



SSTI REVIEW OF

PennDOT's
Smart Transportation

The State Smart Transportation Initiative

Transportation is a basic social and economic need. Providing affordable choices to meet transportation needs is an acknowledged responsibility of government. However, mobility solutions conceived a generation ago might not be economically or environmentally sustainable today.

The mission of the State Smart Transportation Initiative (SSTI) is to promote “smart transportation” practices that foster equitable economic development and environmental sustainability, while maintaining high standards of governmental efficiency and transparency.

SSTI operates in three ways:

1. As a community of practice, where participating agencies can learn together and share experiences as they implement innovative smart transportation policies.
2. As a source of direct technical assistance to the agencies on transformative and replicable smart transportation reform efforts.
3. As a resource to the wider transportation community, including local, state, and federal agencies, in its effort to reorient practice to changing social and financial demands.

SSTI is funded by the Rockefeller Foundation and the U.S. Department of Transportation.

SSTI’s Review of PennDOT’s *Smart Transportation Program*

This review was done at the request of PennDOT to assess how effective its *Smart Transportation* program has been in integrating land use and transportation in its decision-making and to identify areas of opportunity to advance the *Smart Transportation* agenda. SSTI convened a panel of experts that included people who have led transformative initiatives as heads of state DOTs. The panel combined practical and academic thinking. The expert panel reviewed background materials on PennDOT’s efforts, and then interviewed people with varying perspectives on *Smart Transportation*, including PennDOT staff, personnel from other state agencies, federal and local entities, and representatives from the not-for-profit sector. Intended as a “peer review” rather than an audit, the expert panel members brought their knowledge of transportation policy and trends to bear in assessing where PennDOT has succeeded and how the remaining challenges might be addressed.

SSTI is especially grateful to PennDOT personnel, whose pride in their department is evident. Jim Ritzman and Danielle Spila were masters of organization. All of the people we interviewed were welcoming and forthright and exemplified the collaborative spirit that underlies *Smart Transportation* in Pennsylvania.

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Smart Transportation in Pennsylvania in 2011



SSTI Review of PennDOT's *Smart Transportation*

Smart Transportation is Pennsylvania DOT's integrated response to the crisis of crumbling infrastructure and limited revenues to address it, and the need to better align transportation with community revitalization and sound land use policy.

In *Smart Transportation*, PennDOT has intensified discipline in its fiscal and asset management, updated guidance on design and development, and committed to collaborations with local and regional governments and citizens. *Smart Transportation* has transformed the very culture of PennDOT from top to bottom, at district offices as well as at headquarters.

Three highlights of the effort are:

- **A shift in capital investment strategies.** PennDOT has emphasized system preservation, while restraining new capacity projects in number, purpose and scale. At one point the department struck more than two dozen capacity expansion projects from its program. Over the course of a decade, it reduced its spending on capacity projects from 25 percent to less than 4 percent.
- **A fundamental change in project design and development guidelines.** With New Jersey DOT, PennDOT produced the exemplary *Smart Transportation Guidebook*, as well as thoroughgoing changes in workhorse design and construction manuals and the project planning process. These changes have integrated into everyday decision-making the lessons in flexibility and collaboration from Context Sensitive Solutions and Linking Planning with NEPA.
- **Creation of a modest, but very visible competitive funding program for *Smart Transportation* projects.** The Pennsylvania Community Transportation Initiative (PCTI) supports projects that integrate transportation investment with community revitalization and good land use approaches.



Smart Transportation is more than the sum of such specific initiatives, however. It is a theme that affects the functioning of PennDOT and all its constituents. The heart of the message is that transportation must support goals for strengthened communities, fiscal responsibility and good land use. *Smart Transportation* has become a PennDOT brand.

Philadelphia skyline and Fairmont Park.

Some of *Smart Transportation's* tools and approaches are now well developed. Examples abound of useful short-term outcomes. Other processes and partnerships are still in early stages. This report recounts some of its continuing challenges as well as its evolution and achievements until now. *Smart Transportation's* full potential to benefit Pennsylvania's communities, environment, and economy remains to be seen.

Chapter 1. What SSTI found in Pennsylvania

From 2004 to 2011 PennDOT reframed its strategic mission around several initiatives together labeled *Smart Transportation*.

SMART TRANSPORTATION THEMES

From the PennDOT/NJ DOT *Smart Transportation Guidebook* 2008

1. Money counts
2. Understand the context; plan and design within the context
3. Choose projects with high value/price ratio
4. Enhance the local network
5. Look beyond level of service
6. Safety first and maybe safety only
7. Accommodate all modes
8. Leverage and preserve existing investments
9. Build towns, not sprawl.
10. Develop local governments as strong land use partners.

PennDOT's aspirations have been bold:

To change the culture of its organization

To change expectations held by colleagues in government and Pennsylvania's citizens about PennDOT's and local partners' solutions to transportation problems

Altogether the aim has been that PennDOT's programs and investments should be properly matched to tight fiscal times, while still making progress on fixing the huge burden of deteriorated highways and bridges, and discouraging inefficient sprawl development in favor of revitalizing existing communities.

SSTI found that PennDOT's Fix-It-First asset management approach was making progress on the backlog of deteriorated infrastructure.

Also, investments in new transportation projects have begun to reflect the community collaborations, more critical selection processes and flexible design principles for which PennDOT has been striving.

And changes within PennDOT, especially in revisions of its design manuals, have brought PennDOT's staff not just at headquarters, but also in the district engineering offices, to new ways of looking at PennDOT's business.

Noteworthy Progress

- **Fix-It-First Asset Management Strategy.** With funding scarce, PennDOT has reinforced Fix-It-First as its core asset management strategy. PennDOT's accelerated bridge program is slowly cutting into the backlog of structurally deficient bridges that has been the biggest in the nation. Representatives of Metropolitan Planning Organizations, Rural Planning Organizations and FHWA have been important partners in this shift. Critical bridge failures affecting major highways in December 2005 and March 2008 have added to the public's sense of urgency for PennDOT's direction.
- **Redesign of 26 Major Projects.** Early success has been achieved using flexible design approaches in revamping several long-proposed capacity-adding projects to fit with current fiscal constraints and to mesh with local and regional planning objectives.

- Revised Manuals.** Design approaches for non-limited access roadways drawn from Context Sensitive Solutions have been incorporated into a highly successful *Smart Transportation Guidebook* (2008) prepared together with New Jersey DOT. PennDOT has benefitted from the *Smart Transportation Guidebook* by placing new flexible approaches into the array of its canonical design manuals, enriching and expanding the options available to PennDOT's design engineers.
- Cheaper, Faster, More Collaborative Project Selection.** PennDOT has revised the process for project development to emphasize early collaboration with local officials, agencies and citizens, thereby improving the fit between transportation solutions and community interests (and making project delivery faster and cheaper). The process requires decision-makers to consider no-build and low-cost solutions first, with large capacity projects viewed as a last resort. This work is grounded in what has come to be known nationally as Linking Planning with NEPA.
- Demonstrating Smart Transportation.** Realizing the need to illustrate new approaches in good projects, PennDOT has implemented a prominent competitive funding program, though of modest size and generally small projects, called the Pennsylvania Community Transportation Initiative. In 2010 and 2011, over 90 projects across the state were awarded funding, and a few projects already have been completed.

THE DESIGN MANUAL, BEFORE AND AFTER

Example of items *added*, authorizing new flexibility for design speeds:

DESIGN SPEED. Design speed is a selected speed used to determine the various geometric features of the roadway. The assumed design speed should be a logical one with respect to the topography, anticipated operating speed, the adjacent land use, and the functional classification of the highway.

Example of items *deleted*, where lane width flexibility was implicitly constrained to exceptional situations:

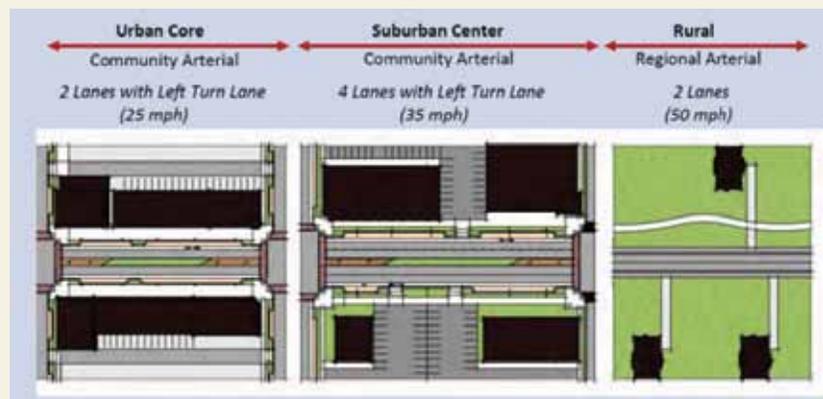
URBAN DESIGN CRITERIA NOTES. Where the available or attainable right of way width imposes severe limitations, 3.0 m (10 ft) lanes can be used in residential areas and 3.3m (11 ft) lanes in industrial areas.

Key Authorizations in Design Manual Part 2 Revision

Use flexible design on all projects.

Increase coordination with local municipalities

Link existing and future land use contexts and roadway design values
Design to a desired operating speed



Hard Work Still Ahead

Funding is chronically inadequate, not only for roadway programs central to PennDOT's mission, but also for transit and other transportation needs.

A transportation funding measure enacted by the General Assembly in 2007 has failed to meet expectations, as a key tolling program did not meet federal standards. So not only is money short, but today Pennsylvania has fallen out of the forefront of states considering new pay-for-use mechanisms

BILLIONS FOR NATURAL GAS FROM MARCELLUS SHALE: SEIZING PENNSYLVANIA'S OPPORTUNITY FOR QUALITY GROWTH

Natural gas extraction from the Marcellus Shale formation underlying much of Pennsylvania may have a value in the hundreds of billions of dollars.

Development is accelerating. Development brings new population, new wealth to landowners signing gas extraction leases, a burst of economic activity from well field development and operations, direct (well fields and water uses) and indirect (new housing and commerce) changes to the land, an array of environmental challenges, and major effects, largely from increased heavy truck and machinery traffic, on road and highway infrastructure.

Both PennDOT and local communities have already sustained severe wear and tear on roads. Concerns are not yet allayed that funding mechanisms derived from tax benefits to the state will be used to preserve and as necessary improve roadway infrastructure.

But a more profound question is how the short-term burst of economic activity will shape local communities to leave them positioned for long-term success as high quality places when the boom years have passed.

Land planning and development issues will be paramount to this question—for the growth of housing, the renewal and revitalization of older towns, and effects on landscape and water resources.

Transportation visions and investments, both in renewal and extension of today's infrastructure, will play a huge role both in the short-term benefits to local communities and the entire state, and also to the capture of permanent benefits for the region. Marcellus Shale development will urgently provide both the opportunity and the test for the application of *Smart Transportation* principles.

either for purposes of raising new revenue or bringing market discipline to managing demand.

Meanwhile, huge forthcoming investments of billions of dollars in natural gas extraction from the Marcellus Shale formation bring both big risks and big opportunities to communities in western and north central Pennsylvania.

Transportation improvements will be key to determining the long term quality of Pennsylvania communities and citizens will be affected by this coming economic activity.

