways, and airports separately from one another, the connections between these modes sometimes fall between the cracks. Many state DOTs have an almost exclusive focus on highways and often fail to optimize the connections between modes. Without sufficient access to rail transportation, businesses ship goods by truck that they could otherwise move by train. Moving goods by truck, which is considerably more expensive and fuel intensive than shipping by rail, reduces businesses' profitability. More importantly from a state DOT's perspective, each 100-car train can move as much freight as roughly 435 fully loaded trucks,[25] each of which generates hundreds of times the pavement damage of a typical passenger car.[26] When shippers are forced to move goods by truck that they would otherwise have transported by rail, these trucks clog highways and local streets, creating the need for additional capacity and more frequent pavement maintenance and repair.

Integrated planning and programming, and a focus on easing intermodal connections can help states optimize their existing freight system. Several activities DOTs can pursue to accomplish this include:

- Developing integrated freight plans,
- Investing in intermodal freight facilities, and
- Improving intermodal connectors.

Developing integrated freight plans. The first step to enhancing freight coordination is to develop and adopt an overarching and comprehensive plan for the design and operation of a multimodal state freight system. While most states have completed some form of a freight plan, many lack the

25 Iowa Department of Transportation website. Retrieved 7/23/12 from www.iowadot.gov/compare.pdf.

26 Federal Highway Administration. (2000). *Addendum to the 1997 Federal Highway Cost Allocation Study Final Report*. Retrieved 7/23/12 from http://www.fhwa.dot.gov/policy/hcas/addendum.htm.

level of detail that provides the redundancies and coordination necessary for a reliable and resilient freight transportation system. Freight plans should incorporate state and regional land use goals and economic development objectives. Studies by the National Cooperative Highway Research Program (NCHRP) have identified seven keys to success for integrated freight planning:[27]

1. Establish a freight technical lead;
2. Understand the statewide freight system;
3. Link freight planning with transportation planning and programming;
4. Understand freight data needs;
5. Involve stakeholders;
6. Provide freight training and education;
7. Advocate for freight planning.

Investing in intermodal freight facilities. In today's global marketplace, goods come from around the world to meet consumer demand. Likewise, goods produced domestically are shipped nation- and worldwide in a globally integrated market. This often means that goods may make three or more transfers between modes before they reach their final destination. Facilities that link these different modes are critical to the efficient movement of goods, and states have an important role to play in coordinating the location of these sites and developing the transportation linkages that serve them.

Improving intermodal connectors. Connectors, critical roads and highways that link key ports and rail terminals to the highway network, often fall between the jurisdictions of state DOTs, port authorities, metropolitan planning organizations (MPOs), local governments, and private sector terminal operators and carriers.[28] These routes tend to be lower volume industrial roads and often have less vocal constituents than major commuter routes or transit lines.[29] State DOTs would benefit from working with other levels of government and the private sector to identify these key corridors for improvement. When states identify intermodal connectors that meet federal guidelines,[30] they should submit a proposal for inclusion of the facility as a link in the National Highway System.

Implementation

There are several ways states can increase the integration of their various freight systems and provide a more comprehensive picture of freight mobility for their state.

1. **Have a laterally integrated and economy-focused freight office.** Most states have a freight program, but these programs vary significantly from state to state. More often than not, they are a small unit, perhaps just one person, and, just as often, that person is more consumed with gathering the data necessary to report to federal agencies than thinking strategically about the freight networks of the state. Strategic planning means that the freight program cannot be isolated within a truck or train silo. It must coordinate with state land use planning, economic development, and multimodal passenger transport planning. Investments in freight delivery should not come at the expense of other state objectives. Rather, by elevating its role and insisting on strategic integration, intermodal freight planning can enhance and support state objectives, and, in turn, other activities can be designed to support freight.

---

27 Extracted from *NCHRP Report 594: Guidebook for Integrating Freight into Transportation Planning and Project Selection Processes*. Retrieved 9/19/13 http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_594.pdf.

28 Cambridge Systematics, Inc. (2003). *NCHRP Project 8-36: Intermodal Freight Connectors: Strategies for Improvement*. Prepared for Transportation Research Board. Retrieved 8/10/12 from http://intermodal.transportation.org/Documents/8-36(30)connectors.pdf.

29 *Ibid.*

30 Federal Highway Administration. (1997). *Federal-Aid Policy Guide, Subchapter E—Planning, Part 470—Highway Systems*, Appendix D—Guidance Criteria for Evaluating Requests for Modifications to the National Highway System. Retrieved 6/28/12 from http://www.fhwa.dot.gov/legsregs/directives/fapg/cfr0470a.htm#appd.

2. **Develop an intermodal freight plan.** Federal regulation requires that every state transportation plan include a freight component. The quality and depth with which states meet this requirement, however, varies greatly. Some simply acknowledge the need and priority to move freight. Much more useful are those states that identify key truck, rail, and water routes, major freight generators, and the linkages between them. States should reach out to local governments and MPOs as well as shippers and carriers in the private sector to better understand the needs of each. By working proactively with private sector partners, the state can identify areas of future demand and target existing chokepoints for improvement. This process can help states to identify key highways and roads as intermodal connections and support their inclusion as such in the National Highway System.

3. **Modernize intermodal facilities.** There is often an uncertain relationship between states and intermodal transfer facilities. These transfer facilities are the essential nodes that connect the various systems; however, while critical to a state's economy, they are typically not state-owned assets. When modernization of these facilities is necessary and budgets are tight, public-private partnerships can assist, providing dividends to the states.

4. **Work closely with local governments, MPOs, neighboring states, and the private sector.** Although freight movement is dispersed, metropolitan areas have a critical and leading role to play in delivering a strong freight system. MPOs work with states and local governments to improve transportation in their regions and often have a better understanding of the critical routes serving freight-intensive industries. Developing inter-state working relationships through invested groups can help coordinate freight investments across states and ensure they are based on a common network, shared priorities, and logical timing.

Case Studies

Maryland: Port of Baltimore

The State of Maryland provides a good example of a state at the forefront of change heading into the new economy. In partnership with private industry and with an eye on global transportation changes, Maryland is adapting the critical freight facilities of one mode in response to changes in another.

The Port of Baltimore supports more than 50,000 jobs and $3.2 billion of economic activity for the region and the state—plus thousands more jobs and many millions of dollars in related activity.[31] As a deepwater seaport, the port is a major national asset for global imports and exports as well.

For more than 100 years, the Howard Street Tunnel provided a critical link serving the port and freight rail transport up and down the east coast, but the tunnel is not adequate for the needs of the next century. The nature of shipping is changing, with ships growing in size in response to the widening of the Panama Canal, set for completion in 2014.[32] The Howard Street Tunnel's "single track, single stack" format, which was once an asset to freight mobility, has now become an obstacle to getting these larger shipments onto the national railroad network.

31 Maryland State Archives. (2012, June 6). "Maryland at a Glance. Waterways: Port of Baltimore." Retrieved 8/9/12 from http://www.msa.md.gov/msa/mdmanual/01glance/html/port.html.

32 Halsey III, A. (2012, March 28). "Aging Baltimore tunnel a threat to shipping economy for the city and Maryland." Washington Post. Retrieved 9/19/2013 from http://www.washingtonpost.com/local/trafficandcommuting/aging-baltimore-tunnel-a-threat-to-shipping-economy-for-the-city-and-maryland/2012/03/28/gIQAjYCVhS_story_2.html.

The tunnel is too short to carry trains with a double stack of shipping containers, and it is too constrained to easily adapt. The city has grown up around the tunnel, and the adjacent development restricts raising, lowering, or widening the tunnel. In addition, despite being critical to the regional and state economy, the tunnel doesn't belong to the state—it belongs to the transportation company CSX.

The cost of reconstructing the tunnel is estimated at $3 billion, too expensive of a project for private industry or the state alone to fund. In order to solve this problem, the State of Maryland has partnered with CSX to provide a new transfer station south of the tunnel capable of receiving double-stacked trains, removing a stack for the run through the tunnel, and restacking again on the other side of the pinch point. While imperfect, it is creative, and at just $160 million, a much lower cost than reconstructing the tunnel.[33] The project demonstrates that Maryland is committed to maintaining the vitality of the port economy and responding to changing freight market trends.

The Howard Street Tunnel project illustrates the interdependency of freight mobility: a port project affects a rail project which will also affect trucking connections, all of which have effects on consumer markets and several job sectors.

Indiana: Multimodal Freight and Mobility Plan

In July 2009, the Indiana DOT released the Indiana Multimodal Freight and Mobility Plan, which assessed the condition of the freight systems in the state and the increasing pressure being put upon them (from freight operators as well as other system users). The report concluded, "What is clear is that no single mode of transportation will sufficiently serve the growing demand for the movement of goods and passengers in Indiana. What is needed is a coordinated multimodal freight network."[34]

The plan was developed through collaboration with a broad group of stakeholders that included neighboring states and the state economic development corporation. This collaboration revealed the demands on the various modal systems and the intermodal facilities that integrate them, but also highlighted the economic impacts of integrated freight system planning for job creation and affordability of goods to consumers. Lowering transport times, increasing travel time reliability, and increasing freight transportation efficiency make the state more attractive to industry. Indiana estimates that "freight-intensive" industries in the state account for 43 percent of gross state product and 38 percent of the state's employment, and cost-effective transportation is a key factor in the economic competitiveness of these industries.[35]

Anticipating, planning, funding, and implementing a system that maintains economic health and vitality is a top priority for the state. Goods movement in the manufacturing and retail sectors is dominated by trucking services, which are often challenged by increasing highway congestion. Intermodal planning provides a way to improve trucking services and design redundancies into this system in a changing world.

The Indiana study is a model in integrated and collaborative planning that combines current industry needs and challenges with anticipated economic market demands in the future.

33 *Ibid.*
34 Indiana Department of Transportation. (2009, July 9). *Indiana Multimodal Freight and Mobility Plan*, p. 1. Retrieved 9/19/13 from http://www.in.gov/indot/files/FreightMobilityPlan.pdf.
35 *Ibid.*

Resources

Goodchild, A. (2011). Defining the Washington State Truck Intermodal Network. Prepared for the Washington State Department of Transportation. http://www.wsdot.wa.gov/research/reports/fullreports/783.1.pdf.

This report provides criteria for use in defining the state's intermodal network and reviews criteria used in other states to identify key intermodal facilities.

Rahall Transportation Institute at Marshall University & Wilbur Smith & Associates. (2004). Meeting the Transportation Challenges of the 21st Century: Intermodal Opportunities in the Appalachian Region, Intermodal Case Studies. Prepared for the Appalachian Regional Commission. http://www.arc.gov/assets/research_reports/MeetingTransportationChallenges_intermodalopportunitiesintheAppalachianRegion3.pdf.

This study builds on the companion regional study of commodity movements within the Appalachian region and between the region and the rest of the world by transportation mode, identifying exemplary case studies of intermodal initiatives and opportunities in the Appalachian region.

Wilbur Smith & Associates. (2009). Arizona Multimodal Freight Analysis Study, Technical Memorandum #3: Strategic Directions for Freight Planning in Arizona. Prepared for the Arizona Department of Transportation. http://mpd.azdot.gov/mpd/systems_planning/PDF/freightstudy/Arizona_Multimodal_Freight_Analysis_TM3_Final_Feb.pdf.

This report offers a menu of options for integrating freight considerations into the Arizona DOT's planning functions. The strategy's recommendations touch on all modes operating within the state.

Foster Win-Win Outcomes for Freight and Passenger Rail

The Opportunity

With only a handful of exceptions, privately owned freight rail lines are the backbone of the passenger rail system. Many regional commuter rail systems operate at least a portion of their service on freight rail lines or rights of way.

Freight and passenger railroads often have an uneasy relationship. As oil prices have climbed and roadways have become more congested, demand to move people and goods by rail has steadily increased.[36] At the same time, deregulation has led railroads to restructure or shed their lower volume lines. Because new rail lines and capacity improvements are difficult to establish today, freight railroads are trying to protect the limited capacity that remains, putting the squeeze on passenger rail.[37] Concerns that inhibit the shared use of facilities by passenger and freight railroads include issues of safety, capacity, compensation, and liability.[38]

Poor cooperation between freight and passenger railroads leads to inefficient use of rail infrastructure and additional strain on the highway network. When railroads are unreliable or inconvenient or lack sufficient capacity, shippers and passengers will increasingly rely on roads, leading to increased congestion and lower economic productivity.

States that can maintain strong freight rail operations alongside rich and reliable commuter and intercity train service can reduce transportation costs for businesses and individuals, increase sustainability, and reduce highway congestion and resultant maintenance and capacity expansion costs.

What Is It?

Because of the interstate nature of the freight system, policies and standards for integrating freight and passenger rail services come from the federal government. However, states still have a role to play in developing state rail plans, defining and advocating for state priorities, and strategically directing state funding to support these objectives. For example, they can establish new rights of way or acquire abandoned corridors. States often serve as the mediator, balancing freight and passenger demands and ensuring that expanded capacity for one does not decrease the other's operability.

Although passenger and freight rail infrastructure needs are similar, the financial, operating, and regulatory environments are radically different. Passenger rail is nearly universally provided by a public entity, commonly a transit authority or state department of transportation. Freight rail, on the other hand, is almost exclusively a private for-profit enterprise. It is not always easy to reconcile these competing interests, but there are steps state DOTs can take that benefit both sides and promote states' overall economic interests, including:

---

36 American Association of State Highway and Transportation Officials. (2007, February).*Transportation: Invest in Our Future: Future Needs of the U.S. Surface Transportation System*. Available at https://bookstore.transportation.org/item_details.aspx?ID=1003.

37 Prozzi, J. (2006, March). "Passenger Rail Sharing Freight Infrastructure: Creating Win-Win Agreements." Center for Transportation Research. The University of Texas at Austin. Retrieved 9/19/13 from http://www.reconnectingamerica.org/resource-center/browse-research/2006/passenger-rail-sharing-freight-infrastructure-creating-win-win-agreements/.

38 Association of American Railroads. (2013, November). *Freight and Passenger Rail: Finding the Right Balance*. Retrieved from https://www.aar.org/keyissues/Documents/Background-Papers/Freight-and-Passenger-Rail.pdf.

Acquire or construct rail corridors where necessary. States interested in expanding passenger service or providing freight service in underserved markets may need to acquire or construct new railroad infrastructure themselves. Service on state-owned lines may be provided by private short line railroads, Amtrak, and/or commuter railroads.

Upgrade track and communications networks on existing lines. Railroads are some of our oldest transportation infrastructure—many sections of track are over 100 years old. While generally adequate for freight transport, where speed is typically less of a factor, poor track conditions hinder passenger transportation. Providing aid to rail owners to improve track conditions and upgrade signal technology with grants or low-interest loans can enable cost-effective passenger rail operations, improve the speed and reliability of freight operations, and reduce pressure on highways.

Improve state rail planning. To receive federal aid, states are required to create plans that outline rail infrastructure priorities and objectives for both passenger and freight. However, these plans vary widely in quality and timeliness. Plans that describe the state's existing rail system in detail, including industries reliant on the system and their economic importance to the state, and define clear objectives and priorities can form a foundation that will lead to increased capacity and service reliability, reduced travel times, cost efficiencies, and improved asset conditions.

Implementation

Expanding passenger and freight rail services, and strengthening cooperation between the two, can provide states with a strong return on investment. A small investment in better information and rail management can bring a big return in network efficiency, market competitiveness, and quality of life. States can improve passenger and freight rail service by taking the following steps:

1. **Take an inventory of assets.** Rail lines crisscross states. Many of these are active rail corridors, but many others are dormant or abandoned. Likewise, many state DOTs are not fully informed of the extent and condition of their railroad networks. In 2005, California created an inventory of all rail corridors in the state,[39] which is now helping state transportation leaders map out opportunities for new rail services to meet rising passenger and freight demand.

2. **Designate a rail coordinator or office.** Many state freight offices are understaffed, sometimes consisting of just one employee. However, having focused and designated leadership on rail issues is essential to advancing both passenger and freight rail priorities, and to navigating the complicated channels of ownership, policy, operations budgets, and regulatory requirements. A rail coordinator is typically responsible for coordinating a state's rail plan development, keeping it current, and tracking implementation progress.

3. **Manage public expectations and leverage political partnerships.** Counter-intuitively, vocal public support for passenger rail can diminish the state's negotiating power with private railroad holding companies. In the United States, the railroads have enormous power—not only do they own the rights of way on which passenger service depends, but they are protected from the state's eminent domain powers. This puts the state in a difficult negotiating position, which can be made even more difficult if the state has made commitments to the public to deliver service and rights of way before securing the necessary rights or agreements. Railroad owners know when credibility is on the line and may use it to their advantage. As a result, it is important to secure agreements before stimulating public enthusiasm. Likewise, it is important

39 Simpson, David P. (2007). *NCHRP Synthesis 374: Preserving Freight and Passenger Rail Corridors and Service*. Transportation Research Board. Retrieved 9/19/2013 from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_374.pdf.

to keep national legislators engaged in passenger and freight rail, as they can have tremendous influence over the freight rail financial and regulatory environment.[40]

4. **Build trust.** Trust is essential to improving the relationship between passenger and freight railroads. Developing an open and accessible rapport between state leadership and freight railroads builds trust, allows candid discussions about needs and concerns, and can lead to mutually beneficial solutions. Building trust takes work, time, and focus, but because rail facilities are in place for decades, it is worth the effort.

5. **Improve communication and coordination.** Communication is the key to maintaining quality passenger and freight services on shared alignments. Track maintenance activities and natural disasters can alter rail schedules and service reliability. While rail assets are owned by private corporations, they are vital parts of state transportation systems. Strong communication networks can reduce the impacts of unexpected incidents on passengers and freight shippers by allowing railroads to better respond to these events.

6. **Get smart on costs.** Compensating freight railroads for track access can be a contentious topic, and sorting out who is responsible for which costs can be difficult. Certain costs are easy to assign—passenger stations are a passenger cost, freight depots are the responsibility of freight alone—but how track maintenance, signalization, communication, and administration costs should be apportioned is less clear. Passenger rail service demands higher speed and safety standards, while freight railroads may be willing to accept slow speeds on some rail lines in order to reduce costs. For states to negotiate with railroads effectively, they need to understand the industry.

Case Studies

California: Rail Right-of-Way and Abandoned Corridors Inventory

Throughout the 1980s and 1990s, California's economy grew at a rapid rate. During the same period, the railroad deregulation of 1980 led to the restructuring of many freight rail operations. Low-density freight lines were abandoned or sold, even as the pressure for more passenger rail grew.

In 2001, the governor tasked Caltrans, the state transportation agency, to inventory the rail facilities and rights of way in the state (both active and dormant). A large, multidisciplinary stakeholder advisory committee analyzed links and segments based on their potential use for passenger rail service, bicycle or pedestrian connections, or joint use, and geographically coded each to create a comprehensive database. The 150-member committee represented diverse interests, including railway officials, transit providers, and regional and local representatives and activists.[41]

To rate the potential use or demand for the various segments, Caltrans and the advisory committee developed evaluation criteria. These included potential demand, connectivity, track geometry, safety, and congruence with local plans. Segments were then sorted into typologies from high-demand/high feasibility to low demand/low feasibility, based on their performance in each area.[42]
Caltrans gave the inventory to local and regional transportation agencies and authorities for their

40 Prozzi, J. (2006, March). "Passenger Rail Sharing Freight Infrastructure: Creating Win-Win Agreements." Center for Transportation Research. The University of Texas at Austin. Retrieved from http://www.reconnectingamerica.org/resource-center/browse-research/2006/passenger-rail-sharing-freight-infrastructure-creating-win-win-agreements/.

41 California Department of Transportation. (2005). *Rail Right-of-Way and Abandoned Corridors Study.* Retrieved 7/13/12 from http://149.136.20.80/rail/dor/assets/File/Report_Files/rowreport.pdf.

42 *Ibid.*

planning purposes and to prioritize corridors for acquisition or preservation. The database has been a valuable resource for regional and local planning authorities to identify and prioritize segments for acquisition and preservation. The database is a good example for other states interested in better understanding their rail assets and investing in the system to spur economic development.

Chicago Region: Environmental and Transportation Efficiency (CREATE) Program

Chicago is the nation's preeminent rail hub, where six of the nation's seven Class I rail lines converge and through which nearly one-quarter of all freight in the nation passes. Millions of passengers also rely on the region's rail system for their daily commute and for longer intercity trips. Rail conflicts have hampered the productivity of both passenger and freight rail, however, as demand has outpaced capacity over the last few decades.

