



MEASURING WHAT WE VALUE

SETTING PRIORITIES AND
EVALUATING SUCCESS IN TRANSPORTATION

MARCH 2015



Transportation
for America

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Foreword

I won't sugarcoat it: We have a national transportation system that is on life support. Our great highway system is aging and falling apart, and our cities and suburbs are struggling to find safe, efficient ways to get people to jobs and goods to market.

Meanwhile, investment in our nation's vital transportation system has fallen to its lowest level since 1947. Once the finest infrastructure in the world, ours is now ranked behind Iceland, Spain, Portugal and the United Arab Emirates, according to the World Economic Forum. Every year Congress has to scour the couch cushions to find enough money to keep the federal program going, even as the revenue from the gas tax drops along with the purchasing power of the dollars we do get.

While I'm hopeful that Congress will soon take action to fix these problems, the truth is we will never have enough money to be wasteful with it. That is why this idea of using performance measures to identify the truly beneficial projects and then prove that they are getting the proper results is so important. Not only does this approach ensure a good return on investment, demonstrating results helps build taxpayer support for investing in the first place.

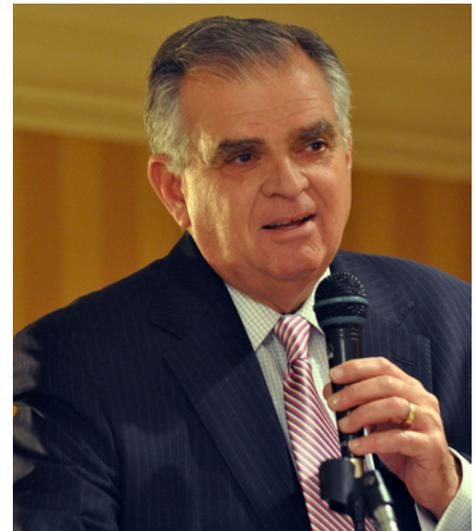
The last update of the federal transportation program in 2012, MAP-21, did not include nearly enough money or last nearly long enough at just two years. But Congress did take an important step by setting out national goals and requiring states and regions to demonstrate that they are using their funding to reach those goals.

As is often the case, some states and local leaders have gotten out ahead of the federal government and begun looking at the results of their transportation investments in terms of not just safety and condition, but also return on investment, public health and access to jobs. This report lays out the early successes of innovative DOTs and MPOs – from Tennessee DOT to the Sacramento Council of Governments and from Massachusetts DOT to Salt Lake City – in measuring performance of their transportation system and choosing projects based on getting a strong return on investment.

This is the direction our transportation program is going to take and this guidebook is a good way to get started. By setting out a vision for performance, in cooperation with the traveling public, we can build the vision we need and the political support necessary to invest in our infrastructure and our economic success.

The Hon. Ray LaHood

Co-Chair, Building America's Future
U.S. Secretary of Transportation 2009-2013



Former U.S. Secretary of Transportation Ray LaHood. T4America photo by Stephen Davis

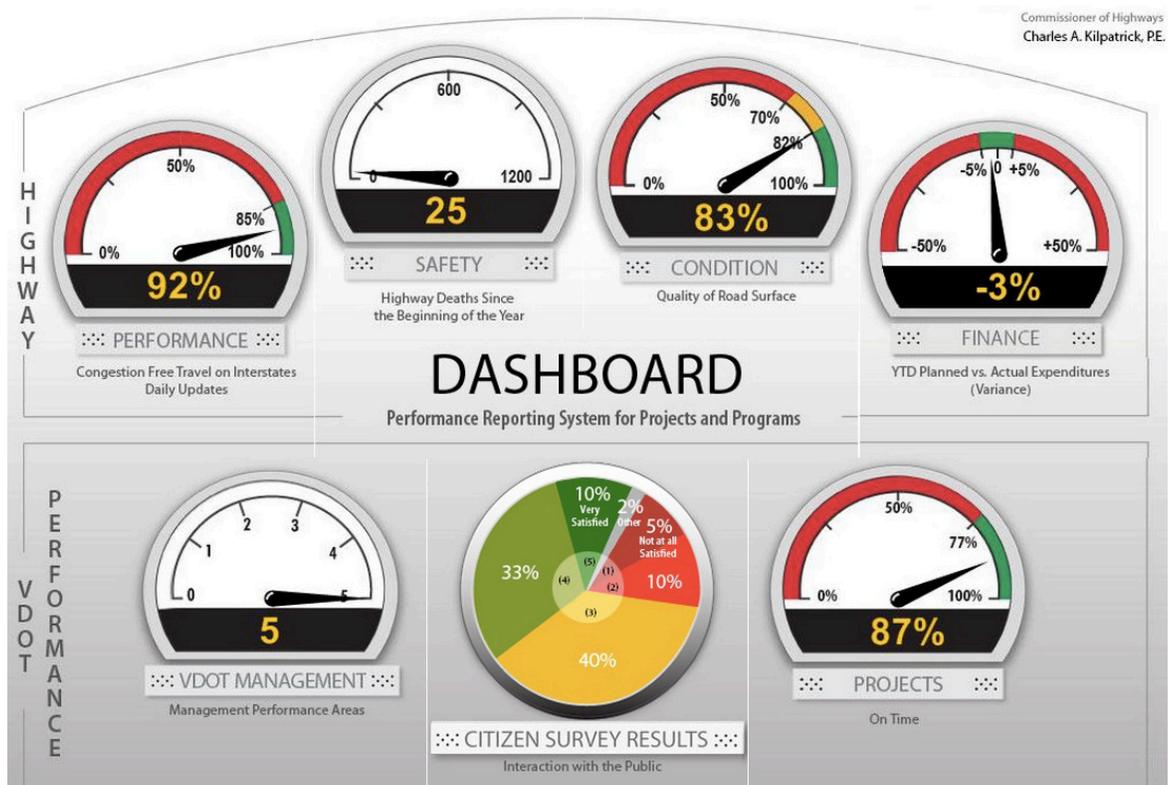
INTRODUCTION

At a time when dollars for transportation programs are being stretched to the breaking point and many stakeholders are urging the American people to pay more, taxpayers are wondering what they get for their current investment. When they contribute their hard-earned money, they want to know how that investment will help their commutes, their pocketbooks, the larger economy and their community’s quality of life. Unfortunately, most transportation agencies focus their attention on the performance of the transportation system as an end unto itself and as a result, have a hard time making a compelling case to their ultimate customers.

If this were the education arena, it would be as though taxpayers were only told about the number of textbooks purchased or teachers hired, when what they really want to know is that kids are learning and being adequately prepared for college and/or careers. Teachers and textbooks are important factors in the students’ success, but it is the performance of the students that really matters. This performance is measured and reported – to parents through report cards and to taxpayers through test scores, admission and drop-out rates. And then funding is directed where it is most needed.

Many transportation agencies have measured their performance in terms of internal operations – say, projects on schedule and under budget – or by surveying public priorities or satisfaction with the transportation system. Where the transportation sector has considered performance of their system, agencies have typically reported conditions through tools like “dashboards,” which provide a snapshot of current conditions. Snapshots (like these samples below) are important for transparency and outreach, but they do not show trends or whether the investments made led to the outcomes promised.