Smart Transportation can influence land use outcomes in Pennsylvania by helping individual projects better serve particular communities. But the broader objectives of turning the tide against sprawl and revitalizing existing communities in Pennsylvania requires a much broader set of tools and less fragmented decision-making on land use than *Smart Transportation* can provide alone. One opportunity lies in making even more use of PennDOT's highway access management authority as a tool for leveraging better land use outcomes from developers and local governments, rather than

simply as a process for securing commitments or contributions to roadway improvements to deal with higher traffic levels.

Also,

- Business processes at PennDOT that support *Smart Transportation*, especially its improved risk-based asset management tools and the revisions to its project development process, are still in their adolescence. PennDOT must devote more work to insure their ultimate success.
- The work of aligning and collaborating with other players in the transportation arena by its nature will never be finished. This includes efforts with local governments and Metropolitan and Rural Planning Organizations.
- Performance measures for testing and communicating *Smart Transportation* efforts and outcomes are new and evolving. In this area, PennDOT has not yet matched the success it has already achieved in developing and communicating *Smart Transportation* themes.



Jim Thorpe, Pennsylvania.

Chapter 2. Setting the Stage in 2004 for *Smart Transportation*

PennDOT and its staff of 12,000 had little to cheer about in 2004.

PennDOT has the fifth largest state responsibility mileage in the country with 40,000 miles of roads and highways. Of that total, 10,049 miles of state responsibility roadways were in poor condition.

With the roads came 25,000 bridges— over 108,256 million square feet of bridge deck. PennDOT periodically tallied and reported to FHWA the unhappy fact of structurally deficient bridges: in 2004 there were over 5,500 of them. Bridges were coming into the deficient column faster than replacement or rehabilitation projects had been taking them out.

If infrastructure deterioration was bad, PennDOT in 2004 had also reached a crisis in making good on promised projects for new roadway capacity. Long on commitments to constituencies, PennDOT was conspicuously short on money for construction. The predicament was all the worse for

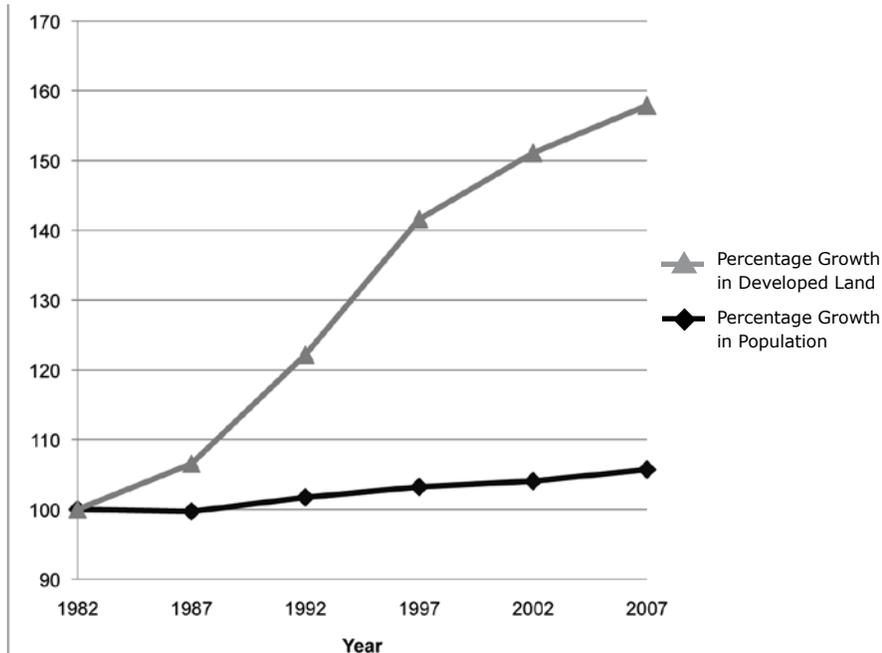
the gap between project cost estimates and market reality driven by the local and national run-up in construction costs.

In the four-year look-ahead for design and construction of capital projects in the state's Transportation Improvement Program (TIP) for 2003–06, Pennsylvania expected about 23% of capital expenditure to go to projects that would expand capacity. But projects on the list on which big dollars had already been spent for planning and design seemed unavoidably headed into the gale winds of "budget buster" and a long-term stall.

POPULATION GROWTH AND DEVELOPED LAND

In Pennsylvania, the rate of land conversion to development has been much higher than the rate of population growth.

Percentage Growth in Population and Land Development in Pennsylvania Since 1982 (1982 = 100)



Sources: USDA Summary Report: 2007 National Resources Inventory (2009), U.S. Census Bureau.

Then, to ice the cake, PennDOT, with the rest of state government, heard tough messages in early 2004 from a Brookings Institution study¹ of the state's condition and competitiveness. According to the study, Pennsylvania's future—especially its economic prospect was being dragged down by a combination of sprawling land use and de-populating central cities: “spreading out and hollowing out” as Brookings put it. And poorly guided directions in public infrastructure planning and investment—including transportation—were contributing to the problem by directing development to open land rather than toward older, denser locations.

To achieve prosperity, Brookings urged, Pennsylvania would have to curb the rush of population to low-density outer townships that in the 1990s had seen a 12 percent surge in land consumption by development while state population as a whole had grown only by a single percentage point. For a change of direction, Pennsylvania would have to revive its cities, boroughs and older townships to keep and attract a highly educated, highly productive workforce.

Al Biehler, PennDOT's secretary since 2003, took stock of the situation and decided, “We've got to stop kidding ourselves. This isn't going to work.”

HIGHLIGHTS OF BROOKINGS INSTITUTION'S 2004 REPORT ON PENNSYLVANIA'S FUTURE:

- Finding: The state ranks low on demographic and economic trends and high on sprawl and abandonment
 - Pennsylvania's population is barely growing and aging fast
 - Young people are leaving the state
 - “Spreading out and hollowing out”
- Finding: Trends undermine the state's competitiveness and are fiscally wasteful
 - Sprawl and urban decline hinder the state's ability to compete for educated workers
 - Sprawl and urban decline burden taxpayers
 - Economic success increasingly turns on attracting and retaining highly-educated people
- Finding: State policies facilitate sprawl and promote abandonment
 - Haphazard investments: Major state spending programs have either skewed funding to outer townships or failed to follow a strategic, competitive vision
 - Weak planning: Disparate state agencies do not plan in accordance with a coherent, unified vision
 - Barriers to reinvestment: Information gaps, limited marketability, and ineffective acquisition processes keep many vacant and abandoned properties idle
- What Pennsylvania must do to build a competitive future
 - ***Pennsylvania should make reinvestment in older, established communities a priority***
 - ***Pennsylvania should reform policies and programs to encourage land reclamation and redevelopment in cities, towns, and older suburbs***

¹ The Brookings Institution Center for Urban and Metropolitan Policy, *Back to Prosperity: A Competitive Agenda for Renewing Pennsylvania* (2004).

Course correction—with a bang!

In March 2004, Biehler and PennDOT made a dramatic announcement. Twenty-six projects, including some of the most prominent highway construction and expansion projects on the state's lists, some in planning for decades, would go back to the drawing boards—deferred, re-evaluated, cut back, maybe even canceled. The projects had a nominal total value of \$5 billion.

Biehler must have known that the announcement—characterized at first by PennDOT as a “rightsizing” initiative to deal with tightening finances and a concern for land use consequences of some of the projects—would cause a stir. It would also launch PennDOT on a bolder journey than simply re-sizing a couple dozen stranded projects.

The end result, as it turned out: recasting PennDOT and the transportation effort everywhere in Pennsylvania. All to make better use of money by more effective attention to managing existing transportation assets and investing only in the most sensible of additions to the system. And thereby to strengthen Pennsylvania's communities and the quality of its landscape.

These efforts eventually came together under the PennDOT banner, *Smart Transportation*.



Chapter 3. Money Matters: First Principle of *Smart Transportation*

“Money Matters”—financial resources must be carefully marshaled, especially in tight times—has been a consistent and central mantra of *Smart Transportation*. [Appendix A has a fuller description of the 10 themes.]

In FY2004–05, the state budget conferred on PennDOT as a state highway department about two-thirds of the revenues from state motor license fund receipts (fuel taxes, vehicle and operator licenses; the fund is generally referred to as the MLF), nearly \$2 billion. (The balance of the fund is distributed to local governments for road purposes and to the State Police.)

Pennsylvania in FY2004–05 also was in line to receive about \$1.1 billion in federal highway assistance.

From these resources PennDOT in FY2004–05 committed about \$1.2 billion to maintenance and operations. In PennDOT’s FY 2004–05 that left about \$2.0 billion to devote to capital spending. PennDOT historically has placed very little reliance on debt financing for transportation infrastructure so cash availability has basically defined the limit of capital expenditure.

Today (FY2010–11), with inflation in the meantime having eroded dollar-buying power by about 38%, PennDOT will have available about \$1.3 billion for maintenance and operations, as contrasted with about \$1.2 billion in FY2004–05.

Given the shrinkage in purchasing power of the dollar since 2004, the funding level for highway maintenance and operations at PennDOT has actually diminished in real dollar terms—a tremendous challenge to PennDOT staff who must keep the pavement striped, the guardrail in good repair, the snow plowed and the culverts and drainage systems cleaned and in good order.

These are the same tasks that had to be performed in 2004–5, although in the intervening years Pennsylvania’s vehicle registrations have increased by 3.5% and total VMT (2008 versus 2003) has grown by about 1%. In its maintenance and operations PennDOT, like many state DOTs, has been forced to follow the budget exhortation “Do More with Less.”

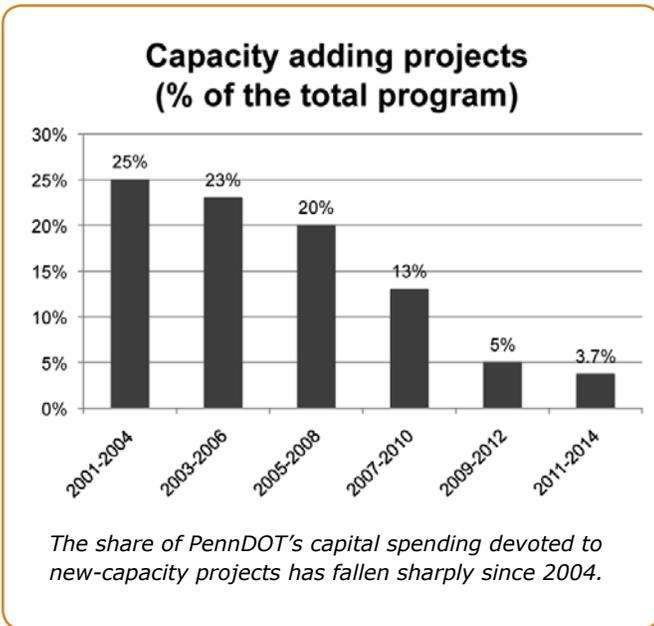
The headline story, however, has been on the capital side. On this score, “then” and “now” must be compared from the four-year views captured in the contrasting TIPs. The dramatic comparison between these two snapshots separated by eight years is the change in *how*, for highways and bridges, PennDOT’s TIPs distribute the funds. In the 2003–06 TIP, expenditure for capacity-expanding projects constituted 23% of the expected expenditures. In the 2011–14 TIP, expected expenditure for

capacity expanding projects constitutes only 3.7%. So the share devoted to preservation projects has grown from 77% to 96% of spending.