Since 1983, when Metra, the regional commuter rail system, began service, ridership has grown nearly 50 percent, with the system now carrying more than 300,000 passengers per day.[43] Freight rail volumes have been growing as well, and are expected to double over the next 30 years.[44] As volumes have grown, service has suffered—freight trains that make the trip to Chicago from Los Angeles in 48 hours often take 30 hours just to pass through the Chicago region.[45]

Recognizing the problem of rail congestion in the region, in 2003 the State of Illinois, the City of Chicago, and the private rail operators announced the CREATE program: a long-term, $3 billion public-private partnership designed to address these rail conflicts in order to improve efficiency and productivity for the region, the state, and the nation.[46]

So far, 19 of 75 major planned CREATE projects have been completed. An additional ten are under construction, six are in final design, and 13 are undergoing preliminary engineering and environmental review. A majority of completed projects (including track construction and new control towers) have occurred in existing privately owned rail corridors with private railroads acting as the lead agency.[47] In addition, the Chicago DOT Viaduct Improvement Program (VIP) has corrected deficiencies at 58 rail viaducts.[48] Projects involving new grade separations have been slower to progress, due mainly to funding issues and environmental review, but promise large dividends in terms of rail efficiency public safety, local development, and environmental goals.[49]

Not all of the proposed CREATE projects involve infrastructure improvements. The Common Operational Picture (COP) project involves development of a multi-railroad dispatch monitoring system for monitoring all train movements by all railroads operating in the region (including eight private freight railroads, Metra, and Amtrak). The system will have an open interface for integrating relevant information from the individual railroad dispatch systems into a single display. The expected benefit of COP is the ability to identify congestion and reroute trains as needed to improve travel times for the 1,300 daily freight and passenger trains in the region. A COP prototype has been developed and tested and final design of a district-wide system is underway.[50]

43 CREATE program website. Retrieved 7/11/12 from http://www.createprogram.org/.
44 *Ibid.*
45 *Ibid.*
46 Federal Highway Administration. "Project Profile: Chicago Region Environmental and Transportation Efficiency Program." Retrieved 5/26/12 from http://www.fhwa.dot.gov/ipd/project_profiles/il_create.htm.
47 CREATE. (2013, November). "Status of CREATE Projects." Retrieved on 11/26/13 at http://www.createprogram.org/linked_files/status_map.pdf.
48 CREATE. (2013). "City of Chicago Viaduct Improvement Projects." Retrieved on 10/16/13 at http://www.createprogram.org/factsheets/viaduct.pdf.
49 CREATE. (2013, November). "Status of CREATE Projects." Retrieved on 11/26/13 at http://www.createprogram.org/linked_files/status_map.pdf.
50 CREATE. (2013). "Common Operational Picture Project Fact Sheet." Retrieved 11/18/13 from http://www.createprogram.org/factsheets/Common_Operational_Picture.pdf

The benefits of the projects completed thus far are substantial, with an estimated 28 percent reduction in freight rail delay and a 33 percent reduction in passenger delay.[51] However, many other CREATE projects remain to be completed. Simulations suggest that, without the completion of these projects, freight train delay will climb from 46 to 143 minutes per 100 train miles and passenger delay will climb from 0.6 to 3.1 minutes per 100 train miles.[52] Although delays are expected to grow even with the completion of the remaining CREATE projects due to increasing passenger and freight volumes, the impacts are expected to be much less severe, with total freight train delay expected to peak at roughly 76 minutes per 100 train miles in 2030 while passenger delay climbs to one minute per 100 train miles.[53]

Resources

Association of American Railroads. (2011). Freight and Passenger Rail: Finding the Right Balance. https://www.aar.org/keyissues/Documents/Background-Papers/Freight-and-Passenger-Rail.pdf.

This two-page document summarizes key principles for expanding passenger rail service without harming the freight rail industry.

California Department of Transportation. (2005). Rail Right-of-Way and Abandoned Corridors Study. http://149.136.20.80/rail/dor/assets/File/Report_Files/rowreport.pdf.

This study evaluates the potential for combined passenger and freight service on active freight rail segments, resumption of service on out-of-operation lines, "rails with trails" along rail corridors, and new uses for out-of-operation lines. Segments across the state were rated based on their potential for joint use or re-use. A key component described in the study is the production of both rail right-of-way and bicycle/pedestrian trail databases.

CREATE Program Website. http://www.createprogram.org/index.htm.

This website provides information about CREATE's projects, program goals, and partners, as well as additional information about the program.

Jolanda, P. (2006, March). Passenger Rail Sharing Freight Infrastructure: Creating Win-Win Agreements. Center for Transportation Research. The University of Texas at Austin. http://www.utexas.edu/research/ctr/pdf_reports/0_5022_1.pdf.

This report is a summary of the environments in which public agencies and private railroads operate and negotiation issues and concerns regarding passenger trains operating on freight railroad infrastructure.

National Coordinated Highway Research Program. (2010). NCHRP Report 657: Guidebook for Implementing Passenger Rail Service on Shared Passenger and Freight Corridors. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_657.pdf.

This guidebook provides support and guidance for passenger rail authorities seeking to initiate, expand, and operate passenger rail services on shared passenger and freight corridors.

Young, E. & Kresge, J. (2003). Building Planning Capacity Between Public and Private Sector Partners in the Freight Industry. The Federal Highway Administration and National Association of Regional

51 *Ibid.*
52 *Ibid.*
53 *Ibid.*

Councils. http://narc.org/uploads/freightresourcesmanual_final.pdf.
This resource manual compiles best practices and critical issues in freight planning for regional transportation planners throughout the United States.

Encourage Innovative Freight Delivery

The Opportunity

Getting freight to customers requires moving trucks through urbanized areas where multiple users compete for valuable street space. In many cities, land prices have caused warehouses and distribution centers to move away from freight consumers, such as shops, restaurants, and stores. Getting goods from ports or terminals to market often means long hauls by vehicles too large to easily move through congested urban settings. Delivery trucks also compete with other road users for limited on-street parking space to unload their goods, sometimes double parking their vehicles and blocking vehicle traffic and bicycle lanes.

By taking a leadership role in facilitating efficient freight delivery and integrating freight, land use, and broader transportation policies, states can reduce congestion and the need for increased capacity, stimulate economic development, and reduce air pollution.

What Is It?

While freight delivery is absolutely crucial to state economies, it is generally uncoordinated and not normally integrated into land use plans. When major freight hubs like ports become clogged with truck traffic, businesses face expensive product delays and higher transportation costs. However, better planning and coordination through initiatives such as intermodal freight villages, real-time information sharing across the distribution chain, and congestion management can increase the efficiency of freight delivery, create jobs, and support economic growth. States recognize the challenges associated with freight delivery and have taken a variety of approaches to improving freight mobility.

One statewide freight plan, the Freight, Goods, and Services Mobility Strategy Plan in Florida, called for clustering freight and making better use of intermodal facilities. In California, a state mandate to produce a congestion plan at the choked Ports of Long Beach and Los Angeles resulted in a successful private sector effort to increase port hours and decrease peak period truck trips by 24% in a one-year span. (See case studies below.)

Sharing freight policy and infrastructure information. In order to implement delivery time restrictions or incentives, designate or revise a truck route network, or foster freight intensive land uses in appropriate locations without generating land use and transportation conflicts, decision makers need to understand freight transportation patterns and the freight policy landscape. The first step is to understand where key freight nodes and transportation corridors are located. Next, because freight crosses jurisdictional boundaries, it is important to understand policies in nearby jurisdictions that impact freight movement. Regional planning agencies and states are well positioned to collect and distribute this type of information to their constituent jurisdictions and to take the lead in efforts to harmonize regional freight land use and transportation policies.[54]

Two MPOs embracing a leadership role in this area are the Delaware Valley Regional Planning Commission (DVRPC), in the Philadelphia area, and the Chicago Metropolitan Agency for Planning (CMAP). To help planners, businesses, and individuals understand the multimodal freight transportation

54 Holloway, B., and Spahr, C. (2013, September). *Getting the Goods without the Bads: Freight Transportation Demand Management Strategies to Reduce Urban Impacts.* Retrieved 11/25/2013 from http://www.ssti.us/wp/wp-content/uploads/2013/10/Final-FreightReport1.pdf.

network in the Philadelphia region, DVRPC has developed the Philly Freight Finder[55], an online freight mapping and data platform that identifies key freight centers and transportation corridors. In order to improve interjurisdictional coordination in the Chicago area, where locally designated truck routes sometimes dead end at municipal boundaries, CMAP is compiling a comprehensive freight policy database that will facilitate better policy coordination.

Clustering freight land uses. Freight villages are clusters of freight infrastructure such as warehouses and logistics centers with access to intermodal facilities. Storing goods near intermodal centers reduces truck travel because freight can be moved onto other modes, such as rail, for portions of the trip. Since distribution centers experience economies of scale, clustering many companies decreases the number of distribution centers needed.

In many communities, large swaths of land are zoned as industrial without any efficient land use planning specifically geared toward freight. In other cities, industrial land designations are disappearing. Having a clear plan for consolidating major freight facilities in places with excellent—and, ideally, intermodal—access to target markets lowers costs to the private market by achieving greater economies of scale. Creating a special zoning designation at freight hubs, particularly those accessible by rail or waterways, can encourage investment and prevent the loss of unique freight assets and associated jobs.

Managing Congestion. Congestion management tools such as freight curb allocation or pricing to shift delivery windows to uncongested periods makes loading and unloading more efficient, reduces backups at retail docks, and saves time and money for the trucker and all travelers on the system. Many cities control when and where trucks may travel. For example, Boston bans commercial vehicles from the downtown hub except from 6 p.m. to 11 a.m. Los Angeles DOT's Tiger Teams Curbside Management Program had been targeting specific corridors for enforcement and towing repeat offenders, but after speaking with the offenders and learning the challenges truck drivers face, the city established new loading zones.[56] These programs at the city level reduce congestion and speed delivery. At the state level, similar principles can be applied to major hubs. For example, upon concerns that the state of California would mandate fees on containers moved druing traffic periods, the terminal operators at the Ports of Los Angeles and Long Beach formed a non-profit company, PierPass, to administer a program to promote off-peak delivery. As a result, nearly 60% of container moves now take place during off-peak hours.[57]

Efficient and coordinated freight management. The movement of a good from its manufacturing place to the retailer often involves transport to numerous distribution centers, which, in many cases, don't know when to expect a shipment.[58] However, sharing real-time information on the whereabouts of containers, port delays, and traffic updates with manufacturers and shippers along the chain of distribution can decrease congestion and lower freight travel time. Shippers and carriers value transit time for truck shipments at $25 to $200 per hour, depending on the product being carried. However, travel time reliability is often just as important. The FHWA estimates that shipment delays impose per-hour costs on businesses that are 50 to 250 percent higher than standard transit time values.[59]

---

55 Delaware Valley Regional Planning Commission. (Updated 2013, April). "Philly Freight Finder" website. Retrieved 11/25/13 from http://www.dvrpc.org/webmaps/phillyfreightfinder/.

56 Better Market Street. (2011, December). "Part 2.4: Loading and Delivery Management." *Better Market Street: Existing Conditions and Best Practices* (Part 2: Best Practices). Retrieved 11/25/13 from http://www.bettermarketstreetsf.org/docs/BMS_P2-4_BestPractices_12072011.pdf.

57 Windes & McClaughry Accountancy Corporation. (2013, April). *PierPass 2012 Financial Report*, Retrieved 11/23/2013 from https://www.pierpass-tmf.org/Documents/pierpass-2012-financial-report.pdf.

58 Butler, R. W. (2009, February). "Electronic Freight Management" Public Roads Vol. 72, No. 4. Federal Highway Administration. Retrieved 9/19/13 from http://www.fhwa.dot.gov/publications/publicroads/09janfeb/06.cfm.

59 Federal Highway Administration. (2004). *Freight Transportation: Improvements and the Economy*. Retrieved 9/19/13 from http://ops.fhwa.dot.gov/freight/documents/improve_econ.pdf.

Most major carriers track their shipments electronically, and many communicate electronically with customers, distribution centers, or other partners. However, the freight industry does not always openly communicate about goods movement[60] and, as a result, freight does not achieve the speed and accuracy that it could.[61] The fact that UPS and Fed-Ex, two companies whose bottom line depends on speed and accuracy, utilize end-to-end electronic tracking shows the efficiencies to be gained from getting data online. The FHWA explored the concept of web-based, near real-time information and found that the freight industry could save an estimated $2 billion annually through electronic supply chain management.[62] Currently Kansas City leads the pack with its economic development non-profit, SmartPort.[63] SmartPort's web-based portal Trade Data Exchange helps make the supply chain transparent from the initial order to customer delivery. In February 2010, test runs of the program showed reductions in back orders due to improved knowledge of shipment arrival. Reduced back orders save companies money because back orders arrive in special shipments. With better knowledge of when shipments will arrive, retailers do not need to place a special back order. Multiplied over tens of thousands of shipments, reducing back orders creates significant savings.[64]

Implementation

States can encourage innovative freight delivery and implement the strategies outlined above through the following activities.

Create a regional plan. Some freight villages and real-time information sharing efforts have started as a result of public sector strategy plans or feasibility studies. One of the key building blocks of a coordinated regional plan is a shared understanding of where and how freight is moving and the current policies that affect regional freight movement.

Develop public-private partnerships. Freight initiatives need buy-in from both the public and private side. Freight travels on public infrastructure (such as highways), but freight handlers work in the private market. A public agency like an MPO or a DOT has little sway with shipping companies, ports, airports, or other freight carriers. Inviting collaboration with shippers and carriers from the outset and emphasizing that reform can improve business profits through decreased delays can help bring the private sector on board.

Enable reform. Vocal state support for innovation can spur change, even when action is required by other levels of government or private industry. For example, the California assembly introduced a bill requiring the Ports of Long Beach and Los Angeles to develop a way to reduce congestion. The possibility of this bill becoming law motivated private sector stakeholders to create their own solution to congestion, as described below.

Create new policies. Some freight management initiatives consist of policy changes. For example, reducing freight congestion through curb management requires cities to change parking policies, and developing freight villages may require the planning board to create a new zoning category.

---

60 Butler, R. W. (2009, February). "Electronic Freight Management" Public Roads Vol. 72. No. 4. Federal Highway Administration. Retrieved 9/19/13 from http://www.fhwa.dot.gov/publications/publicroads/09janfeb/06.cfm.

61 Federal Highway Administration. (2006). "Electronic Freight Management Initiative." Retrieved 9/19/2013 from http://ops.fhwa.dot.gov/freight/intermodal/efmi/index.htm.

62 *Ibid.*

63 For more information, see "KC SmartPort" website at http://www.kcsmartport.com/.

64 Twiddy, D. (2010, February 28). "Kansas City SmartPort's shipment tracking system moves closer to delivering." *Kansas City Business Journal*. Retrieved 8/9/12 from http://www.bizjournals.com/kansascity/stories/2010/03/01/story6.html.

Case Studies

Orlando, Florida: Developing Freight Villages

The central Florida region, encompassing metropolitan Orlando, relies on tourism to fuel its economy, and the tourism industry relies on on-time and predictable freight deliveries. The Orlando region is especially crucial for freight movement, as 50 to 60 percent of Florida's north-south freight passes through the city. Realizing the economic damage caused by freight congestion, the Orlando region MPO (MetroPlan), the state DOT, Port Canaveral, and the Brevard MPO formed a coalition and created the Freight, Goods, and Services Mobility Strategy Plan in 2003. As part of this process, the coalition created a freight steering committee that included both public and private stakeholders. The coalition appointed MetroPlan to lead freight improvements recommended by the plan. Since MetroPlan, as an MPO, does not have regulatory authority, it was important to include local representatives on the freight steering committee to ensure a willingness to make changes.

The Orlando coalition's Strategy Plan recommended the creation of freight villages, calling on jurisdictions to assess local land use and development patterns and designate a freight village at a location with excellent access to the transportation network. Creating a special zoning destination of Warehousing and Logistics (WL) would include design standards specifically for freight, such as loading dock requirements, signal timing, and geometric standards. By investing in a hub for warehousing and distribution, the region provides intermodal connections for freight and today encourages larger-scale manufacturing. A freight village attracts businesses, which can lower their operating costs by relocating. For example, rather than running its own logistics center, a business that moves to a freight village can use the freight village's logistics center.[65]

MetroPlan also used geographic information system analysis and stakeholder input to pick out 15 freight village locations and adopted the draft locations in its 2030 Long Range Transportation Plan. MetroPlan and its planning partners updated the 2003 Freight, Goods, and Services Study and released a new version in 2013. The emphasis continues to be on the nexus between land use and the transportation system.

Washington, DC: Managing the Curbs

Through a partnership with the district DOT (DDOT), the Department of Public Works, and a local business improvement district, Washington, DC developed a Downtown Curb Space Management Plan with the following objectives:

- Reallocate curb space with regulatory signage;
- Increase loading spaces from 40 to 100 feet if possible—loading was also moved to the ends of the blocks to make parking easier;
- Improve parking technology, using multi-space meters to free up sidewalk space and increase curb occupancy by removing pre-defined spaces and allowing people to park wherever they fit;
- Create metered loading zones to reduce all-day parking in loading zones;
- Improve parking enforcement—after rollout in 2007, increased enforcement in the study zone resulted in double the citations;
- Restrict trucks with more than two axles from parking during peak hours.

The DDOT and its partners also created two pilot locations for off-street loading in rear alleys. When possible, off-street loading and unloading is a great way to reduce congestion and travel time. The plan

65 Federal Highway Administration. (2009). "Urban Freight Case Studies: Orlando." Retrieved from http://ops.fhwa.dot.gov/publications/fhwahop10021/fhwahop10021.pdf.

eventually aims to provide one commercial loading space for every 100,000 square feet of commercial space. The DDOT evaluated the program along a ten-block stretch of K Street and found statistically significant decreases in travel times for vehicles and cyclists.

While some cities do little to accommodate truck traffic, the district recognized that freight is integral to the city's economy and developed reforms to protect and bolster these economic benefits.[66]

Reducing Congestion—Ports of Long Beach and Los Angeles, California

Freight volumes at the Ports of Long Beach and Los Angeles rose 39 percent from 2000 to 2004. Truck drivers, paid by the number of "turns," or round trips per day, were losing pay, and increased congestion at the ports sacrificed the ability to complete a trip within a shift, especially since the ports only operated from 8 a.m. to 5 p.m.

The state had been pushing for an extension of port hours for several years, as freight volumes and congestion levels increased. The marine terminal operators (MTOs), however, were opposed to increasing their operating hours because that would raise their operating expenses. Then, in 2004, the state passed Assembly Bill 2041[67] to create a congestion management district and raise a congestion fee. The MTOs did not like this directive for several reasons: the congestion fee would go to a public authority (the congestion management district); the bill required stricter MTO reporting, which operators felt sacrificed competitiveness; and there was fear that revenues from the fee might be directed elsewhere.[68]

Instead, the private sector created the non-profit PierPASS to meet the requirements of AB 2041 on the MTOs' terms and address emissions, congestion, and security issues. PierPASS created the OffPeak PierPASS program, which charges a traffic mitigation fee of $66.50 per 20-foot container and $133 per 40-foot container for imports and exports from 3 a.m. to 6 p.m. The fee pays for opening the port on four weeknights plus Saturday night, and is collected by ACS, the same company that operates E-ZPass, the electronic toll collection system. The fee increases annually, based on labor rates from the Pacific Maritime Association. The Beneficial Cargo Owners are responsible for paying the fee, instead of the trucking companies or ocean carriers. There was widespread support for the OffPeak PierPASS program, from policymakers to adjacent neighborhoods to business groups.[69] In 2007, an opinion survey of truck drivers reported reduced congestion (66 percent), increased delivery trips (45 percent), and higher earnings (37 percent).[70] Increased operating hours also created jobs. The program has managed to shift approximately 60,000 trips per week to off-peak hours.

The MTOs would not have opened their doors to off-peak business without legislative pressure, which pushed businesses to form their own solution. The program has been widely embraced by the MTOs, the truck companies, and the local community.

---

66 Federal Highway Administration. (2009, January). FHWA Operations Support—Port Peak Pricing Program Evaluation. Retrieved 8/9/12 from http://ops.fhwa.dot.gov/publications/fhwahop09014/sect2.htm.

67 California State Legislature. (2004). Assembly Bill 2041. Retrieved 9/19/13 from ftp://www.leginfo.ca.gov/pub/03-04/bill/asm/ab_2001-2050/ab_2041_cfa_20040625_152408_sen_comm.html.

68 Federal Highway Administration. (2009, January). FHWA Operations Support—Port Peak Pricing Program Evaluation. Retrieved 8/9/12 from http://ops.fhwa.dot.gov/publications/fhwahop09014/sect2.htm.