Sample dashboard from the Virginia Department of Transportation. Screenshot taken January 26, 2015 from <http://dashboard.virginiadot.org>.



Over the past 50 years, transportation agencies have focused on tracking a narrow set of goals – typically system condition, safety and sometimes traffic congestion. While these goals are important, they measure the state of the transportation system, not the impact of the system on people’s lives. People want to know that transportation funds are being spent in a way that creates value, supports long-term job growth, makes their communities more attractive to business and talent and will contribute to their economic health and resilience. They are looking for a transportation system that provides not just movement but safe, reliable, affordable access to necessities like jobs, education, health care and groceries. Measuring the impact of transportation investments in a way that resonates with the public is critical going forward. These outcome measures are the focus of this report.



Sample safety dashboard from the Federal Highway Administration’s Safety Data Community of Practice. <http://rspcb.safety.fhwa.dot.gov/SafetyCOP.aspx>

In the past, transportation projects often were rationalized as a way to solve one narrowly defined problem, such as restoring a section of highway to free-flowing conditions. In the current budget environment, however, every expenditure is expected to accomplish multiple outcomes. These additional benefits – supporting local economic development, protecting green space or providing access to opportunity – are no longer “amenities” but, rather, essential benefits to prove the worth of the base project. Outcome performance measures can assist transportation agencies in finding projects that accomplish the most benefit for the least cost.

Using a broad set of measures to determine how investments impact the efficiency of the overall transportation system and help the economy, environment and access to opportunity, policy makers can build the case and public support for putting funding towards transportation needs, even in challenging budget environments.

Finally, a community’s long term resilience – the ability to withstand shocks and stresses and bounce back stronger – is more critical than ever to protect people’s lives, livelihoods and well being. States, regions and cities that invest their public funds to provide a range of cost-effective transportation options are better equipped to respond to economic shocks and to organize response and recovery efforts during and after natural disasters. In other words, investing wisely increases resilience to natural disasters and economic forces that affect states and regions.

The challenge of declining transportation revenues

These days, transportation leaders have a high burden to demonstrate that scarce funds should be spent on transportation, rather than another worthy area, like education. To do so, they must show that that they are making good use of the money and that it is buying people at all ages and wages a better, more prosperous life.

Declining resources for transportation is a new challenge. For decades, as people drove more each year and thus paid more in gasoline taxes, transportation funding was plentiful. But now, as driving has leveled off and cars use less gasoline, funding is not keeping up with investment needs. Transportation leaders have to make a case to the public for more funding or cut back their programs.

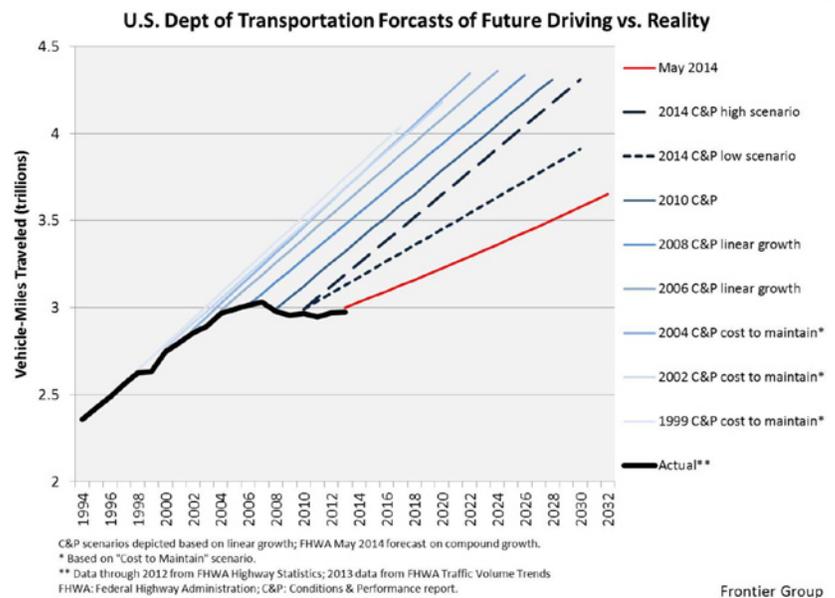
Previously, Congress attracted support from a variety of stakeholders and communities by creating different “buckets” of funds – with each bucket dedicated to different types of projects: urban needs, rural needs, bicycle lanes and sidewalks, highways and railroad grade crossings, among others. This system aimed to create a well-rounded and balanced transportation program.

But with the latest changes to the federal transportation program, approved by Congress in 2012 as part of the Moving Ahead for Progress in the 21st Century (MAP-21) legislation, the goal is to focus less on creating programs that fund particular types of projects and more on system performance.¹ This way, each state and region has the flexibility to address their own unique issues with solutions appropriate for them. The accountability comes from planning and picking projects to meet certain publicly agreed upon performance goals and then reporting on the progress toward meeting those goals.

Federal focus on system performance

MAP-21 created performance measure requirements in three program areas: highways, transit and safety. In all three, the U.S. Department of Transportation (USDOT) is currently developing rules that will define how to measure performance.² At that point, state departments of transportation, metropolitan planning organizations, transit agencies and state highway safety agencies will be required to set performance targets under each measure. State and regional agencies must then report to the public their progress in reaching those targets. For example, a state with 800 traffic fatalities might set a target to bring that down to 700 over four years. They would report their target to USDOT and the public, the investments they plan to make to accomplish that goal and then, after four years, whether or not they have hit that target.

The measures required by USDOT will impact the projects chosen for funding, what the public gets out of the



The Federal Highway Administration projects that the slowing growth in the number of miles Americans drive each year is a permanent trend, increasing the challenge of paying for transportation with dropping gas-tax revenues. Chart via The Frontier Group; read more at <http://t4america.org/2015/01/09/drop-in-driving-growth-is-likely-permanent-fhwa-acknowledges-compounding-the-threat-to-transportation-revenues/>

1 Find out more about MAP-21 with T4America's full suite of resources explaining the current transportation legislation. <http://t4america.org/maps-tools/map-21/>

2 Read more on these proposed rules so far at <http://t4america.org/tag/performance-measures>

transportation system and the way a community develops. Choose the wrong measure and you may hit your targets but find that constituents do not like the outcome.

Agencies typically default to what they know or what they are comfortable measuring, rather than identifying the goals for the community that residents and stakeholders want and determining the measure that best aligns with those goals and leads to projects that support them. This mistake can have profound consequences for the agency. Instead of instilling confidence in the program and making the case for more investment, it could convince voters that their needs are not being considered and thus their taxes are being used unwisely.

When used to engage the public and identify regional goals, performance-based decision-making can be game changing. Most people do not think about how often a road needs to be resurfaced or a bus replaced, how much each costs and what that means for budgeting. Therefore, the public can have unrealistic expectations. Performance-based decision-making allows transportation agencies to define the extent of current challenges, show what is possible at various funding levels and describe the trade-offs that might have to be considered. It can make the public a better partner to transportation agencies that need public support to fund the system. Transportation leaders can also better understand how much they can accomplish with current funds and how to get multiple benefits from one project.