This shift in spending from capacity-expanding projects toward preservation projects is one of the most important ways in which *Smart Transportation* has changed Pennsylvania highway program. The new approach is committed to Fix-It-First, a frequently pronounced ideal almost everywhere in re-thinking transportation infrastructure investment. In Pennsylvania, Fix-It-First has made its mark directly on fiscal policy.

Spending differently—only part of the solution

While PennDOT and its collaborators were changing direction in how available resources would be spent, moves also were underway to increase overall revenue for transportation investment.



In July 2005, a nine-member bipartisan Transportation Funding and Reform Commission appointed by Gov. Ed Rendell and chaired by Secretary Biehler set to work. Mission: to assess unmet funding needs and potential funding sources for highway and transit systems in the state.

Dramatizing the importance of the Commission's work, in late 2005 a deteriorated box girder on a structurally deficient bridge in Washington County collapsed and crashed into westbound travel lanes of I-70, luckily with no fatalities. Dangerous failing infrastructure made front-page headlines across the state.

The Commission's report, in November 2006, described a huge gap between the needs and existing revenues.

Pennsylvania's General Assembly in 2007 took up transportation finance and enacted significant funding legislation, Act 44 of 2007. Act 44 created a Transit Trust Fund with proceeds from tolls on two major east-west routes: the Pennsylvania Turnpike and I-80. The Turnpike was already tolled, but Act 44 called for new tolls on I-80. Legislation drafted in concert with the Pennsylvania Turnpike Commission, however, failed to meet the standard for new tolls under SAFTEA-LU, which require revenues to be dedicated to the facility from which they came. The USDOT rejected the state's request for tolling. Still, transit was left with dedicated funding from the existing Turnpike, which has been critical to local systems' health.



PHOTO OF COLLAPSED BOX GIRDER, BRIDGE ON I-70

Even with partial success, Act 44's cross subsidization of transit represents a remarkable step towards integration of its transportation funding sources and uses, even if not its organizational structures. As Congress considers reauthorizing federal transportation funding, it should consider providing the flexibility that Act 44 envisioned for the Interstate tolls. As travel patterns change, old modal demarcations are blurring and investments in multimodal corridors and intermodal connections are becoming more the norm.

FRUITS OF ACT 44 OF 2007

After the failure of the I-80 tolling proposal, anticipated tolling revenues for transportation were halved.

FY 2009–10

Revenue

\$900 million with anticipated I-80 tolls

Expenditure

\$500 million for highways
\$400 million for transit

FY 2010–11

Revenue

\$450 million without I-80 tolls

Expenditure

\$200 million for highways
\$250 million for transit

Current studies have once again visited the scale of transportation funding needs for Pennsylvania, in the aftermath of the only partially realized visions of Act 44 of 2007, with results as sobering as the 2006 report. Big amounts are needed. Suggestions for revenue sources still include tolling, as well as a range of other options. (See Appendix B for recommendations from the 2010 study.)

In the meantime, this is clear: *Smart Transportation* has achieved an important switch toward Fix-It-First with the limited levels of funding now available for capital spending on transportation systems. But the question of securing sufficient funds to achieve many important transportation goals in Pennsylvania, including the core PennDOT goals of *Smart Transportation*, continues as an urgent and unmet priority.

While the new toll revenue stream under Act 44 did not materialize, PennDOT—like most of its peer agencies around the country—must continue to consider tolling as a revenue source. As it does so, it is important that any new policy also be directed at demand management as well as new revenue. Variable-priced tolling holds promise both of raising user-fee based revenues and of creating a more efficient market for travel—a highly desirable win-win.

ADDITIONAL FUNDING NEEDS, ANNUALLY

Needs identified by the Pennsylvania State Transportation Advisory Committee, Transportation Funding Study, Final Report (May 2010).

Recommended Funding (millions)			
	2010 Need	2020 Need	2030 Need
Highway & Bridge	\$2,576	\$4,693	\$6,545
Public Transportation	\$484	\$1,383	\$3,063
Local Government	\$432	\$670	\$1,092
TOTAL	\$3,492	\$6,746	\$10,700

Chapter 4. New Places for PennDOT among the Transportation Players: *Work in the communities and constituencies*

Inevitably, the dramatic re-evaluation of projects triggered in 2004 would take PennDOT into a rich re-configuration of its relationships with other agencies of government, with non-government constituency groups, and with ordinary citizens. Because PennDOT's work touched on fundamental questions of land use, which were also being re-evaluated, collaborators formed new relationships that gave greater attention to that issue.

After deferring 26 projects in 2004 PennDOT commenced a "rightsizing" process. The projects were too big for the state's budget and perhaps in some instances, ill-suited to good land use outcomes because of their nature and scale.

This led PennDOT back to communities and constituencies in the efforts to establish consensus for revised project expectations. It also prompted some communities and PennDOT to re-examine the goals that the projects had sought to achieve and the outcomes that might occur.

State Legislators

A critically important constituency was the state legislature, especially members who had stakes in the delivery of long-awaited projects in their districts and communities. PennDOT had to explain its change in policy and nurture realistic expectations. The Secretary, key central staff, and PennDOT's district office leadership all provided outreach.

If this was the lion cage that PennDOT entered, the chair the agency held out in front to make its case was built of the hard fiscal facts, carefully constructed for legislative understanding. The urgency of Fix-It-First was one element of the discussion. Another was that more money could be turned into project results if it could be spent on actual hard-dollar project costs, rather than on extended planning programs and over-ambitious right-of-way acquisition. PennDOT said \$500 million would have been sponged up into unrealistic planning expenditures.

PennDOT's ability to market course changes to legislators probably also reflected their relatively limited role, at least contrasted to growing experience in other states and in the earmarking tendencies of the Congress, in directing funding to specific projects. Legislators' expectations, but not legislators' directions, therefore were the target area for the justifications of PennDOT's revisions.

Local Governments

As *Smart Transportation* took form and increasingly attended to the land use/transportation nexus, alignments and collaborations with local governments became more important.

PennDOT had hard work to do in reshaping many of the 26 defer/resize projects. Generally, it fell to the PennDOT district engineering offices around the state to work with local officials and citizen groups in the revamping of project scopes, design features and schedules.

Meanwhile, many of the new tools and procedures PennDOT was developing—see Chapters 5 and 6—aimed to improve local government's performance in providing access at a reasonable cost and less new sprawl.

It particularly encouraged PennDOT when echoes of its new approaches began to be heard from specific localities. The Lancaster County Planning Commission, for example, produced its own *Smart Transportation in Lancaster County* (2010), closely aligned with PennDOT's work. A new smart growth guide in Westmoreland County took a similar direction. Cranberry Township in Butler County used smart transportation themes and tools as it performed its own land use planning. Still, these are just a few communities, and it is not clear that *Smart Transportation* has taken hold broadly among local governments.

Metropolitan and Rural Planning Organizations

The state's 23 Metropolitan and Rural Planning Organizations have emerged as another important *Smart Transportation* constituency.

As PennDOT built the elements of *Smart Transportation*, the challenge was to increase allocations to preservation projects—chiefly bridges—with offsetting decreases in capacity projects. In addressing the local planning organizations, PennDOT generated extensive information on the financial prospects for transportation. Stark reality tended to increase the sympathy for preservation.

PennDOT also integrated Metropolitan and Rural Planning Organizations into processes to improve project planning, such as the project delivery program revisions described in Chapter 6 that emerged from PennDOT's Linking Planning and NEPA effort.

10,000 Friends of Pennsylvania: umbrella for advocacy groups

The smart growth advocacy group *10,000 Friends of Pennsylvania* emerged as an important friend, supporter and collaborator in *Smart Transportation*. *10,000 Friends* seeks to be a unified voice for a host of organizations and citizens on land use issues, including transportation and infrastructure, with an overall aim of strengthening communities and reducing sprawl.

The close alignment between PennDOT on *Smart Transportation* and *10,000 Friends* has served to help define and advance PennDOT's work in the broader landscape of advocacy organizations, over 300 of which have endorsed the principles espoused by *10,000 Friends*.

Private transportation consulting and engineering firms

Private engineering consulting firms are an important constituency both as providers of project development and engineering services and for their civic role as observers of PennDOT and its work. In both respects they have been heavily involved in *Smart Transportation*. Their own engineers have, like PennDOT staff, relied on the department's new flexible design standards to justify innovative, right-sized approaches.

Engineering firms have also helped shape initiatives and provided support for increases in transportation funding and the call for adequate preservation investment. Continued support from this important constituency, especially as PennDOT's new project planning and delivery process is implemented, will be an important element in the long-term success of *Smart Transportation*.

Private construction contractors

Construction firms have been an important component of the "highway lobby" seeking to secure funding for road projects. Today, many such firms are diversifying their portfolios to include transit work as well as roads.

Nevertheless, when some of the big jobs among the 26 deferred projects came off the bid calendars in 2004, no doubt there were job estimators at construction firms who broke their pencils in disappointment.

But there was little pushback, perhaps because the industry could benefit if *Smart Transportation* moved *any* projects along the delivery cycle. A new-fashioned *Smart Transportation* project could be profitable to build too, even if it was less grand than a prior era project. PennDOT, however, has not to date seen a strong reaction from the contractor community either in support of or in opposition to *Smart Transportation* thinking.

Chapter 5. Business Models and Working Tools at PennDOT

Early in the march toward *Smart Transportation*, PennDOT embarked on ambitious efforts to support new directions with processes and tools.

In this work, PennDOT's wisely recognized that meaningful program results would occur in the district engineering offices and at drawing tables and community meetings for specific projects.

Tools to assist in project re-sizing and re-evaluation

PennDOT put in place a convening exercise called VE/ACTT—Value Engineering/Accelerated Construction Technology Transfer—to facilitate internal collaboration in the reassessment of the 26 projects on the defer/re-evaluate list. The purposes of a project VE/ACTT program is to

- Size the project to address well-defined problems and needs
- Incorporate constructability aspects of the project
- Identify opportunities to expedite construction
- Make decisions on design of key project components

The result for the 26 projects is that fourteen of the projects were deferred in 2004. None of these have advanced. Of the twelve projects that were identified to be re-evaluated, the Route 202 project (described below) is the most significant, with a savings of more than \$200 million from the estimates at the time the project was halted. Six additional projects have been re-scoped and are advancing with less costly designs.

Guidance documents and handbooks

An element of this work, largely directed at achieving resonance between PennDOT concerns and local concerns, was the preparation of several important guidance documents targeting local issues.

Examples:

- The design manual revision, authorizing more flexibility in roadway design
- A model noise ordinance in 2004 to stress that better land use planning could reduce transportation noise impacts
- Model ordinances for local government access management in 2006
- A handbook for municipalities on local transportation impact fees in 2009
- A guidebook on integrating transportation and land use in 2009
- A guidebook on local tools to improve land use-transportation connections

Some of the work aimed at improving outcomes that depended on collaborations with engineering consultants, developers, local communities and others. A big push in this area was a manual in early 2009 on assessing the transportation impact of proposed driveways and local roads. The assessment guides PennDOT in issuing access rights.

Condition and risk assessment tools for asset management

If asset management principles would guide PennDOT's investments, the department had to strengthen its capacity for asset inventory, condition assessment and risk-based prioritization of projects.

At the outset of *Smart Transportation* thinking, PennDOT already maintained a bridge inspection and inventory system complying with federal requirements. Following prominent bridge failures in 2005 and 2008, PennDOT raised the bar for assessment of box girders and rocker bearings in bridges all across the state. This work, applying more rigorous standards than federal oversight had required, resulted in adding to the prior lists an additional 300 bridges as structurally deficient.