69 *Business Wire*. (2005, July 23). "PierPASS Launches OffPeak Program Today at Los Angeles and Long Beach Ports; Port-Wide Saturday and Night Shifts Tackle Congestion and Pollution." Retrieved 8/9/12 from http://www.businesswire.com/news/home/20050723005006/en/PierPASS-Launches-OffPeak-Program-Today-Los-Angeles.

70 Business Wire. (2007, February 6). "PierPASS Survey Shows Port Truck Drivers Stay Positive on OffPeak." Retrieved 8/9/12 from http://www.businesswire.com/news/home/20070206005478/en/PierPASS-Survey-Shows-Port-Truck-Drivers-Stay.

Figure 1
Port of Long Beach Truck Traffic Trends, 2005

Time period	Daytime Weekday Truck Traffic	Nighttime Weekday Truck Traffic	Weekend Truck Traffic	Total
January—July	90%	3%	7%	100%
August—December	66%	24%	10%	100%

Source: http://ops.fhwa.dot.gov/publications/fhwahop09014/sect2.htm

Resources

The Federal Highway Administration. (2009). Urban Freight Case Studies: Orlando. http://ops.fhwa.dot.gov/publications/fhwahop10021/fhwahop10021.pdf.
This report provides background on Florida's freight village initiative and lessons learned.

The Federal Highway Administration. (2009). Urban Freight Case Studies: Washington, DC. http://ops.fhwa.dot.gov/publications/fhwahop10018/fhwahop10018.pdf.
This summary provides a description and evaluation of Washington, DC's freight management activities, including the Downtown Curb-Space Management Plan.

The Federal Highway Administration. (2012). FHWA Freight and Land Use Handbook. http://ops.fhwa.dot.gov/publications/fhwahop12006/fhwahop12006.pdf.
This handbook identifies freight-related land use issues, key considerations, and available resources, and includes examples and case studies from a range of urban and rural areas.

The Federal Highway Administration. (2009). FHWA Operations Support—Port Peak Pricing Program Evaluation. http://ops.fhwa.dot.gov/publications/fhwahop09014/index.htm.
This report provides a detailed evaluation of the PierPASS OffPeak program at the Ports of Los Angeles and Long Beach.

Holloway, B., and Spahr, C. (2013). Getting the Goods without the Bads: Freight Transportation. State Smart Transportation Initiative. http://www.ssti.us/wp/wp-content/uploads/2013/10/Final-FreightReport1.pdf.
This report offers strategies to maximize freight efficiency on existing infrastructure, as sustainable, cost-effective alternatives to increasing physical capacity.

THE INNOVATIVE DOT

Focus Area 7: Integrating Transportation and Land Use Decision-Making

Focus Area 7: Integrating Transportation and Land Use Decision-Making

A century ago, developers paid for streetcar lines when they developed new housing and commercial areas, so land use and transportation were by necessity considered together. As government took over transportation responsibilities, agencies wound up trying to respond as best they could to new development. At the same time, local zoning authorities increasingly separated commercial and residential areas, increasing the need for travel over longer distances. The highway infrastructure, originally intended for intercity travel, became clogged with local travel. All of these trends pushed up transportation costs significantly.

Today, state departments of transportation (DOTs) are working to reconnect land use and transportation in order to lower costs and improve community and economic development. They are partnering with local governments and metropolitan planning organizations (MPOs) to ensure land use and transportation solutions are complementary. Some are creating new metrics and new planning processes, such as scenario planning, to help guide decisions. In addition, DOTs are actively engaging with development interests, often to encourage transit-oriented development.

In this section:

- Pursue Policies that Integrate Transportation and Land Use Decision-Making
- Conduct Scenario Planning
- Improve Public Facility Siting
- Coordinate Infrastructure Investments Across Agencies
- Promote Transit-Oriented Development
- Incorporate Climate Change Resilience into Long-Range Planning

Pursue Policies that Integrate Transportation and Land Use Decision-Making

The Opportunity

Conventionally, transportation agencies chase development, responding to accessibility needs created by land use decisions outside of the agencies' control. At the same time, state DOTs tend to disregard the effects their facilities have on land use, leading to low-density, high-traffic development. These are costly practices, as they require ever-more infrastructure at a time when DOTs struggle to maintain their existing systems.

If DOTs can foster land use decisions that create less Single Occupancy Vehicle (SOV) travel demand and allow for more compact development, both through their own actions and by partnering with land use authorities, they can reduce infrastructure costs, reduce vehicle miles traveled (VMT), and improve transportation choices. At the same time, local governments can grow their tax base without creating the new infrastructure construction and maintenance costs that greenfield development requires.

What Is It?

State DOTs can plan their facilities to better accommodate local access along and across corridors, so that local traffic can take shorter, dispersed routes, reducing congestion and travel time on state facilities and making walking, biking, and transit more viable. They can also:

- Help to rethink rigid level of service (LOS)-based mitigation requirements that in the past made desired infill and compact development harder, pushing developers to greenfields and fostering higher VMT.
- Provide technical assistance and develop analytical tools to help local governments make better land use decisions—for example, through scenario planning—and direct state investments in ways that assist these governments.
- Help DOTs coordinate with other state agencies, such as those responsible for water and sewer infrastructure, to align state spending across agencies and ensure that investments from one state agency support the planned investments of another.
- Provide funding for local, off-system projects that improve connectivity and multimodal options, lessening the pressure on state facilities.

Leadership and Partners

State transportation agencies have significant power over the location, design, and other elements of major transportation infrastructure, but little authority over land use, apart from development review, access permitting, and other secondary functions. Local governments, conversely, generally have only an advisory role on major transportation facilities, but control zoning, subdivision regulations, parking requirements, and other critical land use issues. Therefore, strong partnerships between state agencies and local governments are critical in order to integrate land use and transportation decisions successfully.

Land use interests within a state transportation agency typically involve three primary groups:

Planning and project development. These core functions may be organized and housed differently from state to state, but they are at the heart of the land use-transportation connection. If it isn't already included in a planning or project development administrative division, capital programming scan also be involved in a coordination effort.

Access. The access office, which generally functions in a permitting and compliance role, is important for interpreting and possibly helping to reform access and access management regulations and policies that may preclude desired development forms from being approved.

Design. Transportation facility design, especially road design, usually follows standards defined in design manuals. If transportation decisions are to be made in concert with other planning concerns, design officials need to be involved in discussions that identify potential conflicts with design-related requirements and policies at an early stage, to ensure that there is adequate flexibility in the guidance to advance projects that are sensitive to the location and the community's goals.

Beyond the transportation agency, the following are some logical partners for transportation-land use concerns, some or all of whom should be involved depending on political or legal conditions:

Local governments. As the entities that typically have primary purview over the development process, local governments are essential partners. State DOTs often have relationships with transportation providers at the local level, but they less often work with the staff of planning commissions and others involved in land use policy and zoning decisions. Or worse, the DOT and local planners are at odds. To leverage the benefits of transportation-land use planning, partnerships in this area are critical.

Regional governments and planning agencies. Some regional agencies play an active role in coordinating efforts across a broad range of areas, including land use. Some of these agencies even have regulatory authority (such as the Portland Metro and Minneapolis-St. Paul Metropolitan Council), and they must be at the table when state DOTs work in the region. On the other hand, many MPOs take a traditional hands-off approach to transportation, with the same negative results discussed above. Encouraging these entities to look more broadly at their work will both improve results in their regions and provide a stronger partner for the state DOT on land use and transportation issues.

Major employers or other generators of economic activity. Sometimes major employers or other centers of activity (such as a university, shopping center, hospital, or theme park) generate so much transportation demand that they are important to engage directly. State DOTs, if well aligned with local and regional governments, can exert their influence on these private actors to employ transportation demand management methods and/or to build in ways that maximize location efficiency, non-SOV mode choice, and connectivity.

Implementation

Positioning a state DOT to maximize sound land use outcomes, avoid creating more SOV traffic, and save taxpayer dollars is a process that can take many forms. The steps below are not exhaustive or sequential, but might be viewed as general ground rules associated with success:

1. **Ensure adequate staff expertise and buy-in.** State DOTs cannot retrain all of their engineers to be land use planners, but it is important for staff involved in project development, selection, and design to understand how compact, well-connected land uses, with appropriately sized and designed transportation infrastructure, can reduce congestion and costs. If a DOT does not have existing expertise in this area, it may be useful to assign some key staff members to work with a consultant and/or local partners to develop training and written guidance for the agency. There is a robust body of work that can address objections from reluctant staff members, or the DOT can undertake its own research to address questions. Arizona DOT did this, with its 2012 report showing that compact land use generally does not create congestion. (See Resources below.)

2. **Review procedures to make sure agency decision-making takes land use into account.** Many agencies have formal or informal-but-important guidelines that bias decisions toward maximizing highway LOS or operating speeds, at the expense of local access along or across the facility. This bias may hinder compact infill development and reduce local connectivity. Modern DOT guidance recognizes traditional LOS measures as important, but as only one consideration among many. One example of modern guidance is the Smart Transportation Guidebook produced by the New Jersey and Pennsylvania DOTs, which encourages thoughtful treatment of all community goals before project development begins, and provides context-sensitive design standards for those projects that proceed as new or rebuilt roadways.

3. **Build partnerships with local governments and MPOs.** State DOTs and local governments share an interest in managing SOV demand and building thriving livable communities, and. each has something to offer the other: DOTs have funding and expertise to address major transportation facilities, while local governments have the ability to require compact development, mixed uses, and good local connections. If DOTs have made progress on steps 1 and 2 above, they should have developed the language and expertise to reach out to local partners. For smaller communities or MPOs that have not ventured into land use questions, state DOTs can play an important role as a leader and resource. For example, Delaware DOT employs a scenario-planning tool to help local governments assess the transportation impacts of various development plan options, based on density, use, connectivity, and other factors. (See Case Studies below.)

4. **Build partnerships with other state agencies, the private sector, and non-governmental organizations (NGOs).** Transportation is not the only form of infrastructure that requires efficient planning and management. States often also have a significant responsibility as a funder, operator, or regulator of water, sewer, energy, and telecommunications infrastructure. Growth will occur where these services are provided, leading to additional costs, so agencies should coordinate decisions about when and where to extend such service. Additionally, major employers and activity centers have an interest in reliable accessibility, and many NGOs are concerned about healthy growth and environmental quality, so these stakeholders can be helpful as state DOTs become more engaged in land use.

5. **Provide funding for projects that link land use and transportation.** Although state agencies do not have an ability to control land use, they do have a choice in where they invest their resources—they can choose to spend resources in areas where local governments are focusing on effective land use planning. Ideally, the DOT and its local partners would consider land use as every corridor or project is planned. One way to begin is to set aside a portion of the state transportation budget for locally owned transportation projects that improve local connectivity and foster lower SOV travel demand. (See case studies below.) State DOTs can also provide direct funding and technical assistance to support transit-oriented development.

Case Studies

Pennsylvania

The Pennsylvania DOT's Smart Transportation program is one of the most sweeping transportation agency reform initiatives in the United States, founded on broad principles of better management of agency resources. One of the strategic approaches to achieving this better management is in controlling the factors that drive the need for transportation spending, especially for spending on new roadway capacity projects. One such factor is how land is developed.

The Smart Transportation program is a series of guiding principles and policies that seek to reduce costs and spending obligations for PennDOT by developing projects that are more closely tied to need, and therefore potentially more modest in their design and more responsive to community context.[1] The program is supported by a guidebook, developed through a partnership between PennDOT and the New Jersey Department of Transportation (NJDOT), that provides a description of the program's intent and core functions as well as specific design guidance for road project development.[2]

More importantly, the program provides guidance to local governments in how to engage in partnerships with the state. This includes defining community visions and objectives that are inclusive of transportation, particularly transportation that is owned and maintained by the state. It also includes defining priorities for local investment, especially in ways that help to enhance the transportation system and provide secondary infrastructure that supports state transportation projects.

One means of facilitating these partnerships is the Pennsylvania Community Transportation Initiative (PCTI), a competitive funding program intended to support and encourage local transportation projects that demonstrate the goals of the overall Smart Transportation program. This program has provided more than $80 million to prioritize and enhance transportation projects in its two years of funding awards (2009 and 2011). Although PCTI funding is relatively small when compared to PennDOT's overall budget, it has taken the approach of awarding projects throughout the state in order to increase exposure to the Smart Transportation program and principles.

The DOT also has started to implement various other policy changes to advance Smart Transportation, including streamlining the process through which PennDOT projects are delivered and achieving earlier and more effective coordination with municipalities and private developers.

Georgia

The Atlanta Regional Commission (ARC), an MPO, has sought to strengthen the land use-transportation relationship with its Livable Centers Initiative (LCI), focusing on downtowns, business districts, and other key activity centers as places where travel demand could be reduced.

ARC developed the LCI program in the late 1990s, partly in response to the rapid growth and spatial expansion of the Atlanta region, but also from a serious transportation-related consequence of this growth: the region's failure to meet the requirements of the Clean Air Act and its designation of non-attainment status. The LCI program uses funds from multiple sources, including the Congestion Mitigation and Air Quality program, and awards these funds on a competitive basis to communities throughout the Atlanta region. Recipients have ranged from small municipalities to county governments

1 Pennsylvania Department of Transportation and New Jersey Department of Transportation. (2008, March). *Smart Transportation Guidebook.* p. 6. Retrieved 9/19/13 from http://www.state.nj.us/transportation/community/mobility/pdf/smarttransportationguidebook2008.pdf.

2 *Ibid.*

and the City of Atlanta, most of which have developed multiple LCI studies since the program's inception. ARC provides guidance and support in developing integrated land use and transportation plans to reduce driving demand by bringing residential populations and employment centers closer to each other, promoting the use of non-motorized travel options for short trips, and enhancing economic competitiveness for the entire Atlanta region by promoting economic development opportunities.

Though not housed within a state DOT, ARC's program has been applied on a large scale and in an environment of complex transportation needs: a ten-county metropolitan region with a population of more than four million, a central city with multiple centers of employment, an expansive freight movement and logistics economy, and a rapid rate of growth. The agency's role is not to plan for land use, but rather to provide funding assistance so that local governments can develop plans according to their needs.[3] Through its administration of the region's transportation improvement program, ARC is in a strong position to develop project concepts from the LCI studies and to facilitate their programming for capital funds. Importantly, the planning dollars are backed up with capital project funding so that plans, while not guaranteed to receive funding, have a reasonable chance of being funded and are therefore taken seriously. As of June 2012, the LCI program had allocated more than $192 million for 93 projects in 54 communities. Forty-eight of these projects are complete.[4]

Resources

Atlanta Regional Commission. (2011). Livable Centers Initiative Implementation Report. http://atlantaregional.com/File%20Library/Land%20Use/LCI/lu_2011_lci_implementation_report_06-2011.pdf.

This annual report provides an update on the LCI program, annual recipients, status of project implementation from previous LCI studies, and an overall assessment of program effectiveness throughout the Atlanta region.

Arizona Department of Transportation Research Center. (2012, March). Land Use and Traffic Congestion. http://www.ssti.us/2012/05/land-use-and-traffic-congestion-az-department-of-transportation-research-center-2012/.

A first-ever analysis of land use and transportation demand in Arizona contradicts fears that compact, "smart growth" development, while beneficial in moderating demand, will increase localized congestion. The report, produced for Arizona DOT, also suggests that traditional travel demand modeling is outmoded and unable to reflect land use effects on demand, and disputes notions that compact development is inequitable and costly.

Litman, T. (2012, July 20). Land Use Impacts on Transportation. Victoria Transport Policy Institute. http://www.vtpi.org/landtravel.pdf.

This report examines the impacts of factors including density, street connectivity, land use mix, and regional accessibility on travel behavior.

3 Atlanta Regional Commission. "Livable Centers Initiative." Retrieved 8/2/12 from http://www.atlantaregional.com/land-use/livable-centers-initiative.

4 Atlanta Regional Commission. (2012, July). "Livable Centers Initiative Transportation Program Implementation Program Report, January 2012-June 2012," p 2. Retrieved 8/2/12 from http://www.atlantaregional.com/File%20Library/Land%20Use/LCI/lu_lci_breaking_ground_07_2012_final-pdf.pdf.

Pennsylvania Department of Transportation and New Jersey Department of Transportation. (2008). Smart Transportation Guidebook. http://www.state.nj.us/transportation/community/mobility/pdf/smarttransportationguidebook2008.pdf.

This is the 'how-to' guidance document on agency communication, local government planning and partnership, and specific transportation project development.

Conduct Scenario Planning

The Opportunity

Traditionally, most state DOTs do not take an active role in land use planning, but they do pay for the results of local land use decisions, constructing and maintaining infrastructure to support accessibility needs created by development. A lack of coordination between transportation and land use planning can be extremely costly for state DOTs, leading to development patterns that require major investments in new infrastructure at a time when DOTs are struggling to maintain their existing networks.

Scenario planning is an integrated approach to land use and transportation planning that comes from private industry practice.[5] When businesses plan for the future, they frequently model multiple scenarios of future conditions and weigh the costs and benefits of each scenario's outcomes to determine the best strategy for maximizing profit and minimizing risk.

Scenario planning functions in much the same way. It is a means for evaluating multiple future development scenarios to ensure that local land use decisions produce outcomes that support local and state goals and use transportation funds wisely. Encouraging this type of regional planning effort can lead to major cost savings for both state DOTs and travelers—and can help to achieve any number of other state priorities, such as reducing VMT and congestion and improving safety.

What Is It?

Traditional long-range transportation planning efforts at the state and regional level typically treat development patterns as a constant, not a variable. Building a plan involves projecting status quo trends and determining future infrastructure needs based on the results.

Scenario planning differs in that it involves modeling and analyzing multiple scenarios for future growth in a region, typically a baseline scenario that reflects current transportation and land use trends and several alternate scenarios designed to illustrate how different building and development patterns might impact those trends. This approach makes the outcomes of various future growth scenarios—such as impacts on infrastructure costs, congestion, VMT, and emissions—transparent to decision makers and stakeholders. By weighing the costs and benefits of these outcomes, a region can develop a shared vision for future growth that provides a framework for future investments and policy decisions.

A key step in any scenario planning initiative involves identifying major goals or priorities for a particular region to guide the planning effort, and developing performance measures to assess progress in achieving those goals. In some cases, these priorities will already be determined going in to the initiative, while in other cases they will be identified through the process of analyzing different scenarios.

Successful implementation of the chosen growth scenario requires widespread community buy-in. Scenario planning efforts incorporate public outreach and actively solicit business community and stakeholder involvement throughout the process to build consensus around the chosen long-term investment strategy.

---

5 Federal Highway Administration. (2011, February). *Scenario Planning Guidebook.* Retrieved 8/20/12 from http://www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning/scenario_planning_guidebook/.

Reducing Infrastructure Costs and Congestion in Delaware Valley Through Scenario Planning

The Delaware County Valley Regional Planning Commission covers a nine-county region spanning Delaware, Pennsylvania, and New Jersey that is expected to experience significant population growth over the next two decades, resulting in transportation needs that will vastly exceed projected revenues.

To make the best use of limited funds and identify tradeoffs among competing goals, the commission conducted a scenario planning initiative that assessed three scenarios for future development: a "trend" business-as-usual scenario, a "recentralization" scenario, and a "sprawl" scenario.[6]

Through this analysis, the commission was able to develop a long-range plan for future growth that will reduce government and household costs, congestion, and pollution.

	Recentralization	Trend	Sprawl
Annual VMT per capita	7,650	7,920	8,120
Annual crashes	62,400	64,600	66,600
Annual hours of delay per capita	23.8	27.7	32.9
Annual congestion cost (in 2008 $s)	$3.72 billion	$4.33 billion	$5.12 billion
Annual wasted fuel (in millions of gallons)	38.6	47.6	62.5
PM2.5 emissions (in tons per day)	1.74	1.80	1.85
Average annual household automobile and utility expenses (in 2008 $s)	$14,770	$15,070	$16,060
Total supportive infrastructure costs (2008 $s, local roads, schools, utilities)	$7.38 billion	$10.8 billion	$35.6 billion

6 Delaware Valley Regional Planning Commission. (2008, September). Making the Land Use Connection. Regional What-If Scenario Analysis. Retrieved 8/1/12 from http://www.dvrpc.org/reports/08059.pdf.

Implementation

State transportation agencies have little direct authority over land use planning, but they can foster regional scenario planning through a variety of approaches. Scenario planning initiatives are typically led by regional planning commissions or MPOs, so the strategies state DOTs can use to advance scenario planning efforts will generally involve close partnerships with these entities.