Many transportation decision-makers are concerned about the scrutiny that comes with setting and reporting on performance measures. They know that funding is limited and people have high expectations. **But measuring performance is not something to be feared. It is a tool to engage the public in the difficult decisions transportation leaders have to make every day and create a partnership that can help identify priorities and create enough confidence that users of the system agree that more funding is needed.**

Performance measures are coming, one way or another, thanks to the federal requirements created by Congress. Because of their power to make the case for revenue and prioritize investment, the somewhat modest requirements in MAP-21 should be seen as the floor, rather than the ceiling, of what is possible.

The framework in this report is meant to lay out the various ways performance measures can be used in long-range planning, project selection and alternatives analysis — including methods already successfully in use across the country. It will show the wide array of measures that address the public's interest in the transportation system, not just conventional engineering standards.

To ensure the greatest bang for the public's buck, transportation agencies must consider a full spectrum of strategic goals and ensure they find the metrics that ask the right questions and measure progress towards those chosen goals. With that information, the public can become a true partner in addressing our transportation needs.

2: BENEFITS OF PERFORMANCE-BASED DECISION-MAKING

The first step in programming dollars for transportation projects is defining the issues to be addressed. For example, if an agency defines a need as “a new transportation corridor between downtown and the business park” then success can rightfully be declared with the construction of the transportation corridor. However, if the underlying goal is to provide better access to jobs for residents, then the new corridor should be analyzed against a range of other transportation investments that might cost less, include multimodal access and have greater benefits. This fundamentally represents the difference between project-based outcomes and performance-based outcomes.

With the advent of MAP-21, state and regional transportation agencies will be required to develop and report on performance measures. Rather than being a burden, adopting this practice can help agencies:

- Make more transparent decisions with accountability that reassures taxpayers;
- Get more out of every investment;
- Resolve transportation policy conflicts;
- Resolve conflicts between transportation policy and other policy areas; and
- Make the case for additional funds to manage the transportation system.

Accountability and transparency

Decision-making processes for planning and programming transportation investment can be a mystery to the public and indeed to many members of the transportation community. Accountability (demonstrating wise stewardship of public funds or generating a positive return on investment) and transparency (broadly understood and accepted decision-making process) were unfortunately not always a high priority when federal funding was plentiful. Almost everyone’s “needs” were being addressed.

As federal, state and local funding has become harder to come by, decision-makers and the public are taking a much harder look at agency work plans than in the past. Developing performance measures, tracking them over time and applying them objectively and transparently to inform the investment decision-making and project selection process will be a key to agency success.

It is important that transportation leaders have the support of their elected officials. Without that support, agencies can choose projects based on performance and be overruled by state-level project earmarking, further eroding public confidence in the integrity of the decision-making process.

Getting the most out of performance measurement requires not just setting targets and modeling impacts but also monitoring results. Many times the actual outcomes will not turn out the way the models projected, and the transportation models themselves will need to be updated to generate better forecasts of what future investment will produce.

The lack of such a feedback loop in transportation has been one of the primary challenges in convincing people to increase funding. Everyone can point to a project that was touted as reducing congestion or improving safety that did not work as promised. While it is difficult to undo past mistakes and the public can be critical, it is more damaging for transportation agencies to fail to admit (and learn from) those mistakes and improve their projections going forward. It erodes the public's faith in their assurances and their stewardship of taxpayer funding.

Agencies should announce the expected benefits of a project and then report back at a few intervals (e.g., one, five and ten years) as to whether the expected results were achieved. If they were, the accomplishment should be touted. If not, it should be admitted with an analysis as to why and how to improve results going forward.

Getting more out of every investment

In order to achieve greater gains with limited dollars, some transportation agencies have begun making project development decisions using criteria that consider the full spectrum of the state or region's strategic goals, such as safety, economic development, public health, community character and resource conservation.

Using those criteria, a state DOT or a city comparing a road-widening project to synchronizing traffic signals might find that the widening alternative leads to a very high level of service. However, the latter operational improvements may cost significantly less while still reducing congestion and also reducing the number of accidents. Consideration of the full range of performance goals likely would lead to a different outcome than focusing solely on one.

This approach to evaluating performance can help coax the full value out of transportation investments. Consider, for example, a proposed "complete street" project with enough sidewalk space to boost pedestrian safety as well as business for adjacent restaurants by creating space for café seating. While a single focus on traffic speed might rule it out, considering all the possible benefits — safety for motorists and pedestrians, economic opportunity and property values, etc. — might result in a different choice.

The approach also demonstrates the results of transportation investments to stakeholders and constituents, which can ultimately play a critical role in building broad public support for that project.

Analyzing transportation policy trade-offs

With transportation projects and programs expected to address multiple transportation goals, setting regional metrics can help agencies provide objective analysis when policy goals collide. It will also allow the agency to engage the public and build support.



A before/after example of a complete streets project in Seattle. Photo by the National Complete Streets Coalition

Engineers are often asked to design a street that provides access to multiple businesses lining the way while also moving vehicles quickly and safely. While the intersecting streets and curb cuts for businesses provide access, they also create conflicts, the need for more traffic signals and slow the traffic. Using performance measures can help the public weigh these conflicting goals and choose one that maximizes benefits across a range of important outcomes.

Analyzing transportation impacts on other sectors and vice versa

The public and the people they elect to leadership are no longer satisfied when agencies pursue their functions independently. “Silo busting” is occurring at all levels of government and transportation agencies find themselves having to present their programs in concert with agencies responsible for housing, environmental protection, emergency management, etc. Performance measures designed to quantify the impacts of transportation investment in these arenas provide agencies with tools for effective interaction with their peers in other areas of public service. In doing so, they can show greater, broader benefits for transportation investments and build a broader coalition of support.

For example, if a goal is to make transportation more affordable to local residents, a transportation agency might build more low-cost transportation options. However, using this measure, the policymakers can also approach the housing authority to target affordable housing close to that new infrastructure and ask the local land use agencies to adjust their plans to move more necessities closer to housing. As a result, the outcomes should be better and are not born by the transportation agency alone.

Making the case for funding

As dedicated sources of revenue become scarcer, transportation agencies find themselves competing for general fund dollars at the federal, state and local levels. In the past, leaders have made the case for funding transportation agencies based on the need to leverage federal transportation dollars (and avoid leaving money on the table). Leaders of transportation agencies today find themselves having to explain their program costs in terms of return on investment, with or without federal funds.

Performance measures give agencies the tools to measure and report return on investment in terms that policymakers and the public can understand and appreciate. Other sectors and programs are doing this already and, in some cases, have been for years. In a time when government is coming to their constituents asking for more support for a wide array of government services, transportation leaders must quantify the benefits of their programs in order to compete effectively.

3: PERFORMANCE-BASED DECISION-MAKING UNDER MAP-21

MAP-21 was signed into law by President Obama in 2012 and laid out a structure for measuring the performance of the nation's transportation system. It consolidated more than 100 programs into six core programs, streamlined project delivery and increased the flexibility of federal funding to the recipients — state DOTs, transit agencies and Metropolitan Planning Organizations (MPOs), which plan transportation across regions of 50,000 or more people. The law created a system of performance management with three parts that apply to three agencies within USDOT and, in turn, to different state and local agencies.