This work of improving the bridge management system has continued, and PennDOT is still developing risk assessment systems to refine the prioritization of bridge replacement and rehabilitation. This work is an essential underpinning to effective pursuit of Fix-It-First.

Beyond risk assessment, however, lies the realm of asset management, which takes a more comprehensive approach to extending the life of assets and saving money through an organized repair and replacement schedule. Although the bridge program has begun effectively to prioritize projects using risk assessment, prioritization for PennDOT's highway management could be strengthened by applying more through-going business processes to asset management.

Project prioritization and selection

In order to improve capital planning and asset management effectiveness, PennDOT began to use Decision Lens, a proprietary decision-making software, training engineers and project planning and financial analysts in its techniques. The program allows decision-makers and shareholders to balance competing needs with more nuance and precision than traditional lists of selection criteria and weights. PennDOT's partners also use the software to help them identify and use criteria in project selection.

Working with *Decision Lens*: Disciplining the integration of data and professional judgment in prioritizing projects.

PennDOT uses *Decision Lens* software capabilities in a very iterative and flexible fashion, freely and frequently adapting the application to the prioritization task at hand and the nature of both the data and the professional judgment that can be imported into the model. Results that emerge from computer-assisted priority ranking are also always subjected to a final “good sense” screening where PennDOT’s engineers use what they have learned from the computer outcomes to inform their the prioritization conclusions, a process that occasionally but infrequently leads to adjustment of the results produced from the application.

A recent example shows how the model has been structured to assist in prioritizing projects on PennDOT’s interstate system. Data was used from the Bridge Management System, the Roadway Management System and the Multimodal Project Management System. PennDOT has high confidence that data from these systems is impartially grounded in condition assessments and existing system milestones. Planning factors are also weighted in the model including one factor, “Support Mobility and Congestion Management,” which incorporates qualitative criteria from which engineering judgment draws a “high,” “medium,” or “low” ranking for the project.

Criteria	Weight
<p>Bridge Risk Assessment</p> <p>Based on data assembled and combined from sub-categories:</p> <p>Risk assessment score from interstate bridge ranking; Substructure inspection score; Superstructure inspection score; Deck inspection score; National Bridge Inventory structurally deficient or functionally obsolete rateing; Sufficiency rating from the most recent inspection; Vertical clearance compliance with Federal design specifications.</p>	38.4%
<p>Pavement Assessment</p> <p>Based on data assembled and combinefrom sub-categories:</p> <p>Overall pavement structure age; How many resurfacings have been performed; International Roughness Index score; Average overall pavement Index Score.</p>	25.3%
<p>Commerce</p> <p>Traffic and truck volumes measured as Annual Average Daily Traffic and Average Daily Truck Traffic.</p>	24.1%
<p>Planning Factors</p> <p>Supports Mobility and Congestion Management—ITS technology; congestion reduction, or promotes intermodalism to improve mobility. Qualitative “high,” “medium,” or “low” score based on professional judgment</p> <p>Has design field view been completed? (Y/N)</p> <p>Does project have all of its environmental clearances? (Y/N)</p>	12.2%

Design standards and criteria

Bringing greater flexibility and *Smart Transportation* vision to PennDOT's own staff was not a small challenge.

New directions required not only new tools but also new states of mind for many of the agency's people. Established ways of doing things can be deeply rooted even in very good highway planners and engineers.

Smart Transportation is a new way of thinking about how a project serves accessibility needs and how a project scope and purpose should guide design, plans and specifications.

Thus the challenge of *Smart Transportation*: How to get PennDOT highway designers and project developers to use new and flexible thinking? What if solutions to specific project needs and settings, put forward by communities and cheered by PennDOT brass, seemed inconsistent with the solutions suggested by conventional design standards?

Leaders at PennDOT headquarters and in the district engineering offices recognized that some project designers and developers would be hesitant to jump on the *Smart Transportation* bandwagon when that involved novel approaches.

PennDOT encouraged staff that the existing design manuals were not as inflexibly prescriptive as many read them to be. This, though literally evident, at least in some quarters still bumped up against deep-seated cultural institutional aversion to *risk*.

Wasn't there a risk of liability to PennDOT or outside design firms if a motorist crashed on a roadway segment that did not adhere to conventional practice?

To make headway against such resistance, PennDOT at one point put its general counsel into a meeting with designers to explain that simply following a design manual did not remove all risk, nor would it necessarily increase risk.

But PennDOT quickly came to a more direct solution. Even though its top engineers were regularly updating and revising PennDOT Bureau of Design manuals—70 of them—it was time for a fresh and focused look specifically from the standpoint of implementing flexibility along *Smart Transportation* principles. The same applied to design standards maintained in the PennDOT construction office.

Perhaps the most important single change was to expand PennDOT's traditional scheme for functional classification of roadways in the highway design criteria to allow closer fit to a wide variety of settings. Classification of roadways by function is critical because it serves as the basis for

selecting appropriate elements from standard design tables. A richer system of classification would broaden engineers' templates and choices. By way of encouraging flexibility, for example, *Smart Transportation* in its design manual revisions divided the former single "Arterial" classification into two: "Rural Arterial" and "Community Arterial." Similarly, it split the roadway classification "Collector" into "Community Collector" and "Neighborhood Collector."

At the same time, the manuals identified seven land use contexts in order better to refine the ways design criteria could be aligned with the applicable setting: rural places, suburban neighborhoods, suburban corridors, suburban centers, town/village neighborhoods, town center, core city.

From this work came new spectra of roadway elements. These included, for example, new design criteria for roadway geometry such as lane widths.

The flexibility for PennDOT staffers, and for *Smart Transportation* proponents looking in at the design process as community officials or citizens, is illustrated by the following table of roadway design values for community arterials. Each column is specific to just one of the seven land use contexts.

ROADWAY CLASSIFICATIONS

Community Arterial		Rural	Suburban Neighborhood	Suburban Corridor	Suburban Center	Town/Village Neighborhood	Town/Village Center	Urban Core
Roadway	Lane Width ¹	11' to 12'	10' to 12' (14' outside lane if no shoulder or bike lane)	11' to 12' (14' to 15' outside lane if no shoulder or bike lane)	10' to 12' (14' outside lane if no shoulder or bike lane)	10' to 12' (14' outside lane if no shoulder or bike lane)	10' to 12' (14' outside lane if no shoulder or bike lane)	10' to 12' (14' outside lane if no shoulder or bike lane)
	Paved Shoulder Width ²	8' to 10'	4' to 8' if no parking	8' to 10'	4' to 6' (if no parking or bike lane)	4' to 6' (if no parking or bike lane)	4' to 6' (if no parking or bike lane)	4' to 6' (if no parking or bike lane)
	Parking Lane ³	NA	7' to 8' parallel	NA	8' parallel; see 7.2 for angled	7' to 8' parallel; see 7.2 for angled	7' to 8' parallel; see 7.2 for angled	7' to 8' parallel; see 7.2 for angled
	Bike Lane	NA	5' to 6' (if no shoulder)	5' to 6' (if no shoulder)	5' to 6'	5' to 6'	5' to 6'	5' to 6'
	Median	4' to 6'	12' to 18' for LT; 6' to 8' for pedestrians	12' to 18' for LT; 6' to 8' for pedestrians	12' to 18' for LT; 6' to 8' for pedestrians	12' to 18' for LT; 6' to 8' for pedestrians	12' to 18' for LT; 6' to 8' for pedestrians	12' to 18' for LT; 6' to 8' for pedestrians
	Curb Return	25' to 50'	25' to 35'	25' to 50'	20' to 40'	15' to 30'	15' to 35'	15' to 40'
	Travel Lanes	2 to 4	2 to 4	2 to 4	2 to 4	2 to 4	2 to 4	2 to 4
Roadside	Clear Sidewalk Width	NA	5'	5' to 6'	6'	6' to 8'	6' to 10'	8' to 14'
	Buffer ⁴	NA	6'+	5' to 10'	4' to 6'	4' to 6'	4' to 6'	4' to 6'
	Shy Distance	NA	NA	NA	0' to 2'	0' to 2'	2'	2'
	Total Sidewalk Width	NA	5'	5' to 6'	10' to 14'	10' to 16'	12' to 18'	14' to 22'
Speed	Desired Operating Speed	35-55	30-35	35-50	30	25-30	25-30	25-30

1 12' preferred for regular transit routes, and heavy truck volumes >5%, particularly for speeds of 35mph or greater.
 2 Shoulders should be installed in urban contexts only as part of a retrofit of wide travel lanes, to accommodate bicyclists.
 3 7' parking lanes on this roadway type to be considered in appropriate conditions.
 4 Buffer is assumed to be planted area (grass, shrubs, and/or trees) for suburban neighborhood and corridor contexts; street furniture/car door zone for other land use contexts. Min. of 6' for transit zones.
 Sources for values in matrix: AASHTO Green Book (2001), and ITE "Context Sensitive Solutions in Designing Major Urban thoroughfares for Walkable Communities" (2006).

PennDOT published the revisions to classifications in Design Manual Part 2, Highway Design Criteria, in September 2009. The new scheme, also embodied in the 2008 Smart Transportation Guidebook, drew authority from established practice and documentation elsewhere, including the American Association of State Highway and Transportation Officials (AASHTO) *Green Book* (2001) and Institute of Transportation Engineers, *Context Sensitive Solutions in Developing Major Urban Thoroughfares for Walkable Communities* (2006).

The alignment of design manuals and design standards has made a major contribution to the momentum of *Smart Transportation* in project development and design offices.

Meanwhile, as projects based on *Smart Transportation* principles began to come out of design development and off drawing boards, a welcome recognition spread through PennDOT's people. *Smart Transportation* tended to produce simpler projects with smaller footprints than what otherwise would have been the case. That meant projects that were easier to permit and cheaper to mitigate. Lower right of way costs, too. And faster, therefore less costly, overall project delivery

PennDOT staff saw the end result: precious dollars stretching to more projects and meeting more needs. Staff was gratified at this result. "After all," as one PennDOT engineer said to SSTI reviewers, "we're taxpayers too."



Chapter 6. Merging Other Currents into *Smart Transportation*

Smart Transportation took root at PennDOT as an outgrowth and extension of the 2004 decision to re-evaluate 26 projects that were out of scale with PennDOT's financial delivery capability and its desire to improve land use and community development outcomes

As *Smart Transportation* grew and coalesced into a broad umbrella for a host of directions and initiatives at PennDOT, it absorbed and took momentum from at least four other efforts.

Context Sensitive Solutions

Context Sensitive Solutions is now a widely used framework and nomenclature for an approach to transportation projects that looks beyond immediate objectives of safety, mobility and condition of the transportation asset itself—seeking further to preserve and enhance scenic, community and environmental values.

Well before 2004, PennDOT and other DOTs across the country, all with endorsement by the Federal Highway Administration, were embracing Context Sensitive Solutions programs.

As early as 2002, PennDOT committed itself to being a national leader in the use of Context Sensitive Solutions. Staff members trained in its goals and approaches began delivering projects that had been developed on CSS principles.