If state transportation agencies have sufficient technical expertise to address land use and development issues, they can provide direct technical assistance to regions to develop and analyze future growth scenarios. They can also provide funding to support planning efforts.

Beyond direct partnerships with planning organizations, state DOTs can incentivize regional scenario planning efforts by prioritizing transportation investments in regions that use scenario planning to choose land uses that minimize burdens on state facilities and preserve existing capacity.

The following are some specific approaches state transportation agencies can take to incentivize or support regional scenario planning efforts.

1. **Provide funding support to assist planning efforts.** Providing funding to regions to conduct scenario analyses is one of the most direct ways a state transportation agency can alter traditional local and regional approaches to planning. The California Department of Transportation (CalTrans), for example, developed a grant program to provide assistance to regions undertaking scenario planning initiatives. (See case study below.)

2. **Provide technical assistance and develop better tools to help local governments conduct scenario planning.** A successful scenario planning effort relies on good scenario modeling, which, in turn, requires both technical expertise and robust modeling tools. Many of the existing tools available for modeling transportation impacts are cumbersome, produce results that are difficult to translate to decision-makers and the public, or do a poor job capturing the impacts of land use and investments in alternate modes of transportation. State DOTs can play an important role in making regional scenario planning efforts feasible by providing resources and technical assistance to local governments. Delaware DOT developed a scenario-planning tool to help local governments assess the transportation impacts of various potential development scenarios and Oregon produced a guide for statewide scenario planning. (See case studies below.)

3. **Partner with a pilot region.** State DOTs can play an important leadership role by initiating a scenario planning effort in partnership with a pilot region. This approach can help demonstrate the benefits regions can realize from assessing multiple future scenarios as part of the planning process. The Virginia DOT conducted an analysis of the impacts of future growth patterns on the Fredericksburg region using a traffic model developed by the Fredericksburg Area Metropolitan Planning Organization. This analysis identified two alternate growth scenarios with the potential to significantly reduce future congestion below levels the region would experience under the projected land use scenario.[7]

4. **Provide funding to projects in regions linking land use and transportation through scenario planning.** State transportation agencies cannot directly control local land use decisions, but they can choose to invest their resources in areas where local governments are making choices that protect those investments. One way to do this is to prioritize projects in regions that have evaluated multiple future scenarios for accommodating growth and development and committed to a long-term plan that will minimize future transportation costs. A formal agreement with local governments stating that the DOT's future investments in the region will be contingent on local adherence to the plan can help ensure that land use choices moving forward protect state transportation investments.

7 Virginia Office of Intermodal Planning and Investment. (2009, November 10). *Virginia's Long-Range Multimodal Transportation Plan 2007-2035.* Retrieved 8/1/12 from http://www.vtrans.org/.

5. **Partner with other state agencies.** DOTs are not the only state agencies impacted by local land use decisions, nor are they the only entities that benefit from better coordination between development decisions and infrastructure investments. Scenario planning efforts can identify strategies for future growth that reduce the costs of future water, sewer, and electric infrastructure, meet regional housing needs, reduce greenhouse gas emissions, and produce health benefits. Working with other state agencies and the governor's office to support regional scenario planning efforts can build political support for the approach and leverage resources and expertise that would otherwise be unavailable. (See California case study below).

Case Studies

California

California is fostering regional scenario planning through direct funding assistance. The Caltrans Office of Regional and Interagency Planning administers the California Regional Blueprint Planning Program, an initiative designed to support regional scenario planning efforts in the state by providing grants and other resources to MPOs and rural transportation planning agencies (RTPAs).

The California Legislature established the program in 2005 as a two-year initiative, and has updated the program several times since. Though administered through Caltrans, the program is actually a cross-agency partnership between the Department of Housing and Community Development, the Business, Transportation and Housing Agency, and the Governor's Office of Planning and Research.[8]

Through a competitive application process, Caltrans awards federal regional transportation planning funding for regions to identify alternate land use scenarios for future growth and assess the outcomes of each scenario. Caltrans has awarded nearly $22 million through the program since 2005 to a total of 17 MPOs and 15 RTPAs.[9]

The state provides a framework for all regional planning efforts conducted through the program by establishing 12 state-identified performance goals related to transportation planning, land use, resource protection, housing needs, and greenhouse gas reductions that regions must address in their planning. Program participants can develop their own strategies for meeting these goals but must designate objectives for achieving each one and quantifiable performance measures for assessing progress. The chosen performance measures then serve as criteria to compare and evaluate the different growth scenarios identified during community visioning. After regions complete the analysis, they select a preferred growth scenario through community outreach and then incorporate the preferred scenario into the regional long-range transportation plan.[10]

Delaware

The Delaware DOT developed the Land Use and Transportation Scenario Analysis and Microsimulation (LUTSAM) tool, which allows transportation providers to influence land use development for the better. DelDOT will use the tool to help local stakeholders and land use authorities visualize the positive and negative transportation outcomes of potential development plans. Depending on compactness, mixture of uses, connectivity, and other criteria, the tool can estimate VMT and emissions, and can produce an animated simulation of traffic conditions.

---

8 Federal Highway Administration. (2011). *Transportation Planning and Sustainability Guidebook,* Chapter 5. Retrieved 8/10/12 from http://www.fhwa.dot.gov/environment/climate_change/sustainability/resources_and_publications/guidebook/sustain05.cfm.

9 *Ibid.*

10 *Ibid.*

LUTSAM integrates geographic information systems (GIS), four-step demand modeling, and microsimulation software to speed scenario analysis. LUTSAM allows users to design new residential and commercial developments, using standard GIS software, and connect the development to the existing road network to assess its impact on travel patterns, using travel demand modeling software. Streamlining the process by virtually constructing these developments and linking them to the road network allows planners to more quickly evaluate multiple development scenarios to present to their communities. The tool enables planners to demonstrate the value of a particular segment of sidewalk or street in terms of its impact on localized traffic congestion, or community-wide VMT. The ability to quantify the impacts of particular street or sidewalk segments can reassure citizens who may be skeptical about general planning guidelines for creating more transportation-efficient communities.

In addition, LUTSAM allows these scenarios to be depicted using three-dimensional microsimulation software, showing congestion, queuing, turning movements, and other traffic patterns, which can help in communicating the results of the analyses to the public.

Oregon: GreenSTEP

Scenario planning in Oregon began in the early 1990s with the use of the Land Use, Transportation, and Air Quality (LUTRAQ) approach in developing the *Region 2040 Growth Concept* for the Portland metropolitan area. Since then, Oregon DOT (ODOT) has developed a peer-reviewed, award-winning model for strategic planning and taken steps to encourage and enable scenario planning statewide.

In 2008, ODOT began the development of the GreenSTEP model for estimating the effects of different transportation planning decisions on VMT, fuel use, energy consumption, and GHG emissions. The model earned an award from AASHTO and formed a basis for the U.S. DOT's Energy and Emissions Reduction Policy Analysis Tool (EERPAT).[11] In 2010, the state established the Oregon Sustainable Transportation Initiative (OSTI)—led in part by ODOT—to undertake statewide strategic planning and support metropolitan scenario planning.[12] GreenSTEP was the primary planning tool used by ODOT to develop its 2050 Statewide Transportation Strategy, adopted in 2012,[13] and a metropolitan version of the model is being implemented by Portland Metro.

Following the development of GreenSTEP, ODOT took additional steps to implement the model around the state. In April 2013, the DOT and the Oregon Land Conservation and Development Commission (LCDC) released the *Oregon Scenario Planning Guidelines* [14] for use by local governments. The guidelines explain how to use GreenSTEP and available sketch planning tools to evaluate policy scenarios and select a preferred scenario that will best meet each region's long- term goals while reducing greenhouse gas emissions. ODOT continues to improve functionality of the model by developing an installer program, incorporating an easy-to-use Excel interface, and making household data accessible in a database.[15]

---

11 Gregor, B. (2012). "GreenSTEP Model Overview." Oregon Department of Transportation. Retrieved 11/26/13 from http://www.oregon.gov/ODOT/TD/TP/GreenStep/GreenSTEP%20Model%20Overview.pdf.

12 State of Oregon. (2012). *Senate Bill 1059*. Retrieved 10/10/13 from http://www.oregon.gov/ODOT/TD/CLIMATECHANGE/docs/legislativeupdate_june2010_ghg_final.pdf.

13 Oregon Department of Transportation. (2013). *Oregon Statewide Transportation Strategy*. Retrieved 10/22/13 from 22 Oct. 2013 http://www.oregon.gov/ODOT/TD/OSTI/docs/STS/STS%20Report%20-Clean_March%202013_AP%20Final_for%20website_2.pdf.

14 Oregon Department of Transportation. (2013). *OREGON Scenario Planning Guidelines*. Retrieved 10/10/13 from http://www.oregon.gov/ODOT/TD/OSTI/docs/ODOT-Guidelines-April2013.pdf.

15 Gregor, B. (2012, May 25). "Environment: Planning for Transportation Greenhouse Gas Emissions" OTREC seminar. Available at http://otrec.us/events/entry/models_seminar_6.

Maryland: SmartGAP

In 2011, the State of Maryland initiated *Plan Maryland*, encouraging greater interagency collaboration in order to achieve its long-term smart growth goals. This plan played a key role for Maryland DOT (MDOT) in its development of the *2035 Maryland Transportation Plan*. The plan's development involved testing the transportation impacts of various land use and smart growth scenarios through participation in a pilot test of the Smart Growth Area Planning (SmartGAP) tool, developed as part of the SHRP 2 Capacity Project C16.[16] MDOT was the only state agency to participate and conducted two out of the five pilot tests.

The SmartGAP tool allows users to toggle inputs such as road and transit capacity, intelligent transportation systems (ITS) implementation, and dense development patterns. The model can be used to test different scenarios in relatively small regions without the use of complex travel demand models, based on the developers' comprehensive research and knowledge of literature. For its test pilots, MDOT used SmartGAP to evaluate the effects of eight different growth scenarios in two different counties. They evaluated outcomes such as VMT, traffic accidents, and rates of walking. These tests revealed that dense growth strategies could reduce VMT by more than 8% below baseline projections in areas where considerable growth is expected, while reducing the overall number of collisions and increasing rates of walking in both counties.[17]

The findings from these two pilots informed updates to the Maryland Transportation Plan, particularly with regards to TOD and supporting multi-modal access in dense areas. MDOT has planned at least one additional pilot test of the SmartGAP tool and may use it on a statewide scale in conjunction with travel demand models and more detailed travel analyses. MDOT will also work more closely with MPOs and other local planning agencies to conduct further analyses and model development.[18]

Resources

Bartholomew & Ewing. (2010, July). Integrated Transportation Scenario Planning. http://faculty.arch.utah.edu/bartholomew/Integrated_Transp_Scenario_Planning.html.

This report provides an analysis of current scenario planning practices nationwide, including case studies.

California Department of Transportation. Regional Blueprints. Retrieved 8/5/12 from http://www.dot.ca.gov/hq/tpp/offices/orip/blueprint/index.html.

This is the California Regional Blueprint Planning Program website.

Delaware Valley Regional Planning Commission. (2008, September). Making the Land Use Connection. Regional What-If Scenario Analysis. Philadelphia, Pennsylvania. http://www.dvrpc.org/reports/08059.pdf.

This report describes the scenario analysis conducted by the commission and evaluates three scenarios using a number of indicators.

The Federal Highway Administration. (2011, February). Scenario Planning Guidebook. http://

16 Transportation Research Board. (2013). *SmartGAP User's Guide* SHRP 2 Capacity Project C 16. Retrieved 11/25/2013 from http://www.trb.org/main/blurbs/168842.aspx.

17 Transportation Research Board. (2012, August). *The Effect of Smart Growth Policies on Travel Demand. Final Report*. SHRP 2 Capacity Project C16. Retrieved 10/21/13 from http://onlinepubs.trb.org/onlinepubs/shrp2/SHRP2prepubC16.pdf.

18 Based on an interview with Maren Outwater, Vice President, Resource Systems Group (2013, November).

www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning/scenario_planning_guidebook/.

This how-to guide describes detailed steps and key considerations for conducting regional scenario planning.

State Smart Transportation Initiative. (2012, June). Land Use and Transportation Scenario Analysis and Microsimulation (LUTSAM) Tool. http://www.ssti.us/2012/06/lutsam.

This page provides information and links to a recorded webinar, paper, and user's guide.

Zimmermann, E. W., Staley, S. R., Ybarra, S., & Donohue, N. (2011, May). Taxpayer-Friendly Solutions for the Nation's Transportation Challenges. http://reason.org/studies/show/taxpayer-friendly-solutions-to-amer.

This report, produced through a partnership between the Reason Foundation, Transportation for America, and Taxpayers for Common Sense, describes the benefits of the scenario planning approach and provides case studies of successful efforts at the regional level.

Improve Public Facility Siting

The Opportunity

Inefficient land use patterns reduce mobility for non-drivers, increase the cost of transportation, and increase the need for expensive capacity enhancement and infrastructure maintenance activities. Although the land use decisions that shape communities are generally made at the local level, the impacts of these decisions are not confined to the local transportation network. State-level policies that foster coordinated transportation and land use decision-making and encourage public agencies to base those decisions on a full accounting of costs and benefits, rather than on narrow parochial interests, can save money while generating economic, environmental, and quality of life benefits.

Along with land use regulations and transportation planning activities, one of the public sector's primary tools to influence the shape and transportation efficiency of communities is the selection of sites for public facilities, particularly schools and government buildings, to which large numbers of residents and employees travel. Although public facilities represent only a small fraction of the buildings in most communities, they often generate a disproportionately high amount of travel. In some places, schools generate 30 percent of the traffic between 7:15 and 8:15 in the morning.[19]

Aside from the obvious direct congestion impacts and resulting demand for greater roadway capacity when public buildings are inaccessibly located, the location of schools and government buildings also affects the urban form, which in turn further impacts demand for transportation facilities. When new schools are constructed on the edges of their communities, new residential development tends to follow. This pattern often results in a hollowing out of previously developed areas, lower community density, increased per-resident infrastructure construction and maintenance expenditures, and reduced access to jobs and other destinations for low-income, disabled, and other non-driving residents. Government office buildings have similar effects on communities when located on the edge.

While the amount of state-owned roads and highways varies tremendously from state to state, all state DOTs are impacted by the locations of schools and government office buildings. Even in Kansas, where the state has jurisdiction over less than ten percent of the road network, new school construction has created safety and capacity challenges for the Kansas DOT.[20]

Strategies to Improve Site Selection

Those involved in choosing sites for schools and government office buildings make their decisions on the basis of their organization's individual perspective. Officials involved in choosing school sites consider cost, location, site size, and other features specifically relevant to the mission of the school district and the regulations governing it. However, they do not normally explicitly account for the costs that accrue to the public or to other levels of government as a result of their decisions, particularly the transportation and land use implications such as increased infrastructure and personal transportation costs, congestion, and environmental impacts. While school districts or government agencies may

19 U.S. Environmental Protection Agency. (2003, October). *Travel and Environmental Implications of School Siting*. EPA 231-R-03-004. Retrieved 8/6/12 from http://www.epa.gov/dced/school_travel.htm.

20 State Smart Transportation Initiative. (2012). *Reducing Costs in Kansas Through Transportation Efficient School Siting.* Retrieved 8/22/12 from http://www.ssti.us/2012/04/reducing-costs-in-kansas-through-transportation-efficient-school-siting-ssti-2012/.

improve their own bottom line with an exclusive focus on their own interests, taxpayers and citizens bear the costs of these inefficient decisions.

States have implemented a wide variety of policies to improve school and government office site selection to reduce costs that may not be explicitly considered by the decision-making body. These policies may be in the form of executive orders, administrative rules, or legislation, or through construction/site acquisition reimbursement formulas. All of these policies seek to either:

- Incentivize more efficient outcomes;
- Involve other levels of state or local government in the decision-making process;
- Limit decision-makers' discretion to choose locations that impose higher costs on society;
- Require decision-makers to take responsibility for impacts that they had previously considered outside of their purview.

Implementation

There are a variety of specific tools that states can use to generate better site selection from decision-makers. These range from narrowly focused prohibitions, such as Pennsylvania's ban on constructing public buildings on prime agricultural land,[21] to broader rules governing the site selection process, such as Maryland's requirement that growth-related public facilities—including government office buildings and, more recently, schools—be built in "priority funding areas,"[22] previously developed areas or areas that are designated for growth in local comprehensive plans. Other ways states influence public facility siting decisions include:

- **Requiring buildings to be sited in transit-accessible central locations** to enable greater access by the public.
- **Providing incentives for multimodal travel options** to attract and reward employees in centrally-located areas.
- **Limiting building site acreage or repealing site acreage minimums**, enabling decision-makers to choose more centrally located sites where very large sites are rarely available.
- **Eliminating or discouraging minimum parking requirements at public buildings** to allow and encourage their placement in multimodal areas.
- **Incentivizing the reuse or renovation of existing buildings over new construction** to limit external facility costs associated with providing transportation and utility infrastructure.
- **Requiring school districts to fund off-site infrastructure improvements** necessitated by school construction or assume responsibility if they fail to do so to ensure that decision-makers adequately account for the impacts of their decisions on other levels of government and the public.
- **Requiring decision-makers to request state agency approval prior to site acquisition** to ensure that potential sites do not impose an undue burden on the state or other levels of government.
- **Requiring collaboration with other local and/or state agencies during the site selection process** to ensure that decision-makers and the public are adequately informed

21 "State of Pennsylvania (2003, March 20). Part I. 4 PA. Code CH 7. Executive Order no. 2003-2. 33 PA.B. 3483. Agricultural Land Preservation Policy." *The Pennsylvania Bulletin*. Website. Retrieved from 11/25/13 from http://www.pabulletin.com/secure/data/vol33/33-29/1397.html. "Commonwealth funds and Commonwealth-administered federal funds will not be used to encourage the conversion of 'prime agricultural land' to other uses when feasible alternatives are available."

22 State of Maryland Code of Maryland Regulations (COMAR) 23.03.02.13 "Unless a waiver is granted in accordance with Regulation 28 of this chapter, a proposed site for a new school or a replacement school that adds capacity shall be in a priority funding area." Maryland Division of State Documents website (COMAR Online). Retrieved 11/25/13 from http://www.dsd.state.md.us/comar/comarhtml/23/23.03.02.13.htm.

about the impacts of potential sites.
- **Requiring concurrency between school district and local comprehensive plans** to increase efficiency by ensuring that overlapping government entities are not working at cross purposes.
- **Implementing non-binding guidelines** that encourage decision-makers to consider additional factors, such as transportation costs and accessibility, in their decisions.

State transportation agencies are in the unique position of being able to call the attention of policymakers to transportation issues generated by poorly sited public buildings. Some state DOTs, including those in South Carolina and Delaware, are already directly involved in school or public building site selection and evaluation. However, all state DOTs are affected by siting decisions and can help to improve safety, accessibility, and efficiency by working with other state agencies and their legislatures to better harmonize site selection and transportation decision making.

Case Studies

Delaware: Preliminary Land Use Service

Delaware's Preliminary Land Use Service (PLUS),[23] authorized in Chapter 92 of Title 29[24] of the Delaware State Code, requires state agency review of major land use change proposals, including proposed non-residential buildings over 50,000 square feet, prior to submission to local governments. The state's Office of State Planning Coordination identifies other state agencies to participate in the review on a case-by-case basis. State agencies are thus able to comment at the start of the process, so that changes can be made more easily and costly delays can be avoided. The state review process is advisory and is intended to provide useful comments to jurisdictions and developers prior to formal local review, allowing everyone to make better decisions with more complete and helpful input from the state. A recent PLUS review of a proposed high school, for example, identified the need to conduct a traffic impact study and the likelihood that significant road improvements would be required prior to opening the school as issues that should be considered early in the process in order to avoid unexpected delays. The responsibility for land use decisions remains at the local level.

The benefit of this approach is that, by giving state agencies the chance to comment on planned schools and other non-residential buildings before they are submitted to local governments, the state can identify issues such as traffic impacts or implications for capacity expansion and state DOT dollars that could create problems related to congestion and/or safety at a time when changes can still be made.

Massachusetts: Renovation Incentives

Avoiding the need for a new school site altogether is the surest way to prevent costs associated with a new site from being imposed on local, county, or state governments. Renovating a school in its current location largely eliminates the need for new off-site infrastructure and often is less costly overall. Massachusetts, which reimburses schools for construction and renovation, calculates each school's reimbursement rate based on a formula, established in Massachusetts General Law, Chapter 70B, Section 10, which takes into account the district's economic condition and provides additional "incentive points" to districts for renovating or re-using an existing facility, constructing a high-efficiency

23 State of Delaware. (2013). "Preliminary Land Use Service (PLUS)." webpage. Retrieved 9/19/13 from http://www.state.nj.us/transportation/community/mobility/pdf/smarttransportationguidebook2008.pdf

24 State of Delaware Code, Title 29, Chapter 92: Land Use Planning. Retrieved 9/19/13 from http://delcode.delaware.gov/title29/c092/.