The first agency to set out a rule on performance measures was the National Highway Transportation Safety Administration (NHTSA), focused as the agency's name implies on highway safety.¹ Under this rule, state highway safety offices would set targets for several measures designed to assess the safety of the highway system. To be eligible for NHTSA funds, state agencies have to report on progress toward achieving these performance goals as a part of their adopted safety programs. Performance measures will thus guide the work state DOTs and MPOs do under the Highway Safety Improvement Program, which provides about \$2.5 billion per year for efforts to improve highway safety.

MAP-21 instructs NHTSA to negotiate the measures to be used with the Governors Highway Safety Association, an effort that began before MAP-21. The actual measures are laid out in a report called "Traffic Safety Performance Measures for States and Federal Agencies."² Each state highway safety director must set targets in 11 areas:

1. Number of traffic fatalities
2. Number of serious injuries in traffic crashes
3. Fatality rate (per vehicle miles traveled)
4. Number of unrestrained passenger vehicle occupant fatalities
5. Number of fatalities in crashes involving a driver with a blood alcohol concentration of .08 g/dL or higher
6. Number of speeding-related fatalities
7. Number of motorcyclist fatalities
8. Number of un-helmeted motorcyclist fatalities
9. Number of drivers 20 or younger involved in fatal crashes
10. Number of pedestrian fatalities
11. Observed seat belt use for passenger vehicles, front seat occupants

Most of these are measures that state highway safety offices have been tracking for years — they have familiarity with the data, trends and factors that impact the outcomes. But MAP-21 formalizes the performance measurement, requiring it in the development of the state's highway safety plans. And the law makes clear that the Secretary of USDOT should not approve performance targets that are not supported by data or a highway safety plan that does not program sufficient funding to make those targets possible.

¹ The provision of law that directs NHTSA to establish performance measures is Section 402(k)(4) of Title 23, United States Code.

² www.ghsa.org/html/files/resources/planning/Perf.Msrs.Rpt.pdf

The Federal Transit Administration (FTA) and Federal Highway Administration (FHWA) are close behind NHTSA with additional measures. FTA has requested comments in advance of the rulemaking process for transit safety performance measures and the definition of “state of repair” for transit measured by the condition of equipment, rolling stock, infrastructure and facilities.¹ Then FTA funding recipients (state DOTs and transit agencies) will have to set targets under each of these measures and report their progress regularly.

FHWA must establish 12 measures covering a wider range of goal areas, including safety, infrastructure condition, congestion reduction, system reliability and environmental sustainability.² These measures will assess the:

1. Condition of pavements on the Interstate System
2. Condition of pavements on the National Highway System
3. Condition of bridges on the National Highway System, including the Interstate System
4. Performance of the Interstate System
5. Performance of the National Highway System
6. Number of serious injuries (in common with NHTSA)
7. Number of fatalities (in common with NHTSA)
8. Number of fatalities per vehicle miles traveled (in common with NHTSA)
9. Number of serious injuries per vehicle miles traveled
10. Traffic congestion
11. On-road mobile source emissions
12. Freight movement on the Interstate System

These measures are being broken into three separate notices of proposed rulemaking to be combined into one final rulemaking at the end of the public comment process. FHWA decided to do this to ensure that the public had ample time to comment and to make the rulemaking less complicated, and engage the public and stakeholder in the development process.

The first notice of proposed rulemaking was released early in 2014 and covered safety measures.³ The second one, which addresses infrastructure condition, was released on January 5, 2015.⁴ These are areas that state DOTs and MPOs have monitored for years under the federal program.

The third group includes all of the other measures — traffic congestion, freight and performance of the Interstate and National Highway Systems — and is expected to be released to the public later in 2015. These measures are new to the federal program. How these areas are defined will have a profound impact on how states, MPOs and local leaders invest their transportation dollars. Does National Highway System performance mean reliability, the number of vehicles that pass through, the number of people who move through the corridor

1 Required under sections 5326(c) and 5328 (d) of title 49, United States Code.

2 Required under section 150 of title 23, United States Code.

3 For the FHWA notice of proposed rulemaking, see <https://www.federalregister.gov/articles/2014/03/11/2014-05152/national-performance-management-measures-highway-safety-improvement-program>. For a detailed analysis of the notice of proposed rulemaking, see <http://t4america.org/wp-content/uploads/2014/03/T4A-NPRM-Safety-Performance-Measure-Memo.docx.pdf>.

4 For the FHWA notice of proposed rulemaking, see https://www.federalregister.gov/articles/2015/01/05/2014-30085/national-performance-management-measures-assessing-pavement-condition-for-the-national-highway?utm_campaign=subscription+mailing+list&utm_medium=email&utm_source=federalregister.gov.

(car passengers, transit users, bicyclists and pedestrians) or something else completely? Does congestion mean how much slower traffic moves during rush hour as compared to other times, the time it takes to commute, or whether the commute is predictable? Each one of these measures addresses a different goal and will result in different projects and different outcomes.

For example, if performance means reliability – whether trip times on a corridor are consistent from day to day – then the focus of the agency will be on preventing and clearing accidents or other events that create disruption. If it means the number of vehicles that move through a corridor then the focus will be on wider, faster roads moving as many cars and trucks as possible. If it means person throughput then attention will be given to how many people are moved through the corridor by car, carpool, vanpool, bus, train, bike or on foot, and the design of the road will be a complete street meant to accommodate as many forms of travel as possible.

The notice of proposed rulemaking on this last group is likely to be delayed until spring or summer of 2015. Thus agencies have time to consider what makes the most sense for their constituents in time to influence this process. Alternatively, agencies may choose not to engage with USDOT during rulemaking and simply hope that USDOT picks the measure or measures that makes the most sense for their community.

As with NHTSA and FTA's measures, FHWA will issue the rule establishing the measures and then states and MPOs will set targets for each of the measures in their transportation plans and track their progress. If after four years, they have not made sufficient progress, these targets must be updated. If they continue to struggle to meet the targets in safety and infrastructure condition, they lose some of their flexibility in spending federal transportation dollars and would have to focus funding on the problem area.

Developing performance measures in anticipation of the federal rules is smart policy to ensure that each state and region knows what their priorities are, how the federal rules can support them and impact the federal process as it unfolds. It will also help states and regions advocate for the measures that best address their priorities.

Early lessons

While measuring performance represents an emerging practice among transportation professionals, there are some early lessons from state DOTs and MPOs from a pilot program conducted by the National Cooperative Highway Research Program (NCHRP) and the American Association of State Highway and Transportation Officials (AASHTO). The pilot program tested performance measurement in state, regional and local transportation agencies in Washington, DC; the Kansas City region; and Pennsylvania.

One key takeaway was that data availability was not the challenge that the participating agencies anticipated. Once the pilot began, the participants found that most of their work could be done with existing data, often through the use of data from other agencies. The challenge was turning that data into useable information that could support transportation decisions.