PennDOT's experience with Context Sensitive Solutions laid important groundwork for the broader framework of *Smart Transportation*. *Smart Transportation* aligned with Context Sensitive Solutions in emphasizing the planning of transportation projects with community collaboration and an eye for broader goals than just improving a roadway curb-to-curb. Community planners' participation helped PennDOT see communities as the focus of their efforts, rather than simply places that roads pass through.

Today, PennDOT treats Context Sensitive Solutions as part of *Smart Transportation*, woven together into a PennDOT approach that plans and designs within a community framework.

Linking Planning and the National Environmental Policy Act (NEPA)

The NEPA environmental review process has tended to generate voluminous information about projects very late in project development, when projects are near or already at final selection, rather than in their critical gestation periods. This deprives planners and designers of information that might contribute to better project formation. It frustrates citizens and officials who wonder why project planning seems to have run so far ahead of NEPA scrutiny. It often detours NEPA away from information-building and into polarized contention. And it exasperates project workers who are put to overlapping, out of step and duplicative exercises in compiling and using information. All in all, a tangled, inefficient, confusing, aggravating mess.

The phrase “Linking Planning with NEPA” came into use across the country both at FHWA and in the states in the 2000s.

The idea was to streamline project reviews. Agencies sought to develop planning-level information in ways that later could be integrated into NEPA reviews to save duplication of effort. Conversely, planners brought NEPA-type concerns into the earliest stages of the planning process.

These changes in process brought with them a new approach on when and how to engage communities. Not, as often had been the case under the old regime, when a proposed *solution* to a problem was ready for community vetting. But rather, when citizens and other public officials could still explore the issues and opportunities inherent in the *problem* in hopes of developing a consensus solution.

All these aims clearly aligned with aspirations from other directions (Context Sensitive Solutions, for one good example) to offer meaningful engagement to communities, local officials and citizens through every stage of planning.

At about the same time as FHWA and the Federal Transit Administration first issued formal guidance for Linking Planning and NEPA, PennDOT recognized the need to align NEPA-driven project assessment with community-collaborative planning, right-sizing and *Smart Transportation*.

PennDOT sought to adapt new models from other states, and convened executive level discussions with FHWA (as DOTs all over the country were also doing) as well as federal and state environmental resource agencies and services and with Metropolitan and Rural Planning Organizations across Pennsylvania.

The outcome was a revised delivery process, developed over several years and formally implemented in 2010. The revised process covers *all* projects.

In the revised process, proposed projects move from their identification under the strategies of the long range plans (such as PennDOT's 2006–30 Mobility Plan and local regional transportation plans) through evaluation and prioritization in a structured work flow that includes:

- Community participation
- A "right-sizing" and alternatives screening driven by *Smart Transportation* objectives
- Early identification of environmental issues and determination of needs for NEPA evaluation
- Concept engineering
- Participation of the Metropolitan and Rural Planning Organizations and multi-disciplinary task forces from the PennDOT district *and* central offices.



Philadelphia old-town

In the revised process, all of this work is preliminary to project selection for the state's four-year Transportation Improvement Program. The process is mandatory for new projects proposed for inclusion in the Transportation Improvement Program after June 2011 and encouraged for any new capacity projects still in early development. One of the changes included in the revised process is quicker adoption into the TIP of preservation or "asset management" type projects.

The intended outcomes are streamlined project delivery without compromising

community involvement or environmental review, more reliable planning-level cost estimates and schedules, and consistency with *Smart Transportation* objectives.

Effective use of the process, however, requires education, training and outreach not only within PennDOT but also among the other participants in the planning, review and evaluation of a project. This includes close work with the Metropolitan and Rural Planning Organizations, local governments and the environmental agencies. This work began to pick up speed in the last months of 2010.

2003 Conference on Transportation and Land Use for Economic Development

The need to link transportation and land use was recognized in Pennsylvania. In 2003, secretaries of four agencies (PennDOT, and the departments of Environmental Protection, Conservation and Natural Resources and Community and Economic Development) hosted a conference of 230 participants to evaluate where Pennsylvania stood on integrating land use, economic development, transportation and conservation policies. The group identified action items in agency coordination, planning and project delivery, investment and leverage, intergovernmental partnerships and education that were directed toward better integration of the work of the four agencies. At PennDOT, this work was subsumed by *Smart Transportation*.

The Keystone Principles

Pennsylvania's Economic Development Cabinet adopted "The Keystone Principles & Criteria for Growth, Investment & Resource Conservation" in May 2005, following two years of work by the interagency group that grew out of the 2003 conference. (See Appendix C for the language of the Keystone Principles.)

The goal was to include land-use criteria when the state made evaluations, grants or loans for projects. The document responded to particular circumstances in Pennsylvania—especially in land use and community conditions and visions—and also reflected earlier similar efforts from elsewhere, such as the Massachusetts Sustainable Development Principles.

The Keystone Principles specifically endorsed Fix-It-First as a cardinal rule to improve the efficiency of infrastructure. It also encouraged context sensitive design to improve and make more attractive developed areas.

These points were all relevant to PennDOT, although *The Keystone Principles* were not developed by or focused on PennDOT alone.

These high-level efforts have been a valuable reinforcement to PennDOT's development of *Smart Transportation*, marking PennDOT's alignment with the broadest and highest goals for state agency activity. Yet today, work remains to effectively enlist all the agencies in aligned visions for transportation policy in Pennsylvania.

Chapter 7. The Land Use Scene

As *Smart Transportation's* message crystallized, it focused on projects and partnering, but its tag line also had another element: "Linking transportation investment and land use planning and decision-making."

The goal was to make transportation choices more effective in furthering smart growth: more compact communities, more redevelopment of established places, less sprawl, more efficient access to destinations. Achieving this goal would in turn lower transportation demand, helping to preserve precious transportation resources.

The problem is that transportation investment is only one of many factors that determine how society organizes itself spatially. On the ballroom dance floor, is transportation investment firmly leading demure lady land use? Or is land use actually pulling transportation around the floor? Or is it a mosh venue where most of the time it's not even possible to tell who is dancing with whom? One of the problems with transportation/land use linkage is that there are so many forces shaping each.

In Pennsylvania, the organizational complexity of the ordinary function of municipal government nicely introduces one feature of the problem.

In Pennsylvania, local government is in the hands of over 2,500 separate municipal entities. (Only Illinois and Minnesota have more.)

There is no statewide growth management law or institutional structures. State law encourages but does not require municipalities to prepare comprehensive plans, and there is no requirement that zoning be consistent with comprehensive plans. Links are weak between the Metropolitan and Rural Transportation Organizations and regional comprehensive planning processes. Comprehensive plans, where they have been prepared, often suffer from insufficient integration among adjoining municipalities, and sometimes are simply ignored by state agencies.

PennDOT itself can (and does) require developers to mitigate the traffic impacts of the growth that they propose. This mitigation typically involves roadway improvements near a development, but under *Smart Transportation* it can be off site and can be multi-modal, i.e., it could include support for transit and sidewalks and bike paths linking new development to established areas. Or, it could include transportation demand management. As a result, developers will approach PennDOT earlier in the process than before PennDOT began to apply *Smart Transportation* principles.

These early discussions often involve the community and provide an opportunity for PennDOT to offer technical assistance when it will be most effective. Unfortunately, PennDOT has jurisdiction only over projects seeking access directly onto a state highway. Nevertheless, encouraging this type of early consultation can be helpful in a state, such as Pennsylvania, that lacks broadly applicable statewide land use controls.

PennDOT has developed a strong program of technical assistance, often advising municipalities not only on the impact of their land use decisions, but also on how to facilitate improvements, such as new transit services, that will become increasingly useful as growth happens. Anecdotal information from local and county planners suggests that this assistance has contributed to a reduced rate of land consumption since the period described in the Brookings report. At least one region has dedicated local resources to a grant program that mirrors the state's Community Transportation Initiative.

Connecting changes in transportation investment and planning policy to beneficial land use changes has proved an elusive business everywhere. It is very hard to discern, for example, where an unwise land use might have been avoided owing to state or local forbearance from making a transportation investment. In Pennsylvania, however, these things seem likely true:

- The design flexibilities and approaches rooted in Context Sensitive Solutions and described in PennDOT's design manual revisions have made it possible for many communities to improve their transportation systems while at the same time strengthening their overall appeal as places to attract residents, shoppers and businesses.
- PennDOT's emphasis on collaborative thinking with local governmental and planning officials has raised aspirations and strengthened capabilities for planning of transportation strategies and investments on the local scale that support smart growth opportunities.
- The shift in funding toward Fix-It-First and away from capacity projects has probably had land use impacts. Fix-It-First favors developed areas. In contrast, capacity-expanding projects may pull people toward the outer townships where overheated growth had been decried in the Brookings Institution report. It is not yet clear whether this shift has actually altered development.

Smart growth proponents in Pennsylvania will have to mount redoubled efforts to unify *all* the tools of smart growth encouragement—not just transportation programs and investments—in pursuit of smart growth outcomes. Economic development initiatives, sewer and water investments, education and training programs: everything has to come together. Two important advances would be 1) to require consistency between comprehensive plans and zoning, and 2) to condition state support for water and sewer facilities, and any other relevant state-supported activities, on a set of best land-use practices. While these actions might raise political alarms in some quarters, in fact both would preserve local authorities' ability to plan their communities, while asserting the need for a sound planning method and for accountability in state investments.

Tools that set the stage for good growth patterns—both those that PennDOT uses and examples from other states—are shown in the following table.

TRANSPORTATION AGENCIES: TOOLS TO HELP SHAPE LAND USE	
State DOTs can not only provide convenient mobility alternatives, but also help set the stage for such systems by supporting comprehensive planning and sustainable growth patterns. Like many other states, PennDOT uses several types of tools of varying effectiveness to align state grant programs to smart growth goals and/or use state review powers to incentivize the development of reliable and convenient mobility alternatives.	
WHAT PennDOT HAS DONE	SOME OTHER STATES' APPROACHES
<i>Encourage local and regional planning</i>	
<ul style="list-style-type: none"> • Strength: technical assistance program widely available, but insufficient resources • Constraint: local and regional plans not generally required on a multi-municipal level 	<ul style="list-style-type: none"> • Oregon's Transportation and Growth Management program providing planning funds to create integrated land use and transportation plans
<i>Reward communities that adopt smart growth controls</i>	
<ul style="list-style-type: none"> • Strength: PCTI grant program firmly established • Constraint: dollar size of program getting smaller 	<ul style="list-style-type: none"> • Massachusetts' Commonwealth Capital scorecard used in awarding transportation and community development grants
<i>Coordinate state investments</i>	
<ul style="list-style-type: none"> • Strength: isolated interventions by Governor's Action team • Constraint: no established system and state agencies need not follow local/regional plans 	<ul style="list-style-type: none"> • North Carolina's Interagency Leadership Team includes 6 state agencies working together to establish a shared geographic database for decisions on growth and preservation
<i>Support mobility alternatives</i>	
<ul style="list-style-type: none"> • Strength: well established transit program • Constraint: lack of funding with rejection of I-80 cross-subsidy program 	<ul style="list-style-type: none"> • Washington State's Commute Trip Reduction program for State Employees
<i>Leverage State Support</i>	
<ul style="list-style-type: none"> • Strength: allow multimodal mitigation for highway access permits to state roads • Constraint: innovative traffic impact fee system for local roads underutilized 	<ul style="list-style-type: none"> • Virginia's Secondary Street Acceptance requirements by which State maintenance of new roads is conditioned upon pedestrian connectivity (as well as vehicular) and upon CSS design characteristics • New Jersey's Transit Village initiative that rewards municipalities that demonstrate a commitment to transit through place making activities and architectural guidelines, as well as zoning, parking controls, TOD redevelopment
<i>Integrate state development reviews</i>	
<ul style="list-style-type: none"> • Strength: Keystone Principles widely accepted • Constraint: No process for broad integrated reviews 	<ul style="list-style-type: none"> • New York's State Environmental Quality Review (SEQR) process that requires a multi-disciplinary review of state agency actions

While PennDOT's efforts to engage with local entities in land use are laudable, the agency has some more power it could bring to bear to help ensure good outcomes. The agency has improved its mitigation policy to avoid using only capacity expansion to address new development, now allowing consideration of transit and TDM. However, it could use its access authority more proactively to be a player in land use decisions with significant transportation impact.