"green" school, and other qualifying actions.[25] Districts can increase their calculated reimbursement rate by up to five percent by renovating or re-using an existing facility for their school.

By adjusting reimbursement rates based on a range of factors, including whether the project was the renovation of an existing facility or new construction, the state is able to influence school siting decisions without usurping local control in school facility planning. In addition, by incentivizing renovation instead of new construction, the state is able to limit the additional costs associated with providing transportation to students who would not be able to walk to the new school site.

Maine: Site Pre-approval for State-Funded School Construction

Under Maine's school siting rule (05-071 CMR Chapter 60), new school construction projects receiving state funding must be located within a locally designated growth area identified in the municipality's comprehensive plan.[26] Where there is no growth plan, schools must be sited within an area served by a public sewer system with sufficient capacity to accommodate the proposed school, within an area identified by the latest Federal Decennial Census as a census-designated place, or in a compact area of urban municipality. If the requested school site does not meet these criteria, a written justification of the site, including all considerations that provide the basis for recommending the location, must be presented to the State Board of Education for approval. When considering a request for site approval, the State Board of Education will involve all appropriate federal, state, and local agencies.

Maine's rule governing school site selection is among the most stringent, with its requirement that schools be sited within areas designated for growth or in previously developed areas. These types of conditions help reduce the cost to the public of providing transportation and sewerage infrastructure to support new schools in areas that would not otherwise be developed and maintaining the integrity of local comprehensive plans.

Pennsylvania: Downtown Location Law

The downtown location law enacted by Pennsylvania in 2000 prioritizes the restoration and reuse of existing downtown buildings and requires the consideration of transit access when selecting sites for government office buildings.[27] Tom Ridge, the former Republican governor of Pennsylvania who signed the law, noted that "locating a state office in an existing central business district encourages additional private investment, leads to renovations of neighboring buildings, and preserves open space elsewhere."[28] Since it was strengthened by Governor Rendell's 2004 executive order, Utilization of Commonwealth Owned and Leased Space, the law has been effective in pushing state agencies to locate in downtown areas. During the 2006-2007 fiscal year, all state-owned office space and 91 percent of state-leased office space was located in downtowns.[29] These spaces typically have lower overall amounts of travel associated with them and rely largely on infrastructure that already exists, rather than requiring the construction and maintenance of costly new infrastructure.

---

25 State of Massachusetts. *General Laws Part I, Title XII, Chapter 70B, Section 10*. Retrieved 9/19/13 from http://www.malegislature.gov/Laws/GeneralLaws/PartI/TitleXII/Chapter70b/Section10.

26 Maine Department of Education. (2001 August 12). "Maine Department of Education Rule 05-071 CMR Chapter 60: New School Siting Approval." Retrieved 9/19/13 from http://www.maine.gov/sos/cec/rules/05/071/071c060.doc.

27 Pennsylvania State Legislature. (1999). HB 728. Retrieved 7/20/12 from http://www.legis.state.pa.us/cfdocs/legis/PN/public/BtCheck.cfm?txtType=HTM&sessYr=1999&sessInd=0&billBody=H&billTyp=B&billNbr=0728&pn=2547.

28 Blankenship, K. (2010, July/August). "Ridge signs bills aimed at curbing sprawl in Pennsylvania." *Chesapeake Bay Journal*. Retrieved 9/19/13 from http://www.bayjournal.com/article/ridge_signs_bills_aimed_at_curbing_sprawl_in_pennsylvania.

29 Governor Rendell, E. G. (2008, January). *Governor's Report on State Performance Fiscal Year 2006-07. State of Pennsylvania.* Retrieved 8/23/12 from http://www.portal.state.pa.us/portal/server.pt/document/404826/2006_07_govperformancerept_web_pdf?qid=81896601&rank=3.

Resources

Center for State Innovation. Five Easy Pieces on Transportation: Locate State Office Buildings Downtown, Center for State Innovation. http://www.stateinnovation.org/Publications/Five-Easy-Pieces/5ep-trans-lsobd.aspx.

This report describes the benefits of requiring state office facilities to be sited in downtown areas with access to transit and cites several examples.

McKoy, D., Vincent, J.M., & Makarewicz, C. Integrating Infrastructure Planning: The Role of Schools. ACCESS 33 (4). Center for Cities and Schools, University of California, Berkeley. http://citiesandschools.berkeley.edu/reports/Integrating_Infrastructure_Planning.pdf.

This report describes problems associated with the current disconnect between school construction and local planning activities in California and provides recommendations for improvement.

State Smart Transportation Initiative. (2012). Reducing Costs in Kansas Through Transportation Efficient School Siting.
http://www.ssti.us/wp/wp-content/uploads/2012/06/KSSchoolSiting_SSTI.pdf.

This report explores the external costs associated with school site selection and the policies states are using to reduce these costs, and provides specific recommendations for Kansas.

Coordinate Infrastructure Investments Across Agencies

The Opportunity

Each year, states invest large portions of their budgets in infrastructure. A weak economy makes the decisions that states make regarding these investments even more critical. Better coordination across agencies not only ensures that the best infrastructure solutions are created and that the state's priorities are met, but also means that taxpayer dollars are spent more efficiently and effectively.

What Is It?

Today, infrastructure investment decisions in most states are made by agencies without much regard for the decisions and needs of other agencies. States can get more out of their resources by explicitly focusing their investments on the same goals in a coordinated fashion.

To ensure that infrastructure investments are coordinated, states can establish a cross-agency infrastructure entity with the authority to develop and implement an integrated, multi-agency, investment strategy. To provide structure to this effort, a state can develop a set of guiding principles that outline its growth and development goals. Projects and investments can then be evaluated against these goals and principles. States need not limit the application of these criteria to direct state spending; they can also be applied to funds provided on a discretionary basis to local governments, potentially including anything related to housing, economic development, agriculture, natural resources, water and sewer, health, schools, tourism, transportation, and recreation. Under such systems, communities are scored based on their contribution to the development goals and criteria, and the scores are incorporated into the fund approval processes.

Implementation

Large-scale coordination around state infrastructure investments will work best with a formal structure and cross-agency coordinating body in place to guide those investments. The following steps can ensure that such an entity is effective.

1. Create a cross-agency authority to oversee a coordinated investment approach by state agencies. It is important that the interagency team not be used simply as a forum for agencies to discuss coordination, but that it have a meaningful degree of authority over large and small state capital investment decisions. Only with this authority will the interagency team be able to move beyond planning to implementation. To provide a close link to budgetary authority, other states that have pursued interagency investment coordination have most commonly established subcabinets within the governor's office. An effective coordinating entity will likely:

- Involve cabinet members and other senior leadership from transportation, housing, environment, public health, agriculture, and other relevant departments and agencies.
- Meet frequently; meetings should involve cabinet members themselves, rather than their support staff, whenever possible.
- Involve leaders from other state agencies on an as-needed basis.

This approach was pioneered by then-Governor Mitt Romney in Massachusetts. Governor Romney appointed a Super-Secretary to oversee transportation, economic development, housing, and the environment. With budget and other authority over these agencies, the Super Secretary was able to coordinate agency spending and resolve conflicts between agencies leveraging different investments

against one another.

2. Develop guiding principles to clarify investment goals and guide state investment. To successfully coordinate investments across agencies, a state can begin by establishing a set of guiding principles that outline its growth and development goals. Guiding principles serve a critical communications function, both within state government and with the public, articulating the vision for the state in a meaningful, easy-to-understand format. These principles should be concise (no more than one page) and apply to all relevant agencies. They should be designed to help the state prioritize investments and implement policies in each agency so that all agencies work together to further state objectives.

The process involved in developing these principles also plays an important role in transforming cross-agency communication into cross-agency coordination and action. The cross-agency group should ensure that all members have a common understanding of the overarching objectives and solicit feedback from regional and local leaders to ensure that the principles accurately reflect state needs and goals, to foster buy-in for this new direction, and to begin building a supportive constituency.

3. Award discretionary state funds to local government that help to advance the state's priorities. In addition to direct state agency spending, states also award money to local governments for capital spending (often through a formula process) and through discretionary grant making or other discretionary spending. Discretionary state funds are easier to remove from the political process, which allows funds to be directed to the desired projects and programs.

- Inventory and pool state discretionary funds. An important step in this prioritization process is to make an accurate inventory of the discretionary funding streams available. Conducting such an assessment across agencies serves to illuminate, not only the amount of funds available, but also the ways in which each agency's spending patterns impact other agencies. This reveals opportunities to improve efficiency, coordinate state activities, and cut costs.

  The inventory should include funds spent on housing, economic development, agriculture, natural resources, water and sewer, health, schools, tourism, transportation, and recreation. The inventory should not be limited to state funds, but should also include federal funds passed through the state, over which the state has discretionary control. In short, all funds that use criteria for eligibility and distribution that could be revised to support the state's priorities should be considered. Such an inventory can be completed within two to three months.

  While state agencies may consider discretionary funding to be an insignificant portion of their budget, a detailed inventory is likely to indicate otherwise. For example, in Massachusetts, when former Governor Romney developed the Commonwealth Capital system for pooling discretionary funds and scoring municipalities, discretionary funds totaled about $500 million.[30]

- Develop an interagency scorecard to prioritize state investment decisions. To allocate discretionary spending, states can develop a scorecard to help prioritize the state's investment decisions. Scorecards add transparency and objectivity to the decision-making process, and are useful tools to employ when making funding decisions. Many states will

30 U.S. Environmental Protection Agency. "Municipal Level Scorecards." Retrieved 11/26/13 from http://www.epa.gov/dced/scorecards/municipal.htm#eight.

be familiar with the use of a scoring system for judging and awarding discretionary grants. Scoring systems typically evaluate a proposed project against a set of criteria, and projects that receive the highest scores are prioritized for investment.

An effective scorecard will also evaluate other local government activities. Local governments that are supporting state goals with their own actions should receive extra points for their projects, while those that are working at cross-purposes should not receive points. Under such a system, if the state is attempting to address an affordable housing crisis, jurisdictions that zone out accessory dwelling units, multi-family housing, and other more affordable types of housing would not score well. Similarly, a jurisdiction would score poorly if the state DOT is intent on preserving capacity on designated arterials and the local jurisdiction subdivision regulations don't require developers to create a local road network for property access.

Leadership from the governor's office is frequently the most direct and effective way to establish the type of cross-agency coordinating entity described above. However, in the absence of this leadership, there are several ways state transportation agencies can catalyze cross-agency coordination around investments. Two strategies are described below.

- **Start by partnering with a single agency.** State transportation agencies can start by following the steps described above—including creating a cross-agency coordinating body and establishing shared principles to guide investments—with a single agency (such as the housing agency). This early partnership can help to demonstrate the cost savings and benefits that the state can achieve by better coordinating infrastructure investments between agencies, and will encourage adoption of the approach on a broader scale.

- **Coordinate infrastructure investments across agencies in a single pilot region.** A second option is to select a pilot region and work with other state agencies to define a common investment approach for that area. This will generally involve taking stock of how each agency is currently investing in the region and any existing growth and development goals, and working with the local government and stakeholders to identify priorities for the area. Again, this can help demonstrate the benefits of better coordination across agencies and build political support for implementing the approach on a broader scale.

Case Studies

Massachusetts

Massachusetts created the Office for Commonwealth Development (OCD) in 2003 to better coordinate state spending and policy decisions, encourage innovative development locally, and make private investment in worthy projects easier. OCD brought together offices responsible for the state's environmental, transportation, and housing policies under one manager, ensuring that OCD's $5 billion in annual spending improved daily life, the economy, and the environment.

OCD used financial incentives and outreach tools to ensure wise use of state tax dollars and to promote fiscally sound growth policies in the state's 351 communities. For example, the Commonwealth Capital Policy provided financial incentives to communities that applied smart growth principles. The Transit-Oriented Development (TOD) bond program fostered mixed-use, walkable development near transit stations through grants for pedestrian improvements, bicycle facilities, and

housing projects. Approximately 100 TOD sites are planned or completed.[31] The "Fix-it-First" policy ensured that state spending focused investments on existing water, sewer, road, transit, and park infrastructure. In Boston, the state invested $23 million to upgrade the Massachusetts Bay Transit Authority's Blue Line Airport Station. The upgrade helped reinvigorate and enhance the local transit system. Massachusetts also created funding incentives for cities and towns that establish special districts for development that increases tax base and reduces traffic, such as dense residential development in town centers, downtowns, near transit, and on brownfields.

These policies are paying big dividends. Production of multi-family housing units, crucial in a state with the nation's third least affordable housing market, has grown from 3,800 to more than 7,000 units annually. State support for TOD will result in 37 million square feet of new development near transit stations, relieving growth pressure in greenfields.[32] OCD's success demonstrates that states can play a leadership role on development issues while leaving decisions in the hands of local communities. Four of the state's largest TOD projects will collectively produce approximately 9,000 new housing units, nine million square feet of commercial development, and 14,500 jobs.[33]

Pennsylvania

In 2005, under Governor Rendell's leadership, the Interagency Land Use Team and the Economic Development Cabinet developed the Keystone Principles and Criteria for Growth, Investment, and Resource Conservation, a set of principles, criteria, and guidelines that are intended to help agencies "foster sustainable economic development and conservation of resources through the state's investment in Pennsylvania's diverse communities."[34]

The ten principles, which include Redevelop First, Provide Efficient Infrastructure, and Increase Job Opportunities, to name a few, provide broad general goals. The criteria support these ten principles by providing specific measures to evaluate individual projects against the principles. Agencies integrate the criteria into the specific program criteria or as an additional scoring system to help with the decision-making process. The criteria were designed to recognize the fact that communities differ, and what works in rural communities might not be the best solutions for urban areas.

While the principles and criteria are designed to encourage the integration of programs and funding sources from a variety of state agencies into a comprehensive strategy, the system stops short of requiring joint investment decisions.

Nevada: I-80 Corridor System Master Plan

Leaders in the planning and operations divisions at Nevada DOT (NDOT) recently spearheaded efforts to coordinate investments along the Interstate 80 corridor. Interstate 80 is a major route heading east from San Francisco, California, through Nevada. Facing growing congestion along the corridor, planners at NDOT recognized a need to address performance and livability issues without continuing to build additional highway capacity. NDOT launched an I-80 Corridor Study Master Plan in hopes of building a broad alliance of stakeholders along the corridor to better coordinate planning and operations, to pursue innovative strategies, and to secure new sources of funding.

---

31 U.S. Environmental Protection Agency. (2006). "National Award for Smart Growth Achievement." Retrieved 9/19/13 from http://www.epa.gov/dced/awards/sg_awards_publication_2006.htm.

32 *Ibid.*

33 *Ibid.*

34 Pennsylvania Economic Development Cabinet. (2005). *Commonwealth of Pennsylvania Keystone Principles for Growth, Investment, & Resource Conservation*. Retrieved 9/19/13 from http://www.phmc.state.pa.us/bhp/pkp.pdf

The corridor study area covers parts of California, Nevada, Utah, and Wyoming, requiring coordination among the DOTs and other regional entities in each state. In early 2012, NDOT retained a consulting team from Atkins to recruit and coordinate additional stakeholders. The team brought together more than 250 stakeholders representing state, regional and local agencies and organizations along the corridor. The stakeholders are organized into working groups and task forces and they communicate largely through virtual meetings, social media and video podcasts. These smaller groups focus on a range of topics including planning, maintenance, operations, freight, safety, energy, environmental impacts, data, and funding. Stakeholders also participated in tours of the corridor in California, Utah, and Wyoming.[35]

The study team has developed a Livability and Sustainability Self-Assessment Tool for stakeholders to evaluate their own performance. In October 2013, the group launched an online GIS platform, which incorporates data from all four states, including traffic volumes, infrastructure, ITS applications, and roadside facilities. Stakeholders also received training on the development and implementation of effective performance measures to guide decision-making. Through the coalition-building process, NDOT and the study team hope to establish a common language and a lasting network of stakeholders to guide future transportation investments along the corridor and to support nearby communities.[36]

In addition to these efforts, the stakeholder network will collaborate and coordinate with other groups invested in the I-80 corridor, including the I-80 Coalition (focused primarily on winter operations), which recently secured a multi-state corridor operations and management (MCOM) grant from the Federal Highway Administration.

Resources

The Governors' Institute on Community Design. Policies that Work: A Governors' Guide to Growth and Development. Comprehensive Approaches. http://www.govinstitute.org/policyguide/ComprehensiveApproaches/.

This policy guide provides a section on coordinating investments across state agencies toward a common vision for growth that describes the approach outlined in this section in more depth.

Massachusetts Commonwealth Capital. (2006). Commonwealth Capital Application. http://www.epa.gov/dced/scorecards/commonwealthcapitalfy06.pdf.

This application provides a scoring system for the program.

Pennsylvania Interagency Land Use Team and the Economic Development Cabinet. Commonwealth of Pennsylvania Keystone Principles and Criteria for Growth, Investment, and Resource Conservation. http://www.phmc.state.pa.us/bhp/pkp.pdf.

This website provides more information on Pennsylvania's Keystone Principles.

U.S. Environmental Protection Agency. Smart Growth Scorecards. http://www.epa.gov/dced/scorecards/index.htm.

This report provides a collection of sample scorecards from municipalities and organizations that help communities assess their policies and proposed development project.

35 Absher, K., and Gross. P. (2013, Fall). "Livability and the I-80 Corridor Master Plan: Part One." Nevada Planner, Fall 2013: 14-15.

36 I-80 Corridor Coalition. (2012). "I-80 Corridor System Master Plan." Retrieved 11/6/2013 from http://www.i80vision.org/.

Promote Transit-Oriented Development

The Opportunity

Demographic changes, high gas prices, and other factors are expanding the market for and desirability of neighborhoods where residents can walk, bike, drive, and take transit.[37] State DOTs can work together with transit, land use, and economic development agencies to create new walkable development centered around premium transit. This development strategy can increase transit ridership, increase the local tax base, and decrease the demand and need for expensive new transportation facilities.[38] By supporting development in highly concentrated areas served by transit, DOTs can also take pressure off of road capacity needed to serve communities situated in more spread-out development patterns.

What Is It?

Transit-oriented development is a planning concept that creates higher-density, mixed-use development within walking distance—usually a half-mile—of transit stations. While individual developments vary, most create land use intensities high enough that transit becomes a viable, economically superior option to driving. Most developments focus on high-capacity transit lines and stations that are located in convenient, accessible locations and create pedestrian-friendly walkways for shorter trips.

Many transit agencies look at TOD as a smart way to raise revenue and capture the value created by vibrant transit villages (see Focus Area 1). TOD brings in money through the sale or leasing of land (if the land is publicly owned) and increases in transit ridership. Private developers, in partnership with public agencies, can also lead TOD projects.

A state DOT's role in promoting TOD will depend on its involvement in transit. State DOTs that play an active role in transit service can promote TOD by creating staff positions to formally manage and coordinate transit-oriented development. These staff members would focus on coordinating private development with capital, transit, and other state infrastructure assets.

State DOTs that do not have a significant role in transit can still promote TOD. States can prioritize projects that promote rather than impede TOD, such as including pedestrian and bicycle accommodations in state projects that provide connections to transit locations and assisting local transit agencies with planning TOD when state projects are likely to result in new land use patterns.

Implementation

TOD is a complex type of land development. Success requires understanding land development and transit infrastructure and operations. Many state transportation agencies do not have the technical expertise to adequately address development issues, but others are starting to build their capacity. Maryland, for example, established a division within the Maryland DOT (MDOT) that focuses on managing MDOT's land assets to encourage development opportunities. Within MDOT, the Office of

37 Beldon, Russonello & Stewart, LLC. (2011, March). "The 2011 Community Preference Survey: What Americans are looking for when deciding where to live," p. 4. National Association of Realtors. Retrieved 8/1/12 from http://www.stablecommunities.org/library/2011-community-preference-survey-what-americans-are-looking-when-deciding-where-live.

38 Cervero, R., Murphy, S., Ferrell, C. Goguts, N., & Tsai, Y. (2004). TCRP Report 102: *Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects*. Transportation Research Board. Retrieved 8/1/12 from http://www.trb.org/Main/Blurbs/154989.aspx.

Real Estate, an agency that had historically concentrated on acquiring and managing rights-of-way for state highway and rail facilities, grew to include TOD.[39] This change required both legislative action and internal agency commitment.