In Kansas City, staff at the Mid-America Regional Council (MARC), the area MPO, coordinated with state agencies to gather detailed data related to safety, including fatalities and injuries from data sources across four agencies to assess more than 20 measures.

Another key lesson suggests that institutional and organizational obstacles — not technical ones — pose the largest barrier to performance-based decision-making. Even though a group of agencies may collaborate on developing strategic priorities, existing practice and culture in individual agencies can make it challenging for them to implement those priorities, especially if they collide with other needs and priorities. It requires sustained coordination among upper management and a series of champions to guide the process and implementation.

A third lesson is that data must be communicated in a way that is meaningful to stakeholders and taxpayers. Several state DOTs, such as Washington and Massachusetts, release annual reports that help decision-makers and the general public understand the outcomes of previous projects and plan for future investments. This communication benefits transportation agencies as well. Through monitoring and reporting, they better understand the effectiveness of these investments and can adjust their strategies and targets as necessary.

4: CHOOSING PERFORMANCE MEASURES

Creating an outcome-oriented approach

Choosing the appropriate areas to measure is paramount. Choosing a measure that doesn't match a community's goals can lead to the wrong outcomes or delay progress. But finding the appropriate measures can be tricky. Sometimes, even the industry standard can be a poor choice and hinder an area's current transportation, health, environmental and economic development goals.

To demonstrate how very similar measures lead to different outcomes, consider this non-transportation example from the Michael Lewis book "Moneyball": In the early 2000s, the Oakland A's baseball team abandoned the traditional measures of offensive performance — stolen bases, runs batted in and batting averages. Instead, recruiters started evaluating players by different measures — on-base percentage and slugging percentage — because they correlated better with runs and wins. As a result of these new measures, the A's were able to spend less on talent, yet still compete against teams from larger markets with deeper pockets, by recruiting more affordable players who were undervalued by those traditional measures.

As we noted earlier, performance measurement should not be limited to monitoring the current conditions and trends. The USDOT defines performance-based decision-making as "the practice of setting goals and objectives; an ongoing process of selecting measures, setting targets, using measures in decision-making to achieve desired performance outcomes; and reporting results." In short, performance management uses data to inform long-term and short-term investment decisions and links transportation performance to goals.

USDOT outlines an ongoing, iterative process for state departments of transportation (DOTs) and Metropolitan Planning Organizations (MPOs) to follow.

- Setting a strategic direction, including defining goals, objectives and performance measures
- Developing investment and planning priorities, including identifying targets and trends; choosing strategies and comparing alternatives; and determining tradeoffs among investments
- Programming by selecting specific investments (through capital plans and transportation improvement plans)
- Monitoring and evaluating built projects and publicly reporting their results

This section highlights early lessons in using this new approach; recommended goal areas and measures for use in project selection; examples of how DOTs and MPOs have built these goal areas and measures into existing planning processes, project selection and monitoring; and publically available tools to assist DOTs and MPOs.

CASE STUDIES: CHOOSING PERFORMANCE MEASURES

FOSTERING A PERFORMANCE-BASED CULTURE
North Carolina DOT

The North Carolina DOT (NCDOT) aimed to become more transparent in how it funds transportation projects in response to public questions about how state funds were being used. Through executive orders that gave the Secretary of Transportation approval over construction projects and directed the Secretary to develop an approval process for all construction projects — including programs, plans and contracts — NCDOT sought to transform its entire state agency by defining a common mission; creating a new Strategic Planning office and selection approach; developing and implementing program and project delivery models; creating a public-facing executive dashboard; and fostering a performance-based culture through NCDOT.



Strategic Prioritization and Programming Process		
1. Score	2. Strategize	3. Schedule
Prioritize Projects using	Set Investment Strategy	Program Projects
Data	Classify ranked Projects into Buckets (Mode, Goal, Tier)	Develop STIP using Project Rankings & Investment Strategy
Local Input	Conduct Scenario/Trade-off Analysis with DOT & Partners	Apply Constraints
Multimodal Characteristics	Constrained only by Total Available Revenue	Compare Selected Strategy vs. Applied Constraints

Source: <http://www.ncdot.gov/download/performance/prioritization2jan2012.pdf>

NCDOT's focus on strategic selection shifted the department from a short-term portfolio of projects that were not explicitly tied to agency goals to a long-term, formal approach that uses data to assess outcomes. NCDOT established three overarching goals: safety, mobility and infrastructure health. NCDOT scores plans according to three goals, local input and multimodal connections, including connections to a military base or seaport.¹ Then the plans are evaluated according to their "Performance Level of Service (LOS)" to track progress in the following ways:²

- Highway mobility: Percent of miles with volume-to-capacity ratio less than 0.80
- Highway modernization: Percent of miles that meet NCDOT's Paved Shoulder Policy where shoulders are required
- Highway pavement: Percent of miles with pavement condition rating greater than or equal to 80
- Bike/pedestrian: A state-developed bike-pedestrian index
- Ferry: Number of vehicles left behind at terminals per year
- Transit: Passenger trips per year

NCDOT will hold strategy summits across North Carolina and ask participants to allocate 10 years of transportation funding into the three transportation goals. All of this information is used develop and approve the State Transportation Improvement Program. But the final programming of funds also incorporates other factors, such as geographic equity, funding constraints, construction sequence and project development time.

1 More information available at www.ncdot.gov/download/performance/prioritization2jan2012.pdf.

2 Please note that "performance LOS" is not the same measure as conventional LOS, which measures flow of automobile traffic of on a roadway. Cessna, D. (2012, July). Performance-based evaluation criteria and funding decisions: Pennsylvania DOT perspective. Presentation at FWHA/FTA Peer Change, Chicago, IL. Retrieved November 17, 2014, from www.cmap.illinois.gov.

ANALYZING ALTERNATIVES FOR LONG-RANGE PLANNING *Massachusetts DOT*

As part of a 2013 deal to raise new revenue for transportation, the Massachusetts legislature required the DOT to develop and use performance-based criteria in the state transportation plan. The draft criteria under consideration relate to seven broad policy priorities: 1) safety and security; 2) mobility and access; 3) economic development; 4) quality of life and environmental justice; 5) health/environmental impact; 6) regional equity; and 7) system preservation.

The Massachusetts Transportation Finance Act stipulates that these criteria should account for different categories of projects, such as asset preservation; modernization of existing assets; expansion projects; and local construction. As a result, the criteria may not apply uniformly to all state projects.

MassDOT's weMove Massachusetts will take into account additional performance measures — such as economic development, access to jobs and opportunity and environmental sustainability — and shift in the use of various modes of travel, in order to fully account to the legislature and the public for the additional funding provided.

Source: MassDOT. (December 2013). weMove Massachusetts: Planning for Performance. Retrieved August 13, 2014, from www.massdot.state.ma.us/Portals/22/Docs/WWM_Planning_for_Performance.pdf.