Pennsylvania has already laid the theoretical foundation for inter-agency cooperation on sustainability in its Keystone Principles. The critical need is to operationalize those principles in the practice and investments of the many sister agencies that bear on the transportation network and land use. In particular, capital investments by relevant state agencies have enormous, leveraged effects on the transportation system and on land use—both through direct land use impacts, and indirectly through their effects on local governments' willingness to guide or control land use. State programs that fund sewer and water infrastructure, schools (at all levels), affordable housing, parks, prisons, broadband, economic development, and agricultural enterprises are a few of the more obvious examples of public investment dollars that carry both transportation and land use implications. Unless those investments are viewed through a single strategic lens, opportunities to improve the performance and cost effectiveness of the investments, as well as to induce more sustainable land use practices by local jurisdictions, will be lost.

In addition to direct investment, Pennsylvania makes discretionary grants to local political jurisdictions. Impressing those grant programs with more thoughtful land use and transportation goals can serve as a powerful lure to pull localities into alignment with the state's larger sustainability goals. Examples of this approach can be found in the Commonwealth Capital program in Massachusetts, and similar "scorecard" approaches regarding discretionary grants that have been adopted in Arizona and are under consideration in North Carolina.

Interagency cooperation and strategic alignment are, ultimately, the responsibility of the Governor. Some states have attempted to address this challenge through "growth" or "development" cabinets. Others have actually combined agencies (e.g., Commonwealth Development in Massachusetts; Business, Transportation and Housing in California; Energy and Environment in Connecticut). In all cases, whether through formal or informal methods, the key element is strategic alignment of the respective agency capital investments—since those public investments often have the most long lasting effects on the location and intensity of growth, and thus on land use and the transportation system.

THE PROBLEM WITH SILOS

State investment policies are not the only area in need of silo-busting. Silos are one of the recognized bad habits of state DOTs, as well as USDOT. The pattern of modal silos continues despite wide agreement that most travel depends on more than one mode and that intermodal connectivity and multimodal choices improve system performance.

To some extent silos reflect the fundamental differences between modes and the reasons why cross-modal analysis is difficult—transit's cost structure includes more significant operating costs than highways'; sidewalks are typically used for local trips rather than regional; Amtrak depends on privately owned rights of way; airlines use publicly supported airports. Nevertheless, most DOTs are structured and funded to focus on what they own, operate, and maintain, i.e., the state highway system. For example, when the state DOT issues a report on bridges, the report is likely to be on highway bridges that are inspected under FHWA rules. Transit systems, airports, ports, and local networks may receive some funding through the state DOT, but they are not designed, built, inspected, maintained, and operated by the state DOT and the DOT is not the entity with primary responsibility for those parts of the transportation system serving the state.

This modal orientation is reinforced by federal funding patterns that (notwithstanding rules that allow flexing between federal programs) allocate money to states on the basis of specific modal characteristics (e.g., passenger miles for FTA urban formula funds) and needs (e.g., bridge deck size for FHWA bridge funds).

What Pennsylvania has done

Pennsylvania has taken some good steps towards establishing an integrated cross-modal portfolio. Pennsylvania's *Smart Transportation* initiative increased PennDOT's support for non-motorized modes (e.g., nine of the 50 first round PCTI awards were for bike/ped projects and another 13 were for intermodal or TOD projects). Cross-modal analysis is part of state sponsored corridor planning and PennDOT has adopted a multi-modal approach to its technical assistance program. Pennsylvania also provides very substantial support to a diverse set of transit providers (24 urban systems, 14 systems that serve rural areas, and 54 Community transportation operators) and would have provided more had cross-subsidization from new highway tolls to transit not run afoul of SAFETEA-LU.

However, for the most part what PennDOT can deliver is roads. PennDOT still does not plan transit expansion and it cannot actually provide (as opposed to recommend) transit as the solution for a congested corridor. Transit authorities, as well as the port authorities that manage airports and ports, have their own geographically limited priorities, needs, and problems to solve and their own funding sources (state, federal, local, and farebox). Even when highways and transit share policy imperatives (i.e., their mutual recognition of the need to keep existing assets in good condition) their language diverges ("State of Good Repair" and "Fix it First") and there is no combined statement of prioritized need.

The lack of integration that persists at PennDOT hampers the agency's adoption of outcome based metrics (e.g., percent of population with convenient access to health care) that would require crossing several institutional barriers. It also impedes the data gathering that would be necessary for such analyses and for a cross-modal system of priorities.

Chapter 8. The *Smart Transportation Guidebook* - A Big Step for Design

Within three years of PennDOT's 26-project defer/delay announcement in 2004, few areas of PennDOT had been untouched by initiatives involving *Smart Transportation*.

But it took time for "Smart Transportation" to emerge as a label, even a brand, to unite all these activities under a single umbrella.

The transforming instrument was a new document of high quality and great value published in March 2008: the *Smart Transportation Guidebook: Planning and Designing Highways and Streets that Support Sustainable and Livable Communities*.

The *Guidebook* focused on issues of design: it does not offer comprehensive coverage of all the elements embraced by *Smart Transportation*. But it does an uncommonly good job of pulling the threads together in the area of good design for non-limited access roadways and their relation to high quality land use.

It has special interest for two reasons:

How it was developed. And what it says.

PennDOT's *Smart Transportation Guidebook* is not strictly a PennDOT document at all, and in that respect it actually has more, not less, to say about how PennDOT was transforming itself with *Smart Transportation* thinking.

The Guidebook was a joint effort of PennDOT and the New Jersey Department of Transportation. Both departments sought to make transportation projects better suited to their communities.

Though the approaches of two state DOT organizations differed in some minor respects, the two states have basically been headed in the same direction in their planning philosophy. A single volume expressing that direction gave more force to what the *Guidebook* had to offer than had two parallel guides been produced, one for each state.

The message that adjoining state DOTs would collaborate offered powerful validation of the commitment to collaborative approaches.

Consultants engaged by and under the supervision of the Delaware Valley Regional Planning Commission worked with the two state DOTs and additional consultants that the DOTs introduced into the effort to produce the *Guidebook*. Its success is a powerful testament to the commitment and investment of PennDOT—New Jersey DOT, too—in leveraging its program and vision through shared enterprise with Metropolitan/Rural Planning Organizations. And the process also directly involved the Federal Highway Administration offices from both New Jersey and Pennsylvania.

What does the *Guidebook* say?

The chief features and merits of the *Guidebook* are:

- A summary of the rationale of *Smart Transportation*, especially from the standpoint of relating its goals to Context Sensitive Solutions and smart growth
- Detailed, illustrated discussions of roadway types and networks and their features. The presentation consolidates professional understanding in formats that invite and facilitate their use by non-specialists including local officials and the public
- Enumeration of design elements and design values and their relationship to specific types of settings, as well as the appropriate approaches to thinking about desired traffic speeds
- Discussion of effective roadway guidelines for traffic lanes, shoulders, bicycle facilities, medians and intersections; also for pedestrian facilities, public transportation, landscape design and street furniture
- And finally, discussions of access management, traffic calming, operations and maintenance issues and considerations involving emergency vehicles

Nearly everyone agrees real-world projects benefit from flexible approaches to design. The *Smart Transportation Guidebook* is in the best sense a cookbook of how to do it. It achieves both a high standard of professional acumen and an easy accessibility to the non-expert.

The counterpart to the *Guidebook* was the revision of the Design Manual 2 that followed in 2009. This document speaks directly to engineers and is the effective authorization for them to exercise the flexibility that the *Guidebook* encourages.

At PennDOT, the *Guidebook* now stands as a centerpiece of *Smart Transportation* thinking. It does not, however, embrace the totality of the *Smart Transportation* agenda, inasmuch as it does not touch on the asset management issues around the "money matters"/"fix-it-first" constellation or the project and program process delivery issues grounded in Linking Planning and NEPA. It is, nevertheless, a significant reinforcement and synthesis of the course that PennDOT has taken to push smart, flexible design into transportation projects in community contexts.

Chapter 9. Demonstrating and Delivering on New Project Approaches

Project highlights

What are the projects in Pennsylvania that testify to achievement of *Smart Transportation's* goals?

Of course, every bridge replacement or rehabilitation project that would not by now have been programmed or completed but for *Smart Transportation's* Fix-It-First funding prioritization is a tally on the *Smart Transportation* scorecard. As PennDOT struggles to restore the state's transportation infrastructure, every step might be seen as a *Smart Transportation* achievement.

In addition, the new project development and delivery process drawn by *Smart Transportation* in 2010 from Linking Planning and NEPA will reshape projects in the delivery pipeline. Results will take the form of faster and cheaper project delivery—if money can be found for projects—as well as in the design elements the projects demonstrate.

Finally, there are projects already completed or in construction with higher profiles than the typical bridge repair that are emblematic of approaches reshaped by *Smart Transportation*.

Perhaps the most noteworthy of these is the U.S. 202 Parkway project on which construction began in 2008. It is the successor of one of the 26 defer/re-evaluate projects from 2004. Originally conceived as a big expressway bypass on a nine-mile stretch of U.S. 202 north of Philadelphia, it is now an at-grade, multimodal parkway.

The expressway plan—four lanes—had been selected as a project preferred alternative in 1998, but with stiff opposition from communities concerned about traffic and development impacts.

PennDOT began final design following Environmental Impact Statement approval in 1998. Controversy refused to abate. Costs rose to an estimated \$465 million. By 2004, when the project was put on hold, right-of-way acquisitions had already begun. PennDOT's goal in the re-evaluation was to find a solution that was more affordable, better attuned to community context, and still provide improved travel conditions in the corridor.

PennDOT structured the re-evaluation with participation of local officials ultimately forged into a Community Task Force charged with making a consensus recommendation. Or failing a recommendation, face the prospect that money for the project would be withdrawn. The stakeholders hammered out the parkway concept over the course of 2005, whereupon PennDOT proceeded to take essentially a new project into development and design.

The parkway used the corridor first identified, but lowered the design speeds, scaled back pavement, replaced the three big interchanges with several signalized intersections, elevated the standards of landscaping and aesthetic treatment of structures, and added a corridor-long bicycle/pedestrian trail as well as bicycle-useful shoulders on the roadway itself.

**ANOTHER EXAMPLE OF
SMART TRANSPORTATION:
MARSHALLS CREEK
TRAFFIC RELIEF**

Marshalls Creek is a village in Monroe County located north of the Delaware Water Gap. State Highway 209 runs through the community. A bypass to ease expected traffic congestion had been planned since 1991, but with year 2000 estimated costs of \$68 million ballooning upwards of \$200 million, and \$75 million already sunk into the project, PennDOT halted work.