If the DOT does not operate the transit system, activities to support TOD will include funding TOD planning around transit stations, inventorying DOT-owned land within a half mile of high-quality transit stations, participating in TOD planning efforts to understand the roadway and other transportation improvements that will be needed to make the TOD work, aligning state DOT policies with TOD development (i.e., adjusting LOS goals and roadway design requirements within the half-mile TOD area), and prioritizing DOT projects that support TOD development.

State DOTs can also ensure that their projects will not negatively affect TOD or transit access by creating barriers to walking and bicycling to transit stations and centers or by prioritizing automobile travel through roadway design and parking provision. In addition, if the DOT does operate the transit system, the DOT still can act as a proponent and partner in the TOD development process by seeking development of agency-owned land adjacent to transit stations, providing funding for portions of the development per the Federal Transit Administration's joint development policy, and partnering with private sector actors to catalyze development of private land within the TOD area.

Supporting TOD as a state typically involves the following steps:

1. **Run a pilot project.** State DOTs typically begin with pilot projects in neighborhoods that have strong development potential to serve a transit strategy, such as becoming a transfer hub on a busy rail line or connecting high-traffic locations. Most states use pilot projects to demonstrate the agency's commitment to TOD principles and its ability to partner with private development, if applicable.

2. **Designate strong TOD locations.** If a state agency wants to support TOD efforts but will not be directly involved, it can create a system to formally designate TOD areas to receive state assistance. Maryland has evaluated different proposals and selected nearly 20 potential locations,[40] while New Jersey and California allow local governments to apply for a designation if they satisfy a series of criteria.[41]

3. **Formalize partnerships.** Many state and regional transit agencies sign a memorandum of understanding to formalize partnerships and define the responsibilities of each party involved in a joint development.

4. **Enact enabling legislation.** Some states must pass legislation to allow the state transportation agency to participate in development activities or permit spending transportation funds on development programs.

Most states have found it effective to create task forces and formal committees to create momentum for TOD in the short term; dedicating a full office to TOD is a longer-term process.

---

39 Maryland Department of Transportation Office of Real Estate.. "What is Transit Oriented Development?" Retrieved 9/19/13 from http://www.mdot-realestate.org/tod.asp.

40 Maryland Department of Transportation. "TOD Designation." . Retrieved 8/5/12 from http://www.mdot.maryland.gov/Office%20of%20Planning%20and%20Capital%20Programming/TOD/TOD_Designation.html.

41 National Cooperative Highway Research Program. (2005). "Transit-Oriented Development: Developing a Strategy to Measure Success." *Research Results Digest 294*. Retrieved 8/6/12 from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rrd_294.pdf.

Case Studies

Maryland

MDOT is responsible for a range of transportation functions, including transit, highway construction and maintenance, and freight transportation. It is funded through the Maryland Transportation Trust Fund, an integrated account created to allow Maryland the flexibility to fund all of its transportation needs.

MDOT oversees more than 75 rail stations across the state and began exploring TOD as a means to increase transit usage and offset future roadway demand.[42] It investigated ways to support land development in station areas and develop a strategy for disposing of surplus land. Similar to other regional transit agencies, it saw TOD as a way to increase agency revenue by taking advantage of state-owned land assets.

These reforms were made possible by the 2008 Transit-Oriented Development Act, which allowed the Maryland Transportation Trust Fund to pay for TOD efforts by redefining TOD as having a public purpose.[43] While the agency's Office of Real Estate previously sold surplus MDOT land and coordinated its use with private development opportunities, the TOD Act's redefinition of transit-oriented development increased the office's importance and gave it access to state transportation funds. However, the agency recognized that it did not have expertise in the development process or the real estate market needed to ensure successful TOD and added key staff in the Office of Real Estate to address this gap. The office is staffed not only with planners who understand the operational concerns of public transit, but also with real estate professionals with private sector development experience.[44]

MDOT has also proactively identified TOD opportunities and performed early due diligence work to prepare station-area sites for private development. Preparatory work included analyzing the potential for different types and intensities of land uses, the compatibility with surrounding land uses and community features, and the limitations and opportunities of local land development and zoning regulations. Through partnerships with other state agencies, especially the Maryland Department of Planning, MDOT is able to offer technical assistance to local governments to understand the full implications of TOD and grant entitlements.

MDOT is unusual among state transportation agencies in its ability to use a single funding source for multiple transportation modes and its ownership of nearly all of the transit facilities throughout the state. While funding may not be centralized, most state agencies combine responsibility for multiple modes under a single organization and can form joint TOD staff organizations, most often with offices responsible for multimodal transportation and land assets. Other states can also replicate Maryland's decision to add staff with private development experience, whether in their transportation agencies or in a cross-agency partnership focused more on land asset management.

New Jersey

New Jersey promotes TOD through a variety of public policies based on a tradition of statewide planning. The state created a Transit Village Initiative in the late 1990s under Republican Governor

---

42 Maryland Department of Transportation. "TOD Basics—How does it help Maryland?" Retrieved 8/6/12 from http://www.mdot.maryland.gov/Office%20of%20Planning%20and%20Capital%20Programming/TOD/TOD_Basics.html.

43 Federal Highway Administration. "Case Study Profiles: Maryland —MDOT Transit-Oriented Development Initiative." Retrieved 8/16/12 from http://www.fhwa.dot.gov/livability/case_studies/guidebook/appendix/app11.cfm.

44 *Ibid.*

Christine Whitman as a partnership between NJDOT and the New Jersey Transit Corporation (NJ Transit), its single statewide transportation provider. The initiative is an incentive-based program that encourages municipalities to focus development and redevelopment around transit stations. It relies on local governments to apply for designation and demonstrate TOD suitability through proactive growth policies, transit-adjacent development opportunities, supportive zoning and land development regulations, and market demand and suitability.[45] Based on these local indicators, the state prioritizes transportation improvements and has designated 27 transit villages to date.[46]

However, the New Jersey case also demonstrates opportunities where TOD programs can be improved. The Transit Villages Initiative was not supported by any specific legislation to help execute the program or strengthen the case for funding. Instead, it relied on committed elected officials and agency staff for its success, asking policymakers for funding and working with interested local governments to ensure eligibility. Changes in agency and political leadership have resulted in different state priorities, and the weakening economy during the 2007-2008 recession and its aftermath have increased pressure on the state to reduce funding.

New Jersey's program demonstrates that states with a range of transit facilities can create a qualification-based program to prioritize investments around transportation facilities. This creates a clear framework for aligning land use planning and growth management with transportation decision-making. Since TOD places initial responsibility on local governments to demonstrate readiness through a voluntary application program, it is easy to get off the ground in other states. In these cases, the agency's primary role is to communicate with TOD-designated local governments to identify project needs and make sure that projects foster TOD-related goals.

Resources

Cambridge Systematics, Inc. (2006, April). The Role of State DOTs in Support of Transit-Oriented Development. Produced for the American Association of Highway and Transportation Officials. Cambridge, Massachusetts. http://www.fta.dot.gov/documents/Project_25-25_Task_20_final_report.pdf.

> The research described in this report addresses the role that state DOTs can play in supporting TOD. The research was conducted for the American Association of State Highway and Transportation Officials Standing Committee on the Environment.

Center for Transit-Oriented Development. (2008, November). Capturing the Value of Transit. http://ctod.org/pdfs/2008ValueCapture.pdf.

> This publication focuses on the potential for value capture and is oriented to transit agencies, although it provides useful references for state transportation agencies interested in using land assets around transit stations in a more revenue-productive manner.

Center for Transit Oriented Development website. CTOD Papers and Publications. http://www.ctod.org/ctod-research.php.

> CTOD's website provides a number of resources for further information on TOD, including studies on the impacts of TOD, how-to guides, and case studies from around the country.

45 New Jersey Department of Transportation. "Transit Village Initiative Overview." Retrieved 8/6/12 from http://www.state.nj.us/transportation/community/village/index.shtml.

46 New Jersey Department of Transportation. "Transit Village Initiative Frequently Asked Questions." Retrieved 11/26/13 from http://www.state.nj.us/transportation/community/village/faq.shtm.

Curtis, C., Renne, J., & Bertolini, L. (2009). Transit Oriented Development—Making it Happen. Ashgate Publishing.

This book provides a useful overview of transit-oriented development in North America and Australia. It discusses transitions from TOD policy to implementation and regulation, issues for local governance, and the commercial realities of TOD.

Transit Cooperative Research Program. (2011). TCRP Report 153: Guidelines for Providing Access to Public Transportation Stations. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_153AppendixE.pdf.

This report studies access to transit stations and relies on station case studies to illustrate examples of access requirements and ways that local land development contributes to access, with examples from New Jersey promoted under the Transit Villages program.

Incorporate Climate Change Resilience into Long-Range Planning

The Opportunity

A number of state transportation agencies are working on incorporating climate change resilience into their long-range transportation planning processes. While the effects of climate change will vary from place to place, potentially harmful impacts include increased intensity, variability, duration, and/or frequency of weather events such as precipitation, high winds, freeze-thaw cycles, extreme heat, wild fires, and coastal storm surges. Potential transportation system impacts include shortened infrastructure lifespans, increased risk of catastrophic failures, and increased costs, hazards, and disruptions to society. For example, more frequent freezing and thawing weakens pavement and increases the likelihood of rockslides while extreme heat can warp pavement and supporting structures.

The consequences and costs associated with increasingly vulnerable transportation infrastructure reach far beyond the system itself. Roads and bridges not designed for the increased volume or velocity of water associated with increased precipitation may act as dams that extend the area of flood damage. Failed transportation systems can close emergency evacuation routes and relief routes during extreme events. Prolonged closures can disrupt regional, state, or even national economies and hinder recovery efforts.

By incorporating climate change resiliency into long-range transportation planning, transportation agencies can address potential climate change-related vulnerabilities, reducing the likelihood, magnitude, duration, and cost of disruptions associated with extreme weather.

What Is It?

Climate change resilience planning is an adaptation approach that differs from climate mitigation strategies, which attempt to prevent or limit the extent of climate change by reducing greenhouse gas emissions. Climate change resilience is based on ensuring that systems can withstand and/or quickly recover from disruptive conditions and events. Improving the climate change resilience of a transportation system means improving its ability to anticipate, prepare for, respond to, and recover from climate change-related impacts with minimum damage to social well-being, the economy, and the environment.[47]

As with established transportation planning practice, climate resilience planning can involve adapting infrastructure, changing agency approaches to operations, or a combination of both. Performance based criteria and least cost planning principles can also be applied. Incorporation of both climate models and adaptation alternatives in scenario planning (discussed elsewhere in this Focus Area) is desirable.

Implementation

Climate change adaptation involves operational and infrastructure changes to reduce the

47 Federal Highway Administration, (2012). *Climate Change & Extreme Weather Vulnerability Assessment Framework*. December, 2012. Retrieved 10/25/13 from http://www.fhwa.dot.gov/environment/climate_change/adaptation/resources_and_publications/vulnerability_assessment_framework/fhwahep13005.pdf.

vulnerabilities, risks, and potential costs associated with climate change. Climate change resilience or adaptation planning involves first assessing the vulnerability and risks to the transportation system and its stakeholders and second, identifying and implementing changes from established practices necessary to improve the system's resilience.[48]

The first step in the planning process involves documenting changes in environmental conditions and weather patterns and then selecting the most appropriate climate models to predict likely future changes.

The second step, vulnerability assessment, involves identifying climate change-related stressors facing a transportation system and their consequences on the transportation system. It also requires an inventory of transportation assets with an emphasis on characteristics that could help or hinder adaptation to the new stressors. This may involve development of new asset performance measures that were not previously considered. For example, an inland bridge's elevation above sea level may not have been deemed important when it was designed, but may now be relevant to assessing storm surge risks. Structures designed to withstand historic conditions may no longer be adequate in the face of increasingly frequent or extreme flooding, fire, or heat waves.

The third step is to develop and assess alternative adaptation strategies. Adaptation can involve infrastructure and operational approaches. As with any performance-based assessment or planning effort, climate resilience planning requires measures of outcomes and cost that allow for comparison between alternatives. Benefits and costs of competing alternatives can include measures of environmental and economic impacts that extend beyond the transportation system itself. For example, more frequent maintenance of an existing structure may be less expensive over the long term than rebuilding to higher design standards. In other cases, upgrading existing infrastructure to higher standards before the end of its design life to prevent a catastrophic failure may be more appropriate.

FHWA-Sponsored Pilot Projects

Beginning in 2011, the U.S. Department of Transportation (through the Federal Highway Administration) has partnered with several state and regional transportation agencies on projects to develop and test best practices for incorporating climate change resilience into long-range transportation planning. Pilot projects, sponsored by FHWA, are intended to encourage state and regional agencies in the development of climate adaptation plans using the agency's extreme weather vulnerability framework.[49] U.S. DOT's policy is to promote climate change resilience planning for all modal agencies.[50] Broadly speaking, the federally sponsored climate adaptation and resilience pilot programs undertaken by regional and state agencies to date fall into two categories:

> **Vulnerability and Risk Assessment.** Between 2010 and 2011, three state DOT's participated in FHWA-sponsored pilot programs to conduct systems-level vulnerability and risk assessments of transportation infrastructure using the FHWA framework. The resulting inventory of vulnerabilities and risks is intended to help identify those serious enough to warrant changes to transportation plans.[51] Eight of fourteen state-level pilot programs sponsored by

48 *Ibid*.

49 Federal Highway Administration. (2013). "Climate Change Resilience Pilot Descriptions." Retrieved 10/18/13 from http://www.fhwa.dot.gov/environment/climate_change/adaptation/ongoing_and_current_research/vulnerability_assessment_pilots/2013-2014_pilots/index.cfm.

50 U.S. Department of Transportation. (2011, June). "US DOT Policy Statement on Climate Change Adaptation." Retrieved 11/28/13 from http://www.fhwa.dot.gov/environment/climate_change/adaptation/policy_and_guidance/usdot.cfm.

51 Federal Highway Administration. (2013). "Climate Change Resilience Pilot Descriptions." Retrieved 10/18/13 from http://www.fhwa.dot.gov/environment/climate_change/adaptation/ongoing_and_current_research/vulnerability_assessment_pilots/2013-2014_pilots/index.cfm.

FHWA in 2013-2014 (Arizona, Connecticut, Maine, Maryland, Michigan, Minnesota, Iowa, and Tennessee) will resemble the earlier FHWA pilot programs, focusing primarily on assessment of vulnerability and risk of existing assets.[52]

Adaptation Assessment. At least six of the fourteen climate resilience pilot programs approved for 2013-2014 (Alaska, California, Massachusetts, New York, Oregon, and Washington) will move beyond vulnerability and risk assessment and develop more formal methods for generating, comparing, and selecting specific adaptation strategies. Outcomes will include adaptation assessments for specific projects and development of standardized adaptation assessment processes that can be applied to future projects.[53] Alternative adaptation strategies will be compared on the basis of relative expected costs and benefits compared to business-as-usual approaches.

Case Studies

Washington

The Washington State Department of Transportation's (WSDOT) 2011-2012 pilot study is one example of a state-led climate change vulnerability and risk assessment project. Results indicated that much of the state's transportation system is sufficiently resilient to forecasted changes in climate. An exception is the Skagit River Basin, which is especially vulnerable to disruption from extreme flooding events. Because the basin includes a segment of the vital I-5 corridor, the potential consequences of flooding are particularly severe. Based on findings from the climate change risk and vulnerability assessment, WSDOT intends to:

- Develop a set of specific adaptation strategies for the state-owned and managed transportation infrastructure in the Skagit River Basin.
- Develop an action plan to ensure public safety and maintain continuity of international freight flows in the event of flooding or other weather-related closures of the I-5 corridor.
- Develop a replicable evaluation process that includes and compares life-cycle cost analysis of both structural/engineering and non-engineering alternatives that can be applied to other vulnerable subsystems.[54]

California

Owing to its size and varied geography, the state of California is a natural laboratory for monitoring the impacts of climate change and developing adaptation strategies. Among the state's most obvious concerns is the effect of rising sea levels on coastal highways and densely populated coastal areas. Using established sea level projections for 2050 and 2100, Caltrans and regional transportation planning agencies have already begun incorporating sea level projections into life-cycle repaving and reconstruction programs. In areas where rising sea levels are not expected to pose serious threats within the lifespan of corridor structures, the state has not altered its existing maintenance and operations plans. However, where higher sea levels could impact existing structures or the next reconstruction, Caltrans and regional transportation agencies are considering alternatives.[55]

52 *Ibid.*
53 *Ibid*
54 Wisconsin Department of Transportation. (2013). "Adapting to Climate Change." Retrieved 10/21/13 from http://www.wsdot.wa.gov/SustainableTransportation/adapting.htm.
55 Caltrans (2013, April). *Caltrans Activities to Address Climate Change: Reducing Greenhouse Gas Emissions and Adapting to Impacts, Chapter 8: Adapting to Climate Variability and Change.* Retrieved 10/21/2013 from http://www.dot.ca.gov/hq/tpp/offices/orip/climate_change/documents/Caltrans_ClimateChangeRprt-Final_April_2013.pdf.

In 2011, Caltrans issued its Guidance on Incorporating Sea Level Rise to assist regional transportation offices in assessing their vulnerability to rising sea levels and determining whether adaptation strategies are needed. In February 2013, Caltrans issued formal guidance for assisting the state's MPOs and regional transportation planning agencies (RTPA's) with incorporating climate adaptation into the development of their four- to five- year regional transportation plans. As part of the effort, Caltrans published a framework that helps agencies identify potential climate change impacts and offers a list of operations- and infrastructure-based adaptation approaches. The next step will be to develop a decision matrix to standardize evaluation and ranking of competing alternatives.[56]

Resources

Federal Highway Administration (2012, December). Climate Change and Extreme Weather Vulnerability Assessment Framework.
http://www.fhwa.dot.gov/environment/climate_change/adaptation/resources_and_publications/vulnerability_assessment_framework/fhwahep13005.pdf.

This report offers guidance for transportation agencies in conducting vulnerability assessments and lessons for incorporating the results into decision-making.

Cambridge Systematics. (2012, April). Climate Change Vulnerability and Risk Assessment of New Jersey's Transportation Infrastructure.
http://www.njtpa.org/Planning/Regional-Studies/Recently-Completed-Studies/Vulnerability-and-Risk-Assessment-of-NJ-Transporta/FHWAConceptualModel/CCVR_REPORT_FINAL_4_2_12_ENTIRE.aspx.

This report provides detailed summaries of the methods and conclusions from New Jersey's climate resilience pilot project sponsored by the Federal Highway Administration.

Washington State DOT. (2011, November). Climate Impacts Vulnerability Assessment. http://www.wsdot.wa.gov/NR/rdonlyres/B290651B-24FD-40EC-BEC3-EE5097ED0618/0/WSDOTClimateImpactsVulnerabilityAssessmentforFHWAFinal.pdf

This report summarizes WSDOT's approach to applying FHWA's climate change risk assessment framework and presents its findings and recommended next steps.

California DOT. (2011, May). Guidance on Incorporating Sea Level Rise.
http://www.dot.ca.gov/ser/downloads/sealevel/guide_incorp_slr.pdf

This report offers guide to Caltrans planning staff and its project development teams for incorporating sea level rise concerns into programming and design.

Cambridge Systematics. (2013, February). Addressing Climate Change Adaptation in Regional Transportation Plans: A Guide for California MPOs and RTPAs.
http://www.dot.ca.gov/hq/tpp/offices/orip/climate_change/documents/FR3_CA_Climate_Change_Adaptation_Guide_2013-02-26_.pdf

This report was prepared to guide regional planning agencies in preparing sketch-level or in-depth vulnerability assessments and analyses.

56 *Ibid.*

THE INNOVATIVE DOT

Focus Area 8: Improving DOT Processes

Focus Area 8: Improving DOT Processes

State departments of transportation (DOTs) are well served when they work together to tap into their ingenuity and talent, pool resources, and identify affordable solutions to meet transportation needs. Setting appropriate goals and then working together to achieve them is vital to reforming processes, cutting costs, and strengthening state economies with innovative transportation projects.

In this section:

- Set and Achieve Comprehensive Goals for Transportation Investments
- Streamline Project Development and Delivery Processes
- Improve Agency Organization and Initiate Cultural Change

Set and Achieve Comprehensive Goals for Transportation Investments

The Opportunity

Traditionally, DOTs have defined their mission as facilitating the efficient movement of people and goods, prioritizing mobility over access. The resulting focus on a single mode, the automobile, has limited options for many and created unintended economic, social equity, and environmental consequences. Responding to these consequences, DOTs and state political leaders are broadening their transportation vision to encompass the achievement of multiple goals related to supporting multimodal transportation, economic prosperity, quality of life, and environmental protection and providing better return on taxpayer investment.