T4America partnered with Transportation for Massachusetts (T4MA) on a conference to support and encourage their efforts in pioneering a more inclusive, sophisticated approach to picking projects through the newly created Project Selection Advisory Council. www.t4america.org/2014/07/30/massachusetts-is-attempting-to-lead-the-way-on-a-performance-based-system-for-selecting-transportation-projects/

5: RECOMMENDED GOAL AREAS AND MEASURES

DOTs and MPOs commonly monitor indicators of the performance and safety of their transportation networks. However, most of them rarely use that information to evaluate their transportation planning process or to prioritize projects. And while performance and safety are fundamental aspects of transportation, focusing only on those goals misses opportunities to maximize public investments and use transportation projects as a springboard to achieve other policy goals simultaneously.

The following framework in this chapter offers broader considerations in choosing transportation projects including operational performance and safety but also economic health and resilience, access to destinations and public health.

System performance

MAP-21 requires state DOTs, transit agencies and MPOs to use performance measures to understand the condition and performance of roadways, bridges and transit systems. Transportation agencies are familiar with condition (often called state of repair) measures. As USDOT and transportation agencies consider performance, they could look at travel time reliability, vehicle trips generated, vehicle miles traveled, delay and others. For transit, measures can include on-time performance, access to jobs within 45 minutes and fare-box recovery.

Interpreting and responding to these indicators require careful consideration. For instance, interpreting conditions data to mean that jurisdictions must bring every asset to a state of good repair in its current design may miss opportunities to improve design, save money, or respond to new circumstances, such as population growth. In terms of bridge conditions, for example, such an interpretation could lead a DOT to rebuild a bridge with no shoulders or rebuild a highly congested two-lane bridge in the same form, rather than improve those circumstances.

In other cases the current infrastructure is overbuilt for present-day needs, which can be a challenge to agencies that are more experienced in expanding infrastructure than downsizing. Using the replacement of an asset as an opportunity for right-sizing and building a smaller road or bridge can speed project delivery and save money, both in terms of the capital expenses and maintenance. As an asset comes to the end of its useful life, it is important to consider its size, design and context to ensure that limited dollars are being spent as effectively as possible.

The City of Rochester, New York, is currently replacing an under-used 10-12 lane high-speed, below-grade expressway with an at-grade, traditional urban boulevard. The new design would reconnect the neighborhood street grid and help transform blighted, isolated neighborhoods. This project opens nine acres of land for new development to create jobs in an economically distressed city. It also eliminates the costs to maintain, rehabilitate or replace four lane-miles of underutilized expressway, three bridges and retaining walls.

A portion of Rochester's sunken Inner Loop highway closed permanently in December 2014. The city is replacing it with an urban boulevard.

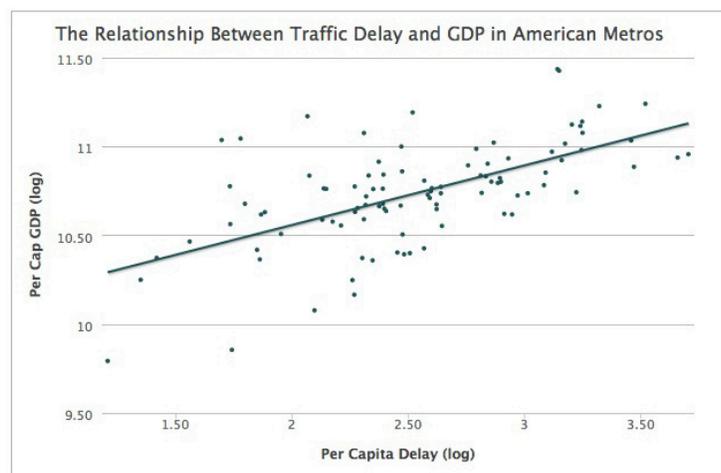
Source: www.cityofrochester.gov/InnerLoopEast/



For many years, the primary factor in evaluating success of a project or corridor has been level of service (LOS). Under that somewhat crude A-F grading system, LOS A describes traffic flows at or close to the posted speed limit and LOS F applies to roadways where vehicles move in lockstep with the vehicle in front of them and frequent slowing is required. The delay captured through the various LOS ratings is measured in seconds. While LOS is a top factor in the design of roadways, it does not indicate whether more people are getting to work safely or on time, whether they have access to education and jobs, and the effect of that roadway on surrounding areas and the economy.

The goal is naturally assumed to be a high LOS grade. This goal represents the assumption that slower speeds and vehicle delay hinder economic productivity. When tested, this assumption often fails. In fact, Eric Dumbaugh with Florida Atlantic University found that every 10 percent increase in traffic delay per person was associated with a 3.4 percent increase in per capita GDP.¹

Why might this be? For one reason, LOS says nothing about the area being traversed and whether it is a zone of high or low economic activity. LOS A does not necessarily refer to an area with a strong economy, nor does LOS F indicate a weak one. This information may point to the fact that congestion is a sign of economic activity and some level of congestion may be acceptable. If the goal of transportation projects is reduced congestion, LOS and congestion mitigation is useful. If the goal is to reduce congestion that creates a drag on the economy, the question then becomes what level of congestion is too much?



A sample of Eric Dumbaugh's counter-intuitive findings on congestion and GDP. See footnote #1 below for more information.

¹ Dumbaugh, Eric. "Rethinking the Economics of Traffic Congestion." The Atlantic Cities. Accessed June 1, 2012. www.theatlanticcities.com/commute/2012/06/defense-congestion/2118/.

The answer can differ depending upon the type of roadway. For example, a local street that is a destination point for retail, restaurants and public space probably should not be expected to move vehicles in the same way as a high-speed connector road or highway. In fact, a street that is meant to be a destination but has little traffic is not successful. Defining roadway purpose and then identifying an appropriate performance or congestion measure is key.

For example, the Sacramento Area Council of Government (SACOG) uses a congestion index that measures the amount of vehicle miles traveled in heavy congestion on a per capita basis. Heavy congestion is defined as when the volume of cars on the road outstrips its designed capacity. This measure allows SACOG to set priorities focusing on the biggest bottlenecks that affect the most people for the largest amount of time. SACOG uses the index to compare alternative futures as part of its long-range planning process: It compares index scores regionally with different levels of investment of transportation funding and project types, pinpointing areas that could benefit from more or less investment.

Another reason that LOS is just a single data point that should not dictate project design is that as speeds decrease, throughput often increases, moving more vehicles through the same corridor. From a budgetary standpoint — especially in an environment with limited funds — moving more people is a much better outcome. It is reasonable to expect person-throughput gains to be exhausted before transportation agencies consider costly expansions, especially considering today's tight budgets. The transportation field's singular focus on LOS often has driven up the cost of projects, requiring more right-of-way and wider roadways than are necessary.

“Although it is true that A is best and F is worst, LOS A is not necessarily a desirable goal.”

Overbuilt projects can in turn lead to other negative consequences and missed opportunities. For example, a focus on LOS usually leads to less friendly and safe conditions for pedestrians, cyclists and transit riders, further eroding the person-throughput potential; less safe conditions for motorists, as higher speeds lead to more severe crashes; and impediments to local economic development. The standards that govern high-speed expressways are not appropriate for arterial roads in residential areas or main street settings. High-speed roadways are often not suitable in complex urban settings where access to business is important and they can create too many crossings and conflicts to support high-speed travel.