With a local advisory committee and an intensive re-look at realistic traffic expectation, the project was reconfigured as a series of intersection improvements (including a roundabout) and a new park-and-ride completed in 2007 and 2009. A final stage of the new project includes a new two-lane highway around Marshalls Creek and additional intersection improvements, all to be completed in 2012 at a vastly lower cost than the original proposed improvements.

The entire U.S. 202 Parkway project will be completed in 2012 at a construction cost of \$200 million, a savings of \$265 million. About \$40 million of the savings resulted from lowering speeds, thereby lowering noise, thereby obviating the need for expensive noise walls!

The U.S. 202 Parkway project is a prime example of *Smart Transportation* moving from the "money matters" project re-evaluation in 2004, through a community collaboration using flexible design principles, to an outcome that avoided pushing unwanted development and traffic upon the communities.

Pennsylvania Community Transportation Initiative (PCTI)

Smart Transportation could be seen in projects coming out of the 2004 26-project defer/re-evaluate process. But that was just a few projects. And new projects would be coming into the pipeline.

PennDOT needed a way to make a project-driven vision of *Smart Transportation* catch fire. To answer doubters: "We don't understand what *Smart Transportation* is. We don't have enough money to plan land use and transportation together."

This was the motive for the initiative. The model came from the Atlanta Regional Commission's Livable Centers initiative, which through a competitive process dedicated planning and implementation funds to enhance centers and corridors.

PennDOT successfully carried out PCTI as a demonstration laboratory for projects to illustrate what *Smart Transportation* would look like and how it could serve communities and their transportation objectives.

The initial call for projects went out in October 2008. In less than three months, local entities submitted 408 proposals. PennDOT staff evaluated applications for their strengths connecting to desirable land uses, focusing on town-building rather than sprawl, capacity to leverage other funding, consistency with regional plans, innovation and suitability to teach or demonstrate the positive application of *Smart Transportation* thinking.

PennDOT invited proposals again in 2010. This time there were 238 applications.

The outcome: two rounds of projects selections by PennDOT: 50 projects awarded \$59.4 million for the first round and 41 projects awarded \$24.7 million in 2011 in the second round.

One of the important selection criteria was that projects be poised on the edge of delivery; PennDOT wanted projects where *Smart Transportation* ideas could be seen on the ground in local communities.

What kinds of projects were chosen?

They are nicely illustrated by one of the first actually to be completed: a mixed-use trail linking the center of the Altoona Penn State University campus with downtown Altoona. The total project cost was \$1.6 million. PCTI contributed \$300,000. Construction began and was completed in 2010.

Another project completed in 2010 was a shared ride facility located near Interstate 81 in Lebanon County.

In the second round projects, Lycoming County received almost \$1 million dollars for a Pathways to Health initiative to improve access for drivers, walkers, cyclists and emergency vehicles for a medical complex in rural north central Pennsylvania.

The number of applications is evidence that local governments have noticed PCTI. PennDOT sensed, both in conceiving and executing the program, its power to infuse both local governments and citizens with the core approaches and appeal of *Smart Transportation* ideas.

FUNDING PCTI

How PennDOT found \$85 million for PCTI projects

- Motor License Fund money could not be used, because of constitutional restrictions.
- Funding was drawn totally from federal sources.
- Taken from TIP funds held for Secretary's discretion.
- Initial measure of resistance from MPO/RPO sources (and PennDot staff) concerned about this use of Secretary's discretionary funds.
- PCTI awards reflected strong geographic balance.
- Amount of \$85 million is a small part of 2011–2014 TIP total planned expenditures of about \$10 billion.

Performance Measures—Strengthening Smart Transportation

PennDOT's *Smart Transportation* has always recognized the importance of performance measures. The scope of the measures should attempt to cover the broad view of transportation/land use/community interactions that *Smart Transportation* has aspired to affect. Ideally they should gauge both real-world outcomes and, because those outcomes are long-term and subject to a variety of causes, measure steps that are expected to lead to positive outcomes.

Some areas of *Smart Transportation* focus at PennDOT are now routinely measured and accounted for. For example, the department tracks progress on implementing projects in PennDOT's accelerated program for bridge rehabilitation and replacement. It also reports on the overall share of preservation expenditures in the budget.

In 2009 PennDOT drafted a suite of measures to track its progress in *Smart Transportation*. These covered items such as project delivery, collaboration with local governments, emissions, multimodalism, land use and economic development. To date, however, it has instituted only two, one focused on cost increases in programmed projects and one on whether capacity projects have had sufficient study to determine land use interactions.

PCTI PROJECTS—SMART TRANSPORTATION THEMES

As a demonstration program, PCTI enabled PennDOT to showcase projects on several of the key *Smart Transportation* themes: Accommodate all modes, Build towns, not sprawl, Leverage and preserve existing assets.

In the first round (2009) of project selections, 50 projects were chosen:

	Projects	Funding
Bicycle/Pedestrian	9	\$9.3 m.
Road Intersections/ Local network	6	\$9.9 m.
Intermodal/TOD	13	\$14 m.
Land Use/Transportation Planning/Redevelopment	13	\$7.7 m.
Streetscape/Traffic Calming	8	\$18.2 m.
Regional Planning	1	\$.3 m.

Clearly this is an area where PennDOT could do more, possibly with SSTI support. Such an effort would be timely, in part because of the consensus in the field that performance-based management would bring needed efficiencies and improved outcomes, and because new resources are at hand to perform the measurements. Such resources include:

- Performance reporting and management regimens in many state DOTs demonstrating formats for gathering and using data for analysis, policy-making and communication with constituencies.
- Ongoing discussions on performance measurement in the pending re-authorization of the federal surface transportation act.
- Pennsylvania's requirements for detailed performance reporting by transit agencies under Act 44 of 2007, as well the Federal Transit Administration's new measurement emphasis in its State of Good Repair program.

- Activities by Pennsylvania Metropolitan Planning Organizations and their counterparts around the country in developing system performance measures, especially related to demand management and operational strategies, to meet requirements of FHWA's Congestion Management Process.
- Efforts at the U.S. Department of Housing and Urban Development to measure and track livable and sustainable communities.
- Widespread and inexpensive access to GIS, remote-sensed imagery, internet-shared data and other technical advances.

Appendix D lists some of the performance measurement arenas that SSTI believes PennDOT should consider incorporating into expanded efforts.

Chapter 10. Planting *Smart Transportation* in PennDOT's culture

In 2004 *Smart Transportation* started from the need to put a constructive face on a wrenching reality of PennDOT's fiscal capacity to build big projects. It has evolved to a broad usage for virtually every phase of the department's activity.

By 2008, the ten *Smart Transportation* themes had taken consolidated form in the *Smart Transportation Guidebook*.

By 2011, *Smart Transportation* had really grown from a set of initiatives and programs and had taken on all the attributes of PennDOT's brand. It carried the core values of PennDOT's approach to its work, its alliances and partnerships, and all its constituencies.

Including its own employees.

PennDOT's leadership early recognized that the work of transforming the purposes and processes of its business could only be carried out if its district office leadership and staff, and the staff of all its central office branches, fully understood and embraced the new core operating approach.

PennDOT made full-on efforts to bring *Smart Transportation* to the rank and file and secure their interest, understanding and support.

The methods used were conventional—trainings, guidance, outreach. And extensive publications—both printed and web-based. By the time the *Smart Transportation Guidebook* was published, there would have been few PennDOT employees not yet recognizing that *Smart Transportation* was the PennDOT flag to which enthusiasm and allegiance were expected.

Since 2008 the drumbeat for *Smart Transportation* has only increased. *Smart Transportation* even has produced its own quarterly newsletter, "Smart Transportation Update."

ROAD TO *SMART TRANSPORTATION*

How it happened:

- A shortage of money for big projects led to rightsizing projects.
- Failing infrastructure led to the Fix-It-First emphasis.
- "Spreading out and hollowing out" of metro areas led to Context Sensitive Solutions and more deliberate project selection.
- Project delays led to Linking Planning and NEPA.
- A combination of these efforts became *Smart Transportation*.

How it became understood:

Constant communication branded *Smart Transportation* as a new way of thinking about transportation projects in a fiscally constrained era. PennDOT engaged critical staff and spread the message of *Smart Transportation* in three important ways:

1. District Engineers (who are the regional managers for 11 regions) were central players from the beginning in discussions about rightsizing projects and all the elements of *Smart Transportation*
2. The 2008 *Smart Transportation Guidebook* and the revised "Design Manual 2" that followed gave engineers the authorization to use flexible design standards.
3. A demonstration program, Pennsylvania Community Transportation Initiative, attracted hundreds of grant applications and showed the public—local governments and MPOs—what *Smart Transportation* could mean.

But the shrewdest step PennDOT took in reaching its employees was the oldest method, and yet sometimes today the most radical: PennDOT listened to its employees, fielded and responded to reservations and concerns and engaged its own workforce in shaping its own change process.

On its *Smart Transportation* website, for example, questions like this reflected the kinds of concerns the rank-and-file were raising:

— Are we the only ones doing this?— Is *Smart Transportation* here to stay?— How does *Smart Transportation* address land use and congestion?— How do I get communities to understand that *Smart Transportation* goes beyond adding amenities to projects (aesthetic treatments, street furniture, etc.)?— How does the bridge initiative fit into this?— Are there performance measures for *Smart Transportation*?— Where is FHWA in its effort. Are they supportive of the approach?— Where can I get technical/design guidance?— Where in the project development process do I apply *Smart Transportation*.— What role does *Smart Transportation* play in the Highway Occupancy Permit process?— How does *Smart Transportation* fit into Context Sensitive Solutions?— Will *Smart Transportation* increase project delivery time?— Does *Smart Transportation* apply to projects in suburban and rural areas as well as urban areas?

The list of questions is refreshingly attuned to the concerns the rank-and-file would have about how *Smart Transportation* was affecting the daily work of PennDOT. Straightforward and simple answers to all the above concerns have been presented to the employees and have had the effect of significantly building the receptivity of PennDOT's workers to the program.

This is not to say that PennDOT's workers, as well as citizens more broadly, do not fully appreciate that there are systemic problems for the transportation program in Pennsylvania—the most prominent being the need for a stronger long term revenue solution—that the *Smart Transportation* initiative by itself cannot solve.



APPENDIX A—SMART TRANSPORTATION THEMES

1. Money Counts. All DOTs are currently operating in a hugely challenging financial environment. Cost inflation has been rampant, sharply eroding PennDOT's purchasing power. Meanwhile, high gas prices are resulting in people driving less for the first time since the 1970s. This leads to lower gas tax revenue, transportation's primary funding source. Smart Transportation provides us with an innovative approach to these challenges so that we can continue providing great service to the Commonwealth's residents.

2. Leverage and preserve existing investments. Previous generations of Pennsylvanians have made enormous investments in infrastructure. Those investments can be seen all over the Commonwealth, from old stone arch bridges to the cobblestone streets surrounding Independence Hall. As one of the oldest states in the nation, Pennsylvania has spent billions over the past 300 years building roads and highways, rail lines and runways, canals and ports. Smart Transportation asks us to place an emphasis on leveraging and preserving these existing investments when creating our programs.

3. Choose projects with high value/price ratio. Big, complicated projects are often considerably more expensive and have more damaging impacts, but may offer only limited increases in value over the smaller-scale and less expensive options. For instance, if a large potential solution costs \$50 million more than a simpler alternative, but only results in 15 seconds less travel time delay through a corridor, is it worth the added cost?