What Is It?

For many DOTs, introducing priorities and goals that extend beyond infrastructure construction, condition, and level of service is relatively new territory. Historically, these agencies have not considered the connection between transportation and land use, economic development, and other state concerns. In addition, DOTs typically do not possess the technical resources or the decision-making authority to explore these connections in a meaningful way. Many of the states that are tracking these indicators do not have a means of using the reported outcomes to inform decision-making.

State DOTs can benefit from setting multiple goals related to broader economic, community, and environmental ends to be achieved through transportation investment and identifying and tracking metrics that document how well those goals have been met. The introduction of a goal-driven policy approach recognizes that transportation investments represent too great a share of public resources not to address the larger, more systemic challenges that a state faces. This approach includes evaluating transportation-specific performance measures that truly demonstrate how well state projects meet transportation needs (such as changes in metropolitan area travel times and vehicle miles traveled) as well as non-transportation specific measures (such as the change in tax base for communities along a project corridor, the number of jobs created, or the amount of private investment generated within five years of a project's completion).

Implementation

DOTs currently take advantage of many coordination opportunities to develop transportation plans and programs across their states. By using the structures already in place for coordination, they can start a new process for infrastructure investment planning that takes into account the world of externalities not considered in the past. State DOTs can use these coordination processes to build cross-agency partnerships that achieve a multimodal, financially sustainable vision for our transportation future. The coordination processes can also be used to agree on a set of performance metrics to evaluate results per economic development, social equity, environmental benefits, and multimodal outcomes. The sections below describe three principal levels of partnership that help to make implementation of this initiative successful.

Partnership with local government. State transportation agencies make decisions with significant consequences at the local level, most notably with regard to land use planning, land development and economic development potential, and real property value.

Partnership with metropolitan planning organizations (MPOs). Through the Long-Range Transportation Planning (LRTP) process and the development of MPO Transportation Improvement Programs, DOTs already have a seat at the MPO table. They can take advantage of this presence to shape the conversation, which is increasingly based on visioning, scenario planning, and other regional consensus building to reach desired outcomes. These consensus-building efforts are typically translated into broad goals and indicators for project selection and programming so that the LRTP process yields meaningful projects reflective of community goals.

Partnership with other state agencies. Certain indicators, especially those related to transportation's impacts on environmental resources, large-scale commercial freight movements, and major employment, are probably already tracked by other state cabinet agencies. Partnership with these agencies is a key component of measuring the performance of the transportation system and individual investments against a state's broader goals.

Detailed Steps

Define acceptable and measurable goals, and identify the needed measurement tools. The first step is to determine priorities for state transportation investments and how performance will be tracked empirically against these new metrics. For example, state transportation agencies already monitor the performance of new road projects using a variety of measurements for the traffic they serve, the overall travel speeds they enable, and even their ability to accommodate other travel modes, but they are not always immediately able to understand the degree of private economic or other investments that result from a project. New project-specific goals and performance measurement methods might include the following:

- **Employment and commerce.** Performance measures include job creation, the movement of freight, and estimates of the economic return from policies and investments. To gauge this, state DOTs may wish to create a database where local governments and employers can report on business expansion, new employment, and changes in economic output that are directly related to a state transportation investment. Leaving this to local communities and employers may lead to gaps in reporting activity, but it allows a clearer and less biased assessment of the true economic development results.

- **Equity of access.** States can track how well investments facilitate public transit service or non-motorized travel and accommodate persons with disabilities, and the amount of recreational facilities (such as state and local parks) to which state facilities provide direct access. Tracking can be largely performed by the state agency through transit ridership counts, bicycle and pedestrian traffic counts, or a spatial analysis of recreational resources and commercial centers and how well a state project connects to them. Partnering with transit agencies and transportation advocacy groups can help to identify the strengths and weaknesses of a transportation project with respect to multiple modes of travel.

- **Resource management and environmental responsibility.** Performance measures include fuel usage, transportation-related carbon and other greenhouse gas emissions, and preservation of and impact on ecological systems. Because many transportation projects must assess their environmental impact through the National Environmental Policy Act (NEPA) as a condition of receiving federal funding assistance, some of these indicators are already being assessed during project planning. Some transportation projects in nonattainment areas also involve traffic modeling as part of the air quality conformity process, which can provide additional data.

- **Community preservation.** State transportation projects invariably change the nature of the communities they serve. Tracking the performance of a project with regard to the character of the community can include a clear assessment of the costs for additional public right-of-way, the impact on historic properties, and the effect on nearby property values. Partnering with local governments can help to ensure that these changes are understood, especially as local governments are typically responsible for property assessment, zoning and land development review, and general community planning.

- **Providing staff and agency resources to compile and report results.** Many states that do not currently assess the true costs and benefits of transportation investments beyond conventional transportation performance measures, such as changes to traffic congestion or travel speeds, are not equipped with the staff and agency resources needed to establish and maintain a meaningful monitoring program.

Case Studies

Washington

Washington State represents one of the early cases of a broad performance management system using non-transportation-specific indicators such as environmental impact and economic development. The state's development of this performance management system precipitated from a crisis of public confidence in the agency in the early 2000s. Voters passed a ballot measure that rolled back transportation taxes and created a committee whose analysis found that the Washington State Department of Transportation (WSDOT) operated inefficiently and lacked transparency in decision-making.

In order to win back public confidence, WSDOT established the Gray Notebook, in which it notes project status and progress toward specific benchmarks.[1] Within a couple of months, public perception started to change. Due to the reporting in the Notebook, two legislative transportation revenue packages funded $16 billion worth of projects in 2003 and 2005.[2] Increased public confidence also led to the defeat of a statewide initiative to repeal a 2005 gas tax increase.

Missouri

The Missouri Department of Transportation (MoDOT) uses tools developed by the state's Department of Economic Development and the U.S. Department of Commerce's Bureau of Economic Analysis (BEA) to develop detailed estimates on the economic return the state can expect from transportation investments.[3] Although the estimates are used more as a decision-making tool than as a tool to track outcomes, they allow MoDOT to better understand the likely economic benefits that may be generated by its proposed transportation infrastructure projects and policies as well as the estimated return on investment. The state also uses a separate model, developed by the BEA, to estimate job creation by specific industry resulting from transportation investment. Through data it has already been collecting,

---

1 Washington State Department of Transportation. (Updated 2013, September 30) "The Gray Notebook Quarterly Performance Report Subject Index". Retrieved 9/19/13 from http://www.wsdot.wa.gov/Accountability/GrayNotebook/.

2 Washington State Department of Transportation. (2007, May). "Performance Measurement at WSDOT." Retrieved 9/19/13 from http://www.wsdot.wa.gov/NR/rdonlyres/91089378-E709-49EF-AE42-AE80BC44A91C/0/TRB_Performance_Folio.pdf.

3 Missouri Department of Transportation. (2012, July). *Tracker: Advance Economic Development*. Retrieved 9/19/13 from http://www.modot.org/about/tracker_archive/documents/Tracker_PDF_July12/Chapter_7.pdf. Other sections of the Tracker: Measures of Departmental Performance can be retrieved from http://www.modot.org/about/Tracker.htm.

Missouri reports on transportation indicators related to economic development and commerce, such as freight movements and tonnage. Adding a focus on job creation broadens the focus and better informs decisions about transportation investments.

Michigan

Michigan's statewide transportation plan has set forth a vision for the future development of the state's transportation system and has identified alternative investment packages that will be necessary to move toward that vision.[4] However, Michigan has also invested in evaluating the economic impacts of its transportation vision.[5]

This assessment was used as the basis for a statewide plan, so Michigan evaluated the economic benefits and consequences of transportation decisions in the form of entire transportation scenarios (or project packages), instead of evaluating individual projects as they are planned and programmed. These investment packages include a base package (referred to in the plan as Business as Usual) and three alternative packages based on a variety of conditions in project delivery speed, modal balance, and availability of funding (see Focus Area 3 for more information about this approach to planning).

In order to assess the various investment packages, the Michigan Department of Transportation (MDOT) used the Regional Economic Models, Inc. (REMI) Model to evaluate each investment scenario. This allowed for a better understanding of the level of economic activity, including industrial output, freight and shipping, and job creation, that each of the scenarios would be expected to generate.

Resources

Bremmer, D. & Bryan, J. H., Jr. (2008). Making the Case for Funding Using Performance Management: Experience of the Washington State Department of Transportation. Transportation Research Record: Journal of the Transportation Research Board, No. 2079, 146–153. http://trb.metapress.com/content/pn54367382p71083/.

This paper shows that information asymmetry and the resulting lack of support for agency funding can be corrected using performance management and measurement and effective, ethical communication.

Pew Center on the States. (2011, May). Measuring Transportation Investments: The Road to Results. http://www.pewstates.org/uploadedFiles/PCS_Assets/2011/Measuring_Transportation_Investments.pdf.

This report explores transportation funding in various states and gauges accountability with regard to various state goals.

Michigan Department of Transportation. (2010, March). Economic Benefits of the Michigan Department of Transportation's FY 2010-2014 Highway Program. Statewide and Urban Travel Analysis Section, Bureau of Transportation Planning. http://www.michigan.gov/documents/mdot/MDOT_economicbenefitreport_202828_7.pdf.

This study assesses the economic benefits of the highway and bridge component of MDOT's five-year transportation program and summarizes key findings based on investment levels in the program.

4 Michigan Department of Transportation. (revised 2012). *Michigan Transportation Plan*. Retrieved 9/19/13 from www.michigan.gov/slrp.

5 Michigan Department of Transportation. (2011, March). *Economic Benefits of the Michigan Department of Transportation's FY 2011-2015 Highway Program*. Retrieved 9/19/13 from http://www.michigan.gov/documents/mdot/MDOT_EcnBen_2011-2015_363646_7.pdf.

Michigan Department of Transportation. (2007, June). Economic Impact Analysis of the Michigan Transportation Investment Packages. http://www.michigan.gov/documents/mdot/MDOT_SLRP_Economic_Impact_Analysis_200445_7.pdf.

This report evaluates the economic impacts of and implications resulting from the transportation investment alternatives developed by MDOT.

Michigan Transportation Dashboard. http://www.michigan.gov/midashboard/0,4624,7-256-59297---,00.html.

This site tracks the performance of state transportation infrastructure across modes. The dashboard uses performance metrics such as economic development, safety, mobility, accountability, and condition.

Missouri Department of Transportation. MoDOT Tracker. Measures of Performance. http://www.modot.org/about/Tracker.htm.

MoDOT's Tracker is a tool to assess how well the state delivers services and products to customers. MoDOT uses this tool to determine if it is going in the right direction to best serve its customers.

Washington State Department of Transportation. (2007, May). "Performance Measurement at WSDOT." http://www.wsdot.wa.gov/NR/rdonlyres/91089378-E709-49EF-AE42-AE80BC44A91C/0/TRB_Performance_Folio.pdf.

This report documents WSDOT's multimodal system performance measures. The agency uses well over 100 specific performance measures in its accountability reporting.

Streamline Project Development and Delivery Processes

The Opportunity

Transportation agencies are expected to deliver more projects than ever before, and the environment in which projects must be delivered is increasingly challenging. The project development process used by most state agencies today is outdated, inefficient, and unpredictable. Although the federal process, especially NEPA and the environmental impact statement (EIS), is often blamed for project delivery, in fact, more than 90 percent of projects do not require an EIS, and those that do can be often be managed more efficiently.[6] Simply put, in the majority of cases, states create many project delivery problems on their own—and the fixes for these internal problems are the opportunity.

Streamlining the project development process can help demonstrate to the public that the agency feels a sense of urgency when it comes to addressing existing problems, and that the DOT and political leadership are leading efforts to improve government efficiency and accountability. Modern project development processes tend to have more predictable outcomes, with more projects being implemented as they were planned and in the timeframe anticipated. This predictability is a result of knowing the expectations of the community and agency stakeholders from the beginning, designing solutions that meet these expectations, and ensuring that appropriate funding is available to implement the project.

What Is It?

Most agencies' project decision-making and delivery processes can be revamped to make better transportation decisions that can be implemented in less time with less money.

Decisions about transportation solutions are often pre-determined before the full range of potential solutions is fully understood and, as a result, sometimes default to big, expensive projects (see the Pennsylvania case study below). This approach often leads to projects that lack full funding, with resulting long delays in project implementation that postpone project benefits, increase project costs, and—if the delay is long enough—make the project obsolete. Although it may seem counterintuitive, the most effective way to streamline this process is to spend more time in up-front planning, identifying the full range of potential solutions that meet the project's needs so that less time (and money) is spent designing solutions that may not be permitted, that exceed project budgets, or that do not have community support. If upfront work can identify a smaller project with fewer negative impacts and costs, everyone wins.

National Cooperative Highway Research Program (NCHRP) Report 662 studies DOTs that have addressed these challenges and summarizes how they built the internal capacity to do so:

> "The DOTs of today and their leaders see the transportation environment in a very different light than they did two decades ago. First, loyalty in the new paradigm is not as much between the agency (DOT) and the client (stakeholder); it has shifted more to the problem at hand. Whether it be a capacity issue or a safety concern, a congestion problem or an operational challenge, the transformed DOT culture focuses on solving the problem with swift conviction, within the real constraints being faced.

6 American Association of State Highway and Transportation Officials. Center for Environmental Excellence. *NEPA Process—NEPA Process and Documentation Options.* Retrieved 8/7/12 from http://environment.transportation.org/environmental_issues/nepa_process/#bookmarkNEPAProcessandDocumentationOptions.

”Second, the studied DOTS exhibited some form of sustained capability that emphasized greater accountability on the part of their managers. Accountability was closely linked to a kaizen-like evolution that encourages a continuous improvement of processes, materials, and personnel. State DOTs are implementing programs that reward individuals who think outside the box and improve processes to achieve greater efficiencies and commending those who meet and exceed established goals. This approach promotes highly motivated individuals and fosters a balanced growth environment in which employees can experiment, take prudent calculated risks, develop new ideas, and implement practical solutions to solve problems. Principles of ingenuity and accountability are interwoven into the new paradigm.

“Third, this new paradigm values economies of scale in the execution of projects and programs as much as it does paying individualized attention to the smaller “meat and potatoes”—type projects that fall under its umbrella.

“Fourth, because most transportation challenges cannot be solved through singular relationships, today’s DOTs seek to collaborate and partner with the many stakeholders involved. This collaboration is sought not only for financial stability and leverage, but also for planning and execution. External relationships are cultivated and honored; under the new paradigm, stakeholders are brought in early as participants in a partnership set up to solve the transportation problem, rather than as “clients” whom the DOT as “vendor” is tasked with satisfying. Transparency and accountability on the part of the DOT go far to help stakeholders see the complexities and ramifications inherent in a project; they are less likely to clamor for costly embellishments when they see that trade-offs, compromises, and negotiations are required from all quarters to reach the best solution…

“Fifth, the new paradigm takes into account the advent of an emerging global economy in which technology and communication are central pillars in any organization that wants to compete in the global marketplace. Many states have invested in advanced technologies, allowing their DOTs to operate more efficiently, obtain real-time data, communicate instantaneously, and disseminate information more rapidly than ever before.”[7]

Implementation

Keys to successfully designing and implementing a streamlined project development and delivery process are to:

1. **Engage federal, state, regional, and local partners in revising the project delivery process.** Start with a clear understanding of what each stakeholder needs to achieve with the project development process. For example, regional partners often are responsible for some or all of the planning phase of project development. If MPOs and state DOTs have common goals, projects that meet these collective goals advance more smoothly; the project development process can be used to outline these common goals and set the criteria for project selection and prioritization. Local communities must live with the results of this process; ensuring that it provides the opportunity to offer input during the early stages of a project, before solutions are chosen, is critical to community support and successful implementation.

7 National Cooperative Highway Research Program. Transportation Research Board. (2010). *Accelerating Transportation Project and Program Delivery: Conception to Completion (NCHRP Report 662)*. Retrieved from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_662.pdf.

2. **Have clear state goals, and align the programs and projects that are to be funded with these state goals.** A key aspect of this approach involves having clear goals and objectives to guide day-to-day and long-term work. It is also important that goals and objectives are publicly available and understandable. For example, if an agency has goals of improving the transportation network and minimizing costs (as many do today), it might require projects to be evaluated using a cost-effectiveness or value-to-price ratio method prior to choosing a solution. Agencies can determine when and how this information is generated through their project development process.

3. **Set clear criteria for state transportation projects.** A state's goals and objectives are the underlying rationale in determining where the transportation dollars go. Developing criteria for project selection and directly tying decision-making to these criteria helps to sanction a state DOT's method for allocating funds. This adds predictability to the process of determining projects eligible for state funding and prioritizes an outcomes-based approach. For example, one of Pennsylvania DOT's (PennDOT) goals was to accommodate multimodal travel. This was implemented through project screening that required the identification at the beginning of a project of all modes to be served. The measure of how well an alternative meets this goal (such as the number of pedestrian crossings per mile or the number of miles of bicycle or pedestrian facilities provided) is used to compare project alternatives.[8]

4. **Evaluate the current project delivery process.** An important step is to determine how long a project is really taking and where it is getting bogged down. Evaluate how often the desired solution at the beginning of a project is actually implemented, and what it costs compared to the estimates. PennDOT, for example, was struggling with replacing or repairing small bridges. It analyzed where these projects were getting stuck and determined that a lack of community and agency engagement up front and a lack of design flexibility were causing these projects to take an average of 12 years to complete.[9]

5. **Ensure that problems are well defined before deciding on solutions to solve them.** Community or transportation agency desires for a specific solution often pre-determine the outcome. Exploring and assessing a full range of potential solutions (such as multimodal investments rather than just automobile investments) prior to making a decision can ensure that DOTs address challenges at the least cost. For instance, if a problem can be solved via a system management solution or land use changes, that may forgo the need for the extensive review processes that would be required by a capacity addition project, saving both time and money.

6. **Evaluate how projects are funded at every phase of project delivery.** If a problem or project is determined to be multimodal at the planning stages of project delivery, then funds that can be used for multimodal investments should be included in the construction phase of the project.

8 State Smart Transportation Initiative. *Review of PennDOT's Smart Transportation*. Retrieved 11/19/13 from http://ssti.us/wp/wp-content/uploads/2011/02/SSTI_Review_of_PennDOT_Smart_Transportation.pdf.

9 *Ibid.*

Case Studies

Pennsylvania

In 2003, PennDOT was attempting to deliver a program that was woefully underfunded. The program included many high-cost transportation solutions (26 major capital projects at a cost of $5 billion) that could not be funded in the short or long term.[10] PennDOT's leaders cut the program dramatically, then set out to revamp their decision-making process so that the problem would not recur. The revised process strengthened the planning phase of project development and instituted screening methods to choose projects that were high priorities for the region and the state, that met agency goals, and that were constructible with available revenues. The process they developed is called Linking Planning and NEPA (LPN) because it initially responded to changes in SAFETEA-LU legislation regarding the connection between the planning and NEPA phases of project delivery.[11]

PennDOT engaged its federal, state, and regional partners in developing its project delivery process. Representatives of the end users of this guidance, including MPOs, rural planning organizations (RPOs), local municipalities, and state and federal regulatory agencies, worked closely with PennDOT over a nine-month period and developed a process that was implementable by MPOs, RPOs, and PennDOT itself. Critical elements of this new process included a planning level asset management tool that MPOs and RPOs could use to better estimate life-cycle costs, a firm understanding of a problem and community and agency expectations before choosing a project or a particular design option, a project delivery process that is tailored to the complexity of the problem or project, and project selection criteria that are linked to state and regional goals and objectives.[12]

One of the major challenges in implementing the new process was that some of the critical skills needed for more comprehensive decision-making were not necessarily housed within PennDOT. PennDOT's core strengths were in engineering and design, and it relied on the MPOs and RPOs to conduct most of the planning activities. PennDOT is now working with MPOs and RPOs to better determine how more comprehensive and effective planning can be accomplished.

Through the use of this process, regional prioritization provides a more realistic picture of the funds available to implement projects. This helps to manage regional and local expectations from the beginning of the process, and drives the development of project solutions that are affordable, have a high value-to-price ratio, and meet community and agency needs.