DOTs and MPOs across the United States are beginning to recognize the tradeoff that comes with LOS: vehicle speed and space between vehicles for higher cost and at the expense of space for other modes or transportation or economic development of adjacent land. As the Florida Department of Transportation (FDOT) puts it, “Although it is true that A is best and F is worst, LOS A is not necessarily a desirable goal.” Transportation professionals recognize the need for new measures that focus on increasing person-throughput and balancing modes. For this reason, some DOTs and MPOs are beginning to replace LOS with time spent in congested traffic; travel time predictability; total travel time; and a multimodal level of service (MMLOS). MMLOS represents a broad concept but at its core, signifies an attempt to expand how transportation problems — and solutions — are defined by accounting for additional modes and the considerations that accompany them.

Table 1 on the next page provides a wide range of metrics to understand the interplay among all modes. It includes a mix of conventional measures, such as delay, and newer measures, such as Multimodal Level of Service (MMLOS), time spent in congested traffic, travel time predictability and total travel time.

Table 1: Recommended system performance measures

Measures that are starred are required by MAP-21.

Travel Time Reliability, *for freight and passengers, measured by a buffer index*

Travel Time, *for freight and passengers*

Congested Vehicle Miles Traveled, *measured by vehicles miles traveled spent on roadways with vehicle-to-capacity ratio over 1*

Congested Vehicle Miles Traveled Per Capita

Delay Per Capita, *for expressways*

Multimodal Level of Service

Auto Trips Generated

Transit On-Time Performance

Mode Shift/Mode Split

Pavement Condition*

Bridge Condition*

Transit Condition*, *measuring vehicles, stations, facilities and guideway components*

CASE STUDIES: SYSTEM PERFORMANCE

USING STATE OF GOOD REPAIR TO TARGET INVESTMENTS *Delaware Valley Regional Planning Commission*

Covering nine counties in Pennsylvania and New Jersey, the Delaware Valley Regional Planning Commission (DVRPC) reoriented its long-range transportation planning process to include data-driven analysis that aims to achieve and maintain a state of good repair.

In a state with aging infrastructure and a disproportionately high number of bridges in disrepair, DVRPC began by developing a formula that estimated the funding needed to 1) replace one percent of the bridge deck surface per year and 2) rehabilitate the bridge deck at the same rate. Planners calculated future bridge needs using a linear regression that took into account 25 years of bridge inspection data and projected costs based on the most recent TIP. This allowed DVRPC to tally the costs of achieving and maintaining a state of good repair, rather than merely assume a flat rate of investment.

The DVRPC drew from state DOT bridge and pavement management systems to estimate preservation needs, identifying specific projects and their costs that should occur as part of the Connections 2040 long-range transportation plan for each facility. Then the agency prioritized the projects identified for each facility based on condition, automobile traffic, truck traffic and bypass length, among others. Using this prioritization, the DVRPC identified which projects would be implemented under different funding scenarios, allowing for an estimated state of repair for each facility in 2040.

According to the DVRPC, this analysis allowed the region's stakeholders to understand the impact of allocating different amounts of funding to these project categories. It demonstrated the opportunity cost trade-off between investing in system preservation, operational improvements or system expansion. The process borrowed analytical techniques from the National Cooperative Highway Research Program's Estimating Life Expectancies of Highway Assets but did not require additional data sources to institute its performance-based approach.

CALCULATING MULTIMODAL LEVEL OF SERVICE

Florida Department of Transportation

The Florida DOT (FDOT) has developed its own methodology for determining a multimodal level of service (MMLOS).¹ FDOT's Quality/Level of Service Handbook grades corridors based on:

- Auto LOS;
- Bicycle LOS (as determined by average effective width of the outside through lane; motorized vehicle volumes; motorized vehicle speeds; heavy vehicle (truck) volumes; and pavement condition);
- Pedestrian LOS (as determined by existence of a sidewalk; lateral separation of pedestrians from motorized vehicles; motorized vehicle volumes; motorized vehicle speeds);
- Transit capacity and LOS (measured by standards adapted from the Transit Capacity and Quality of Service Manual, particularly service frequency and bus headway).

This is applied in all areas — urban, suburban and rural. For an extensive list of other ways to measure different components of MMLOS, visit the Victoria Transport Policy Institute at www.vtpi.org/tdm/tdm129.htm.

RETHINKING CONGESTION MEASURES

Various

Congestion index

The Sacramento Area Council of Governments (SACOG) has developed an index measuring the per capita vehicles miles traveled in congested conditions on a peak hour trip. Congestion is defined as a volume-to-capacity ratio of more than 1, or when the number of cars exceeds the number the roadway was designed to accommodate. SACOG uses the index to target funding to areas where travelers are losing a great deal of time in the worst congestion, rather than looking at all delay as equally problematic. Because the measure is per capita, the area also gives itself credit for removing people from traffic by providing alternative forms of travel and moving destinations closer to home.

1 For more information, see www.dot.state.fl.us/planning/systems/programs/SM/los/pdfs/2013%20QLOS%20Handbook.pdf.

Travel time reliability

SACOG also uses an index showing travel time reliability. A key determinant of whether congestion is an irritant or serious disruption is its effect on reliability – the relative predictability of travel times, which helps manage expectations among travelers. In other words, even for people who encounter traffic during peak hours, a transportation system may be meeting expectations if commute time does not vary day-to-day.

The Federal Highway Administration (FHWA) recommends that reliability be measured using a buffer index – what FHWA calls “the extra time (or time cushion) that travelers must add to their typical travel time when planning trips to ensure on-time arrival.”

The Southern California Association of Governments (SCAG) has incorporated travel time reliability into their analysis of goods movement in the region. SCAG used buffer time to identify the additional time that must be factored into a trip to ensure goods reach their destination on schedule and then to evaluate the benefits and costs of various freight transportation investments.¹

Auto trips generated (ATG)

ATG aims to capture the total automobile trips added to a transportation system by a transportation project or new development rather than rely on LOS rating, which measures how many cars move through a particular intersection (i.e., how much congestion a project creates). San Francisco adopted ATG to evaluate the environmental impacts of proposed projects, along with a mitigation fee strategy, after recognizing that its reliance on LOS overstated congestion; adding time, cost and money to project review and conflicted with the goals of its Transit First policy.² Using ATG, San Francisco avoids costly additional environmental review for projects such as bike lanes or bus-rapid transit, that do not add any new automobile trips and create a more efficient transportation system.