4. Safety always and maybe safety only. Safety for all users remains the most important consideration in planning and building our transportation system. Smart Transportation does not change this

focus, but simply asks us to look for more innovative ways to continue improving our safety record.

5. Look beyond level-of-service. Conventional traffic performance measures, such as "level-of-service" (LOS), have dominated how we evaluate transportation problems and solutions; we should also begin considering other performance measures to evaluate project need and potential alternatives. These measures may include things like travel time, multi-modal access, or the economic development opportunities certain alternative might bring (or inhibit).

6. Accommodate all modes of travel. An efficient transportation system should consider the infrastructure necessary to support all modes of travel, including walking, bicycling, transit, and private automobiles. This is especially important in an era of \$4 gasoline, when many of our families are spending 30% or more of their income on transportation.

7. Enhance local network. Disconnected, sparse local street networks inevitably lead to significant strains on state roads. A highly connected local network, which provides residents a variety of route options for their daily needs, is necessary for state facilities to function as designed.

8. Build towns not sprawl. Transportation strongly influences existing and future land uses and the character of local communities. Smart Transportation asks us to consider the impacts of our transportation decisions: will they help create great places for people to live, or will they encourage sprawl? Will they help a municipality achieve their economic development goals? Does the project fit into the vision of the community?

9. Understand the context; plan and design within the context. Context-sensitive solutions (CSS) has been a part of the Department's

vernacular for many years. CSS is an antidote to the “one size fits all” approach. It requires that all transportation projects be planned and designed with careful consideration of the local land use, economic, environmental, and social contexts.

10. Develop local governments as strong land use partners. PennDOT does not have the jurisdiction to make land use decisions—we must partner with local governments to ensure that transportation solutions are consistent with a community’s land use goals, and that municipalities make land use decisions that take into account corresponding transportation needs and realities.

APPENDIX B—FUNDING OPTIONS FROM TRANSPORTATION ADVISORY COMMITTEE

A More Direct User Pay System Such as a Vehicle-Miles Traveled Fee (VMT). Technology advances will increasingly make possible revenue systems that are based on usage of the transportation system. Ultimately this may be established through federal policy, but Pennsylvania must advocate and plan for such solutions in the short term and collaborate on a myriad of implementation issues through the American Association of State Highway and Transportation Officials (AASHTO), Transportation Research Board (TRB), and the PA Congressional delegation. VMT fees are flexible and also allow for peak hour pricing, dedicated lanes, etc., in highly congested areas as appropriate. The public today is far more accepting of Web-based transactions than it was only a decade ago. As an example of the embrace of technology which will make a direct user pay system feasible, many Pennsylvanians are loyal users of EZ-Pass.

Tolling Options for Existing and New Highways. Major highways generally, and the Interstate system specifically, will not be sustainable without a nearly uniform use of tolling. Here too, technology will make such systems more efficient. The public is accepting of tolling if the pricing translates into a quality product and enhanced mobility. Adaptations to tolling schemes can minimize the impact of tolls on local trips. The federal government may eventually shift to a tolling approach on the Interstate system. Pennsylvania must align itself to help lead this direction in order to ensure federal policy changes work in ways that are beneficial to the Commonwealth.

Greater Use of Public-Private Partnerships (P3). Public-private partnerships are not revenue sources, but they can create cost savings and bring private investment into transportation. PennDOT and others now have sufficient experience with Design-Build and other alternative contracting approaches to expand the use of public-private partnerships. TAC Transportation Funding Study

Strategic Borrowing. Debt financing became an issue for Pennsylvania during the 1970s. Since 1979, PennDOT, to its great credit, has been averse to debt financing. That caution is generally still in order. However, debt financing can be properly used when it can be linked with a dedicated revenue source to finance the debt and to protect other revenue sources from being consumed. Further, there should be an exploration of some reasonable debt financing for transportation investment in line with specific project investments with a high benefit-cost. Infrastructure is a long-term asset, and borrowing can assist in delivering projects sooner. As such, debt financing is appropriate if carefully and responsibly managed and capped.

Local Option Taxes. Local government has considerable responsibility for local highways and bridges as well as public transportation. They can play an even larger role in overall mobility within each region and locale within the state. However, greater local capacity is needed. Local jurisdictions require more options for raising revenue to address local highway, bridge and transit needs.

Source: Pennsylvania State Transportation Advisory Committee, Transportation Funding Study (May 2010), available at <http://pahighwayinfo.org/wp-content/uploads/2010/05/TACFullReport.pdf>

APPENDIX C—KEYSTONE PRINCIPLES

Keystone Principles for Growth, Investment & Resource Conservation

1. Redevelop First. Support revitalization of Pennsylvania’s many cities and towns. Give funding preference to reuse and redevelopment of “brownfield” and previously developed sites in urban, suburban, and rural communities for economic activity that creates jobs, housing, mixed use development, and recreational assets. Conserve Pennsylvania’s exceptional heritage resources. Support rehabilitation of historic buildings and neighborhoods for compatible contemporary uses.

2. Provide Efficient Infrastructure. Fix it first: use and improve existing infrastructure. Make highway and public transportation investments that use context sensitive design to improve existing developed areas and attract residents and visitors to these places. Provide transportation choice and intermodal connections for air travel, driving, public transit, bicycling and walking. Increase rail freight. Provide public water and

sewer service for dense development in designated growth areas. Use on-lot and community systems in rural areas. Require private and public expansions of service to be consistent with approved comprehensive plans and consistent implementing ordinances.

3. Concentrate Development.

Support infill and “greenfield” development that is compact, conserves land, and is integrated with existing or planned transportation, water and sewer services, and schools. Foster creation of well-designed developments and walkable, bikeable neighborhoods that offer healthy life style opportunities for Pennsylvania residents. Recognize the importance of projects that can document measurable impacts and are deemed “most-ready” to move to successful completion.

4. Increase Job Opportunities.

Retain and attract a diverse, educated workforce through the quality of economic opportunity and quality of life offered in Pennsylvania’s varied communities. Integrate educational and job training opportunities for workers of all ages with the workforce needs of businesses. Invest in businesses that offer good paying, high quality jobs, and that are located near existing or planned water & sewer infrastructure, housing, existing workforce, and transportation access (highway or transit).

5. Foster Sustainable Businesses.

Strengthen natural resource based businesses that use sustainable practices in energy production and use, agriculture, forestry, fisheries, recreation and tourism. Increase our supply of renewable energy. Reduce consumption of water, energy and materials to reduce foreign energy dependence and address climate change. Lead by example: support conservation strategies, clean power and innovative industries. Construct and promote green buildings and infrastructure that use land, energy,

water and materials efficiently. Support economic development that increases or replenishes knowledge-based employment, or builds on existing industry clusters.

6. Restore and Enhance the Environment.

Maintain and expand our land, air and water protection and conservation programs. Conserve and restore environmentally sensitive lands and natural areas for ecological health, biodiversity and wildlife habitat. Promote development that respects and enhances the state’s natural lands and resources.

7. Enhance Recreational and Heritage Resources.

Maintain and improve recreational and heritage assets and infrastructure throughout the Commonwealth, including parks & forests, greenways & trails, heritage parks, historic sites & resources, fishing and boating areas and game lands offering recreational and cultural opportunities to Pennsylvanians and visitors.

8. Expand Housing Opportunities.

Support the construction and rehabilitation of housing of all types to meet the needs of people of all incomes and abilities. Support local projects that are based on a comprehensive vision or plan, have significant potential impact (e.g., increased tax base, private investment), and demonstrate local capacity, technical ability and leadership to implement the project. Coordinate the provision of housing with the location of jobs, public transit, services, schools and other existing infrastructure. Foster the development of housing, home partnerships, and rental housing opportunities that are compatible with county and local plans and community character.

9. Plan Regionally; Implement Locally.

Support multi-municipal, county and local government planning and implementation that has broad public input and support and is consistent with these principles.

Provide education, training, technical assistance, and funding for such planning and for transportation, infrastructure, economic development, housing, mixed use and conservation projects that implement such plans.

10. Be Fair. Support equitable sharing of the benefits and burdens of development. Provide technical and strategic support for inclusive community planning to ensure social, economic, and environmental goals are met. Ensure that in applying the principles and criteria, fair consideration is given to rural projects that may have less existing infrastructure, workforce, and jobs than urban and suburban areas, but that offer sustainable development benefits to a defined rural community.

The Keystone Principles are further developed with more actionable “Core Criteria” and “Preferential Criteria.”

APPENDIX D—STTI SUGGESTIONS FOR SMART TRANSPORTATION MEASURES

The SSTI expert panel has assembled this appendix to stimulate PennDOT’s thinking about performance measurement. These are examples, mainly of outcome measures, and would in some cases require instrumental or process measures as well. In many cases Pennsylvania measures would benefit from a comparison with national figures. Potential sources for state and national data are indicated.

Transportation trends

- Per capita VMT, annual. (PennDOT/ FHWA, Census Bureau)
- Drive-alone commute mode share, annual. (Census Bureau)
- Mode share for all regional trips. (NHTS)
- Transit ridership. (National Transit Database)

- Parcel to parcel multimodal accessibility. (Tax assessors, PennDOT, local governments, transit systems)

Land use changes

- Developed land per capita. (USDA; also see HUD Livable Communities measures)
- Lane miles per capita by functional class. (PennDOT and FHWA)
- Percentage of new housing units that can be served efficiently by existing or planned frequent fixed route transit service. (Local governments and MPOs, transit systems)
- Portion of population paying more than 45% of income for combined transportation/housing costs. (Center for Neighborhood Technology)
- Urban Accessibility Index, showing access to economic benefit opportunities. (University of Texas).

Economy

- Gross state product per VMT. (Bureau of Economic Analysis, PennDOT/FHWA).
- Anticipated future costs of maintaining infrastructure in acceptable condition. (PennDOT, transit systems)
- Job creation and preservation from Smart Transportation. (To be developed)

Asset preservation

- Transit asset conditions and state of good repair needs and trends compiled consistent with FTA SGR program. (Transit systems, FTA)
- Structural deficiency of bridges by number and deck area, and by risk assessment classification. (PennDOT, local governments)

System operating performance

- Transit data required for Act 44 Section 1513 distributions of operating statistics and otherwise stipulated in Act 44 reporting. (Transit systems)
- Measures of demand management and operational management strategies under FHWA's Congestion Management Process. (MPOs)
- Centerline miles of road network in need of upgrading as complete streets. (PennDOT, local governments)
- Measures of speeds, travel times, travel time reliability, delay costs for freight, etc. as developed by other states and private vendors (e.g., Inrix, Breakthrough Fuel).
- Portion of roadway segments with design speed appropriately matched to land use context. (PennDOT, local governments)

Safety

- Motorist, bicyclist and pedestrian crashes, injuries and deaths. (National Highway Traffic Safety Administration)
- Traffic calming treatments installed. (PennDOT and local governments)

Environmental performance

- Transportation sector fossil fuel consumption and criteria and greenhouse gas emissions. (EPA, Pennsylvania DEP)
- Impervious surface. (PennDOT)

Planning processes and resources

- Availability of staff and supporting technical tools at PennDOT, Metropolitan and Rural Planning Organizations and local municipalities to conduct transportation and land use planning. (PennDOT, local agencies)



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