MPOs and RPOs are currently using this new project development process to develop long-range transportation plans and transportation improvement programs. The process was also used to assess several projects that had been stuck in PennDOT's conventional project delivery process. One example of this was the U.S. 202 Parkway in northwest Philadelphia, which was initially conceived as the U.S. 202 Bypass, a grade-separated, 70-miles-per-hour expressway. The project was delayed and finally stopped because of cost increases, community opposition, and difficulty getting environmental permits. PennDOT re-evaluated the project and determined that a smaller-scale project with more local street connections would also provide traffic relief but with less opposition and at a cost savings of $200 million. PennDOT engaged stakeholders early in the decision-making process and was able to deliver the project (from concept to construction) in just three years.[13]

10 *Ibid.*

11 Federal Highway Administration. "Linking Planning & NEPA." Retrieved 11/26/13 from http://www.environment.fhwa.dot.gov/integ/int_pennsylvania.asp.

12 Pennsylvania Department of Transportation. (2010, September). *Design Manual Part 1–Transportation Program Development and Project Delivery Process*. Publication 10. Retrieved 8/7/12 from ftp://ftp.dot.state.pa.us/public/bureaus/design/PUB10/Pub10_Cover.pdf.

13 State Smart Transportation Initiative. (2011). *Review of PennDOT's Smart Transportation*, pp. 37-38. Retrieved 11/26/13 from http://www.ssti.us/wp/wp-content/uploads/2011/02/SSTI_Review_of_PennDOT_Smart_Transportation.pdf.

North Carolina

The North Carolina Department of Transportation's Merger01 process brings stakeholders together at key points in project development. At each point, all members agree on relevant decisions and pledge not to revisit them as the project moves along unless there is new information or some other change that warrants re-evaluation. The concept is called "concurrence," and Merger01 provides for a process to resolve differences if concurrence cannot be reached.[14]

Concurrence points in a project development process could include:

1. Definition of purpose, need, and study area;
2. Detailed study alternatives, including review of alignments;
3. Selection of a preferred alternative;
4. Review to avoid or minimize impacts to communities and the environment;
5. Hydraulic review; and
6. Permit drawings review.

According to NCHRP Report 662, Merger01 has been shown to shave at least six months off a project's schedule. "As a result of these formal concurrence points," the report finds, "project review in subsequent stages is minimized, approvals are speedy, and re-submissions are practically nonexistent."[15]

Michigan

Construction Program Management

The Michigan State Transportation Commission (STC) set a policy goal for the Michigan Department of Transportation (MDOT) to manage its annual construction program to no more than five percent over the as-bid amount for the total statewide construction program. In order to meet this goal, while also reducing the time needed to approve contract changes, MDOT developed a new three-tiered contract change approval process. MDOT staff worked with the State Administrative Board to approve related regulation changes.

Under the new procedures, engineers are empowered to make and approve rapid contract changes necessary for completing work in the field if they can keep their project budgets within five percent of the contract award. These Tier I contract changes can be approved with just the agreement of the construction engineer in charge of the project and his or her direct manager. Projects that fall within five to ten percent above the awarded contract (Tier II) must be approved in the same way as Tier I changes, but also require additional approval from the Region Construction Engineer. Any projects that exceed 10 percent (Tier III) must be approved by the Construction Field Services Division in MDOT's central office.

This streamlined process gives engineers the flexibility to react to unforeseen changes on projects or changes in conditions, traffic, or other factors, in order to deliver better final project results. It also increases oversight of the contract modification process and has doubled the number of licensed professional engineers reviewing large project changes, while still meeting all attorney general and state regulatory requirements. Prior to the policy changes, contract modifications averaged 311 days to be fully approved. The new statewide policy sets a maximum cap at 64 days. The actual statewide

14 North Carolina Department of Transportation. "The Merger Process—Concurrence Points." Retrieved 8/7/12 from http://www.ncdot.gov/doh/preconstruct/pe/MERGER01/Meetings.html.

15 National Cooperative Highway Research Program. Transportation Research Board. (2010). *Accelerating Transportation Project and Program Delivery: Conception to Completion (NCHRP Report 662)*. Retrieved 9/19/13 from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_662.pdf.

average in 2012 for approving large Tier III contract modifications was reduced to only 39 days. The use of digital signatures further reduces average approval time on large projects to less than 5 days. Digital signatures are authentic, time-stamped objects encrypted into PDF files, making them original legal documents.[16]

E-Construction

MDOT has also pioneered paperless construction projects (originally termed "e-Construction") to further streamline project development, delivery, and maintenance. The e-Construction pilot project required contractors to submit all of their construction documents electronically to MDOT's document management system and dramatically increased the use of mobile devices in the field, allowing seamless access to all project data for inspectors, engineers, contractors, and other interested parties. The program incorporates state-of-the-art design and construction surveying, 3D design modeling, electronic document submittals, automated document approval workflows, electronic records storage, and requires the use of digital signatures.

Following its successful e-Construction pilot project, MDOT will implement the program statewide in 2014 and plans to expand electronic document gathering, sharing, and storage to all of its divisions and regions. Projected out across the entire construction program, e-Construction is expected to save as much as $7.5 million in fixed overhead costs. More importantly, however, it offers significant benefits that are difficult to quantify, including greater productivity, the elimination of lost documents, improved transparency (which translates to reduced claims), faster approvals and payments, and more effective collaboration on work sites.[17]

Resources

National Cooperative Highway Research Program. (2010). Accelerating Transportation Project and Program Delivery: Conception to Completion (NCHRP Report 662). http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_662.pdf.

This study focuses on challenges and DOT responses, providing case studies from California, Maine, Maryland, Missouri, New Jersey, North Carolina, Utah, and Texas.

Pennsylvania and New Jersey Departments of Transportation. (2008). Smart Transportation Guidebook. http://smart-transportation.com/assets/download/Smart%20Transportation%20Guidebook.pdf.

This document provides a guide to building and maintaining a transportation system that supports community goals. For technical details, see PennDOT design manuals below.

PennDOT Design Manuals. Pennsylvania Department of Transportation. (n.d.) Available at: http://www.dot.state.pa.us/Internet/Bureaus/pdDesign.nsf/DesignHomepage?openframeset&frame=main&src=HQADStandards?OpenForm.

These manuals detail PennDOT's development process and provide other design guidance.

North Carolina Department of Transportation. The Merger Process. http://www.ncdot.gov/doh/preconstruct/pe/MERGER01.

The Merger 01 process brings DOT staff and important stakeholders, including federal agencies, together at key points during project development to find compromise solutions and avoid delays and rework.

16 Based on contributions from Polly Kent, Administrator of Intermodal Policy Division, Michigan DOT (2013, November).
17 *Ibid.*

FOCUS AREA 8: IMPROVE DOT PROCESSES

Improve Agency Organization and Initiate Cultural Change

The Opportunity

This handbook presents a variety of specific measures for addressing the growing responsibilities and challenges facing DOTs, along with strategies for staying viable and competitive over the long term. In many cases, however, actually implementing these measures requires making substantial changes to the organizational structure of each agency and initiating a culture change throughout. While this process can be slow, these changes can be both beneficial and necessary to operate effectively as a modern transportation agency.

Most DOTs began as highway authorities—rich with federal funding to build and expand a national system of freeways—and their approach was heavily oriented toward civil engineering functions such as construction and maintenance. For many agencies, their responsibilities now span a broader range of functions that include operating and managing existing infrastructure, incorporating new technologies, accommodating different modes and travel choices, engaging with communities, and securing unique funding sources to accomplish these tasks. Many agencies already carry out some of these functions, but often in ad hoc ways. Institutional changes can make these new functions integral to agency operations at all levels, thereby improving process efficiency, agency reliability, project outcomes, and public perception.

What Is It?

Now that many DOTs are formally viewed as multimodal transportation agencies charged with long-term planning functions and other responsibilities, they must build the necessary skill sets, repurpose their existing skill sets, and rethink the way they do business in order to carry out these tasks. Making this transition successfully requires making changes throughout the agency, which include:

- Setting new goals, objectives, and performance measures;
- Establishing new processes for conducting day-to-day business;
- Building human capital and setting strategies for succession planning; and
- Exploring new approaches to communicating, reporting, and disseminating information.

Many agencies have already begun taking steps necessary for change based on self-assessment and local external pressures. New rulemaking in MAP-21 tying federal funds to broad goals such as improved safety, system reliability, and project delivery is further impetus for DOTs to review their organizational structure and manage outcomes in new ways.[18] These changes must be based on an overarching vision for the agency with clear, tangible goals established. This vision must be championed at the highest level and steps must be taken to integrate these changes into each process at every level so that every stakeholder understands their role in working toward that vision. Each person involved must be empowered to do their job effectively and held accountable for outcomes.

Implementation

Marked changes in DOT culture and business practices can be initiated at a number of levels, including through middle-management initiative, top-down directive, or external influence. Middle-

18 Federal Highway Administration. (2012). "MAP-21 Putting Performance into Action." Transportation Performance Management webpage. Retrieved 10/30/13 from https://www.fhwa.dot.gov/tpm/.

management change can occur through excellent regional leadership or individual championship for innovative practices. External factors such as changing travel trends, limited resources, and legislative actions can force change within an agency. Lasting change, however, requires cooperation at all levels, which can include external players, and must be championed by a high-level official within DOT—namely, the CEO. The intent should be made clear through memos, planning documents, and other programs. For example, Massachusetts DOT Secretary Richard Davey launched an innovation campaign encouraging staff to think in new ways, complete with a tagline included in memos and printed on buttons: "But we've always done it this way," with the key being that the phrase is struck out. As important as bold steps like this one are, change is gradual and must be institutionalized in order to have a lasting impact.

Strategic planning and performance measures provide a valuable structure for implementing cultural change throughout an agency.[19] This approach enables an agency to align many key players toward a common goal and to ensure that progress toward meeting that goal can be sustained over the long term. Strategic planning and performance-based project selection have been central components of North Carolina DOT's recent organizational transformation (see Focus Area 2). Generally speaking, this approach requires taking key steps, which include:

- Develop and document a vision for the agency and build support at all levels;
- Select a small number of broad performance measures to guide decision-making and to focus the efforts of different divisions (subsets of performance measures can be chosen for specific functions and processes);
- Garner active involvement among middle-management and staff;
- Hold staff accountable for performance and empower them through training and access to information;
- Seek feedback and assess performance measures on an ongoing basis; and
- Use performance measures to improve transparency, communicate with the public, and build bridges with state legislators.

Some common initiatives, while less comprehensive in their scope or impact, can send a strong message of change throughout an agency when championed by a CEO. Many can serve the necessary function of aligning multiple divisions and processes toward a specific common goal. These initiatives, which often overlap, include context sensitive solutions, complete streets policies, asset management, new project selection criteria, and sustainability. The GreenDOT initiative and subsequent Healthy Transportation Policy Directive both serve that function within the Massachusetts DOT. The GreenDOT policy embeds sustainability goals within the agency's core principles and outlines specific targets pertaining to greenhouse gas emissions reductions, travel mode shares, and smart growth development patterns.[20] The Healthy Transportation Policy Directive, issued in September 2013, orders all staff to take specific steps for increasing and encouraging pedestrian, bicycle, and transit travel in association with every project.[21]

---

19 Barker, J. B. (2010). *NCHRP Report 660 – Transportation Performance Management: Insight from Practitioners*. Retrieved 11/26/13 from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_660.pdf.

20 Massachusetts Department of Transportation. (2010, June 2). *GreenDOT Policy Directive*. Retrieved 11/6/13 from http://www.massdot.state.ma.us/portals/0/docs/P-10-002.pdf.

21 Massachusetts Department of Transportation. (2013, September 9). *Healthy Transportation Policy Directive*. Retrieved 11/6/2013 from http://www.massdot.state.ma.us/Portals/0/docs/GreenDOT/DirectiveHealthyTransportation.pdf.

Cultural change also commonly requires an agency to improve its capacity for performing a range of functions such as operations, system management, planning, and communication. Research conducted as part of the Strategic Highway Research Program (SHRP 2) offers guidance for integrating new programs within existing transportation agencies. This work focuses specifically on system operations and management (SO&M) strategies, but is based on a *capability maturity model*, which has broad applications for improving organizational architecture. This model provides a framework that allows agencies to incrementally improve the way they implement new programs from ad hoc to mainstreamed, by focusing on four key institutional elements: leadership, organization and staffing, resource allocation, and partnerships. New technical and business processes (such as those necessary for improved SO&M) depend on a formal commitment to supportive programs in each of the institutional areas above.

Case Studies

Missouri

During the 1980s and 1990s, performance management at Missouri DOT (MoDOT) was ad hoc and largely ineffective. A new approach began taking shape in early 2000, beginning with a series of statewide rallies to solicit input from road users, which was used to develop new performance measures geared toward customer satisfaction rather than engineering standards. This change also led to a new approach for revenue allocation that was geared more toward managing existing assets, in addition to adding new capacity.[22]

Performance management became a guiding principle beginning in 2004 when Pete Rahn was appointed Director of MoDOT. This new "data-driven and results-focused approach" depended on four implementation strategies similar to those outlined above. These strategies include empowering staff (particularly middle-management leaders), encouraging innovation, demanding measurable results and cost savings, and holding staff accountable for results.[23]

MoDOT's new institutional culture is manifested in key programs such as practical design, new asset management strategies, and improved customer relations. Practical design (see Focus Area 4) leads to substantial cost savings by discouraging overdesign and relying instead on "right-sized" design solutions and improved system performance. Asset management strategies include MoDOT's successful Better Roads, Brighter Futures plan, which was launched in 2007 to improve conditions of the state's most heavily traveled roadways in a five-year period.[24] The agency's efforts to improve transparency, accountability, and customer relations include a quarterly publication called *Tracker*,[25] which highlights progress made toward seven tangible goals, and other major public outreach and customer service efforts.[26] As a result of these new efforts, the agency has met highway improvement goals ahead of schedule, reinvested more than $400 million in project cost savings, and saw considerable increases in customer satisfaction. Performance management is now viewed as a standard approach for conducting business at MoDOT.

---

22 Cambell, M. (2010). "Driving Asset Management Through Performance: Culture Change and Proven Results at the Missouri Department of Transportation." *TR News 270*. Retrieved 11/16/13 at http://onlinepubs.trb.org/onlinepubs/trnews/trnews270AssetManagement.pdf.

23 *Ibid.*

24 Briggs, J. (2007, February). "MoDOT Launches Better Roads, Brighter Future Program." *Connections (publication for MoDOT employees).* Retrieved 10/19/13 from http://www.modot.org/Connections/archives/2007/feb07.pdf.

25 Missouri Department of Transportation. (2012). "About MoDOT Tracker Performance Measures." Retrieved 10/29/13 from http://www.modot.org/about/Tracker.htm.

26 Missouri Department of Transportation. (2006). "Newsroom" webpage. Retrieved 10/29/2013 from http://www.modot.org/newsroom/.

Minnesota

Integrating all available transportation modes into a cohesive, cost-effective system is a key function of modern transportation agencies. Recognizing this, the Minnesota DOT (MnDOT) recently restructured its Modal Planning and Program Management Division (MPPM) in order to better support modal integration.

Previously one office within MPPM had been acting as the highway modal office as well as performing a number of additional services for MPPM and the department as a whole, leading to the perception, both inside MnDOT and externally, that planning at MnDOT was highway-centric, rather than multimodal. In February 2010, that office was divided into two offices, the Office of Statewide Multimodal Planning and the Office of Capital Programs and Performance Measurement.

The Office of Capital Programs and Performance Measurement now acts as the highway modal office and leads the development and implementation of MnDOT's performance-based capital improvement program for the highway system. The office is also responsible for conducting investment analysis and performance measurement for other modes, and providing expertise in those areas to the entire department.

The separate Office of Statewide Multimodal Planning now focuses on integrating and connecting the modal systems to ensure that transportation planning in MnDOT will be multimodal, customer-based, future-focused, and performance-oriented. By creating a new office with a special focus on multimodal planning, MnDOT has taken an important step toward developing a more truly multimodal transportation system.

In 2011, MnDOT released *Minnesota GO*, a 50-year statewide vision for multimodal transportation based on interviews and input from citizens and stakeholders. The following year, the agency released its *Statewide Multimodal Transportation Plan*,[27] based on that vision. This plan will provide a framework for all subsequent decision-making, including follow-up plans, investment decisions, and internal processes.

Illinois

In 2012, Illinois DOT (IDOT) Secretary Ann Schneider announced *Transforming Transportation for Tomorrow*—a multimodal transportation improvement program (TIP) that provides a vision for the future of the state's transportation network and a framework for achieving cultural change within the agency in order to achieve that vision. Language in the TIP signals an important directional shift for the agency:[28]

"This multi-modal systemic programming approach goes beyond previous individual modal programming efforts to identify and provide needed and dynamic links among various modes where possible, and to encourage public use of those links and all available options. Modal programs now and in future years must be designed as steps toward a comprehensive vision as seen through a multi-modal lens with reasonable and beneficial connections among highways, public transportation, rail, airports and ports serving inland waterways."

---

27 Minnesota Department of Transportation. (2012, September). *Minnesota Statewide Multimodal Transportation Plan*. Retrieved 10/29/13 from http://www.dot.state.mn.us/minnesotago/pdf/statewidemultimodaltransportationplan.pdf.

28 Illinois Department of Transportation. (2012, March). *Transforming Transportation for Tomorrow: FY2013-2018 Proposed Multi-Modal Transportation Improvement Program*. Retrieved 11/26/13 from https://www.dot.il.gov/hip1318/html/district/mtip.pdf.

The state's Long-Range Transportation Plan (LRTP), released later that year, builds on the TIP by outlining specific strategies for achieving that vision. Together, these two documents outline 11 guiding policies that provide a framework for building and maintaining a transportation system that meets the state's evolving transportation needs. These policies focus on improving multimodal connections (including bicycle and maritime travel), retaining and diversifying human capital within the agency, improving transportation safety, and preserving the state's existing transportation assets.[29]

Although the process for implementing these policies is still in its early stages, the LRTP has provided a framework for taking a number of key steps. The agency immediately began planning for freight mobility and statewide bicycle connections and it began working with the Department of Natural Resources for maritime planning. The agency developed a sustainability scorecard to evaluate new projects and it has taken early steps to establish a sustainability committee, which includes representatives from all departments from its onset. IDOT intends to improve knowledge-sharing among district offices, partly through additional training which has begun taking place in connection with its existing context sensitive solutions (CSS) program. Eventually, the LRTP is expected to serve as a blueprint to guide any future departmental changes.[30]

Resources

Campbell, M. (2010). "Driving Asset Management Through Performance: Culture Change and Proven Results at the Missouri Department of Transportation." *TR News 270*. http://onlinepubs.trb.org/onlinepubs/trnews/trnews270AssetManagement.pdf

This article provides a case study of how the Missouri DOT incorporated performance management (or "asset management") to initiate cultural change, bolster accountablity, and improve agency outcomes.

Federal Highway Administration. *Transportation Performance Management website*. https://www.fhwa.dot.gov/tpm/.

This webpage provides information on performance requirements outlined in MAP-21 and guidance on implementing performance management strategies.

Parsons Brinckerhoff. (2011). Guide to Improving Capability for Systems Operations and Management, SHRP Report S2-L06-RR-2. Available online at: http://onlinepubs.trb.org/onlinepubs/shrp2/SHRP2_S2-L06-RR-2.pdf.

This report offers guidance for implementing system management and operations strategies through imrpoved business practices and organizational architecture at state DOTs.

Transportation Research Board. (2010). *NCHRP Report 660 – Transportation Performance Management: Insight from Practitioners*. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_660.pdf

This report offers guidance for transportation agencies interested in using performance data to guide decision-making and operations.

29 Illinois Department of Transportation. (2012). *Long Range State Transportation Plan* webpage. Retrieved 11/26/13 from http://www.illinoistransportationplan.org/.

30 Based on interviews with Bola Delano, Deputy Director of Planning and Programming, Illinois Department of Transportation. (2013, October).

Smart Growth America
Making Neighborhoods Great Together

State
Smart Transportation
Initiative

This handbook is a product of Smart Growth America and the State Smart Transportation Initiative.

Smart Growth America is the only national organization dedicated to researching, advocating for and leading coalitions to bring smart growth practices to more communities nationwide. From providing more sidewalks to ensuring more homes are built near public transportation or that productive farms remain a part of our communities, smart growth helps make sure people across the nation can live in great neighborhoods. For additional information visit www.smartgrowthamerica.org.

The State Smart Transportation Initiative, a network of 19 state DOTs, promotes transportation policies and practices that advance environmental sustainability and equitable economic development, while maintaining high standards of governmental efficiency and transparency. Housed at the University of Wisconsin, SSTI operates in three ways: as a community of practice, where participating agencies can learn together and share experiences as they implement innovative smart transportation policies; as a source of direct technical assistance to the agencies on transformative and replicable smart transportation efforts; and as a smart transportation resource to the wider transportation community, including local, state, and federal agencies. Learn more at www.ssti.us.