

THE INNOVATIVE DOT

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



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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

FOCUS AREA 7: INTEGRATING TRANSPORTATION AND LAND USE DECISION-MAKING

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 can 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

Tennessee

The Tennessee Department of Transportation (TDOT) has made it a point to interact with local communities to create better outcomes for projects. As part of Commissioner John Schroer's "top to bottom" review, completed in February 2012, he created a team to focus on changing TDOT's planning, design, and funding of transportation projects across the state.

Through the Office of Community Transportation (OCT), which was formed following the review, TDOT has improved the coordination between land use and transportation decisions by strengthening outreach to local communities. The Community Planning section of OCT provides resources to communities beginning to work on comprehensive plans and offers them advice on cost-effective transportation investments to suit their needs. One way OCT is helping local communities think about land use and transportation linkages is during the school site selection process. OCT planners work with communities to provide advice on the transportation costs associated with potential school locations.⁵

In addition to the renewed focus on engagement between TDOT and local communities, OCT also offers grants to improve local planning in communities with limited capacity.⁶

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.

- 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.
- 5 Smart Growth America. "Improved community outreach pays off for Tennessee Department of Transportation." Retrieved 10/24/14 from <http://www.smartgrowthamerica.org/2014/07/17/improved-community-outreach-pays-off-for-tennessee-department-of-transportation/>.
- 6 Interview with TDOT Chief of Environment and Planning (2014, November).

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.

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.

FOCUS AREA 7: INTEGRATING TRANSPORTATION AND LAND USE DECISION-MAKING

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.⁷ 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.

⁷ 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 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.⁸

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

8 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.⁹
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.

9 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.¹⁰

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.¹¹

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.¹²

Delaware: LUTSAM

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.

10 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.

11 *Ibid.*

12 *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).¹³ 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.¹⁴ GreenSTEP was the primary planning tool used by ODOT to develop its 2050 Statewide Transportation Strategy, adopted in 2012,¹⁵ 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*¹⁶ 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.¹⁷

13 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>.

14 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.

15 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.

16 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>.

17 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 C16.¹⁸ 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.¹⁹

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.²⁰

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.

18 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>.

19 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>.

20 Based on an interview with Maren Outwater, Vice President, Resource Systems Group (2013, November).

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.

FOCUS AREA 7: INTEGRATING TRANSPORTATION AND LAND USE DECISION-MAKING

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.²¹

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.²²

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

21 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.

22 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,²³ 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,”²⁴ 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

23 “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.”

24 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),²⁵ authorized in Chapter 92 of Title 29²⁶ 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 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

25 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>

26 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.²⁷ 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.²⁸ 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.²⁹ 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.”³⁰ 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.³¹ 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.

27 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>.

28 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>.

29 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>.

30 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.

31 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

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.

FOCUS AREA 7: INTEGRATING TRANSPORTATION AND LAND USE DECISION-MAKING

Coordinate Infrastructure Investments Across Agencies

The Opportunity

Each year, states invest large portions of their budgets in infrastructure. A weak economy causes the decisions about these investments to be 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.³²

- 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 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

32 U.S. Environmental Protection Agency. "Municipal Level Scorecards." Retrieved 11/26/13 from <http://www.epa.gov/dced/scorecards/municipal.htm#eight>.

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.³³ 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.³⁴ 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.³⁵

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.”³⁶

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) 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.

33 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.

34 *Ibid.*

35 *Ibid.*

36 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.³⁷

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.³⁸

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.

37 Absher, K., and Gross. P. (2013, Fall). "Livability and the I-80 Corridor Master Plan: Part One." Nevada Planner, Fall 2013: 14-15.

38 I-80 Corridor Coalition. (2012). "I-80 Corridor System Master Plan." Retrieved 11/6/2013 from <http://www.i80vision.org/>.

FOCUS AREA 7: INTEGRATING TRANSPORTATION AND LAND USE DECISION-MAKING

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.³⁹ 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.⁴⁰ 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

39 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>.

40 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.⁴¹ 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,⁴² while New Jersey and California allow local governments to apply for a designation if they satisfy a series of criteria.⁴³
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.

41 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>.

42 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.

43 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.⁴⁴ 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.⁴⁵ 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.⁴⁶

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

44 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.

45 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.

46 *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.⁴⁷ Based on these local indicators, the state prioritizes transportation improvements and has designated 27 transit villages to date.⁴⁸

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.

47 New Jersey Department of Transportation. "Transit Village Initiative Overview." Retrieved 8/6/12 from <http://www.state.nj.us/transportation/community/village/index.shtml>.

48 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.

FOCUS AREA 7: INTEGRATE TRANSPORTATION AND LAND USE DECISION-MAKING

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.⁴⁹

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

⁴⁹ 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.⁵⁰

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.⁵¹ U.S. DOT's policy is to promote climate change resilience planning for all modal agencies.⁵² 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.⁵³ Eight of fourteen state-level pilot programs sponsored by

50 *Ibid.*

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.

52 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.

53 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.⁵⁴

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.⁵⁵ 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.⁵⁶

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.⁵⁷

54 *Ibid.*

55 *Ibid.*

56 Wisconsin Department of Transportation. (2013). "Adapting to Climate Change." Retrieved 10/21/13 from <http://www.wsdot.wa.gov/SustainableTransportation/adapting.htm>.

57 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.⁵⁸

Massachusetts

In January 2014, Governor Deval Patrick announced \$52 million in funding for a statewide plan to address the present and future impacts of climate change. Citing weather events such as Tropical Storm Irene in 2011, which washed out Route 2 in North Adams and created \$23 million worth of damage to a six-mile stretch of the road, the governor pointed out that climate change is creating more disruptive weather and challenging public health, safety, and economic vitality. While much of the funding will be in the form of municipal grants to cities and towns to improve their energy services at critical sites, some funding will go toward assessing the vulnerabilities of transportation facilities and adoption of climate adaptation plans by 2015.

The Massachusetts Climate Change Adaptation Report, which was published in September 2011 and acted as a catalyst for some of the committed investments, makes recommendations to better prepare transportation facilities for extreme weather. Some of the strategies in the plan include adjusting standard maintenance and inspection procedures and developing financing mechanisms to fund anticipated expenses to address climate change impacts at the state and local levels.

The \$40 million worth of grants to local governments will be paid for through Alternative Compliance Payments, which are made by electricity suppliers that do not meet state standards for the use of renewable energy. Another element of the plan, coastal infrastructure upgrades and dam repairs, will receive \$10 million and will be paid for through existing capital funding. The remaining \$2 million, including funding for transportation vulnerability assessments, will be part of the governor's 2015 budget proposal.

Resources

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/FHWACConceptualModel/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.

Massachusetts Executive Office of Energy and Environmental Affairs and the Adaptations Advisory Committee. (2011, September). Massachusetts Climate Change Adaptation Report. <http://www.mass.gov/eea/docs/eea/energy/cca/eea-climate-adaptation-report.pdf>.

This report provides strategies for reducing and stabilizing greenhouse gas emissions and adapting to climate change in Massachusetts.

⁵⁸ *Ibid.*

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 guidance 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.