Total travel time

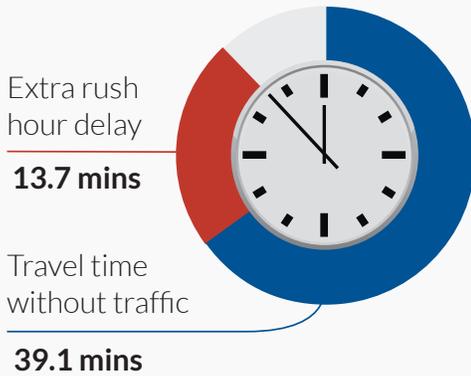
The travel time index (TTI) in the Texas Transportation Institute’s Urban Mobility Report (UMR) is the most commonly used congestion performance measure. It measures the ratio of average peak hour travel times to average free flow travel times, which may be above the posted speed limit. This is a dubious goal that doesn’t match expectations – most travelers do not expect the roadway to be as open during rush hour as in the middle of the night. In fact, such an investment would lead to unused capacity for most hours of the day, which is difficult to justify in a constrained budget environment. The UMR estimates the cost of traffic congestion (\$87.2 billion annually) and characterizes it as a growing problem between 1982 and 2010. By contrast, CEOs for Cities claims the TTI “overstates the cost of congestion by about \$49 billion.” Incorporating considerations such as travel distance and mode choice to determine total travel time creates a more realistic picture of how much time people spend in congestion and the traveler’s experience. The CEOs for Cities analysis illustrates the different conclusions that result from accounting for travel distance as part of congestion and its cost: Using TTI, Chicago (TTI of 1.25) has a slightly higher congestion score than Charlotte (1.20), suggesting that Chicago has slightly worse travel conditions than Charlotte. However, when trip distance is included, people in Charlotte spend 48 minutes in traffic per day, whereas people in Chicago spend only 33 minutes in traffic per day.

1 http://ops.fhwa.dot.gov/publications/tt_reliability/TTR_Report.htm

2 More information available at http://www.sfcta.org/sites/default/files/content/ATG_Report_final_lowres.pdf.

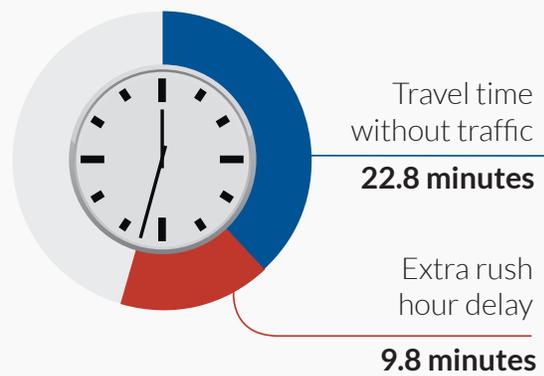
Atlanta Travel Time

Travel Time Index = 1.24



Chicago Travel Time

Travel Time Index = 1.25



Though their Travel Time Index was almost identical in 2012, in Chicago, the average trip to work took 35.6 minutes – 38% less time than the 57.4 minutes it took Atlantans to drive to work. A major reason is that Chicago drivers do not have to travel as far as drivers in Atlanta – 13.5 miles vs. 21.6 miles on average. Even during rush hour, Chicago drivers experience only 10.7 minutes of delay compared to Atlanta’s 14.8 minutes – a big difference to drivers but considered nearly identical under the TTI methodology.

Total travel time can be calculated using the following equation:

$$\text{Total delay per peak-period traveler} \times \text{TTI} / \text{TTI} - 1.$$

Most state DOTs do not consider distance of travel in their transportation planning because they do not have land-use authority. However, a coordinated approach can lead to more cost-effective solutions and partnership with other agencies, like siting housing closer to jobs and existing infrastructure rather than embarking on more expensive roadway expansions to connect dispersed residential areas and job centers. By integrating development and transportation decision-making, states and regions can identify low cost solutions to congestion and prevent the transportation agency from being forced to bear the full responsibility of fixing problems created by the poor siting of development with its limited transportation budget.¹

The Travel Time Index would tell us that commuting in Denver is far worse in 2007 than it was 25 years ago. (TTI in 2012 was 1.27, still worse than 1982.)

Yet the average travel time in 2007 compared to 25 years ago is about the same. Rush hour delays have almost tripled, but the travel time without traffic (a good proxy for the average length of trips) actually decreased by almost ten minutes.

More people live near transit today in Denver than 1982, and with accompanying investments in new housing and jobs near transit, more people have shorter trips to get to work each day.

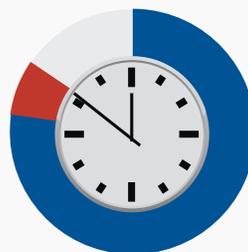
Denver 1982

1.09

50.6 minutes

46.4 mins

4.2 mins



Travel Time Index

Average travel time

Travel time without traffic

Extra rush hour delay

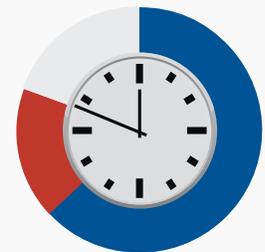
Denver 2007

1.31

49.6 minutes

37.9 minutes

11.7 minutes



¹ Joe Cortright, Impresa and CEOs for Cities. September 2010. Measuring Urban Transportation Performance: A Critique of Mobility Measures and a Synthesis. Retrieved August 12, 2014, from www.ceosforcities.org/pagefiles/MeasuringUrbanTranspoTechnicalReport-FINAL.pdf.

Other resources

National Bridge Investment Analysis System (NBIAS), a free software tool from the Federal Highway Administration, assesses anticipated bridge investments needs and outcomes across a system. Available at www.fhwa.dot.gov/tpm/resources/nbias.

Highway Economic Requirements System – State Version (HERS-ST), a free software model from the Federal Highway Administration, evaluates highway investment through an incremental cost-benefit analysis that considers travel time, safety and vehicle operating and emissions costs and performance objectives. Available at www.fhwa.dot.gov/infrastructure/asstmgmt/hersrprep.cfm.

Safety

Improved transportation safety — reducing traffic-related deaths and injuries — represents a core goal of transportation policy and investments. Better safety outcomes are often achieved by correcting roadway design that contributes to dangerous conditions and targeting high- and mid-risk locations, as well as building projects that reflect the needs of all users.

Table 2 on the following page outlines the recommended measures of safety — most of which coincide with the safety measures required by MAP-21. Choosing what measures to use represents a key decision in performance-based management.

The MAP-21 safety measures are quite robust and address several important areas. Bicyclists were added by Congress in the FY2015 omnibus spending bill and distracted driving-related deaths may be added in the next few years. Implementing these measures, however, requires coordination among multiple levels of governance to create consistent measures: State Highway Safety Administrators implement the NHTSA measures; state DOTs and MPOS implement the FHWA measures; and transit agencies and state DOTs implement the FTA measures.

An additional challenge within safety is accounting for trips not taken because of safety fears. Strategies to address safety for motorized vehicles may often increase danger for non-motorized users, who may adapt by avoiding non-motorized travel all together. For instance, building wide lanes for vehicles so that drivers can weave at high speeds aims to improve safety for motorists. The consequence of that strategy is wide, higher speed streets are harder for pedestrians and cyclists to cross. Encouraging high-speed travel for motorists creates an unfriendly environment for those outside of a car. The result tends to be that people stop walking and biking out of fear and the number of fatalities among these modes decrease. But the reduction in fatalities should not be seen as a safety success. In this case, fewer pedestrians and cyclists indicate degraded — not improved — safety.

To account for this interplay in performance management, an agency should look at use rates and trends within one corridor or between corridors to determine whether design differences have changed non-motorized use in that corridor. And it is important to recognize that the corridor is the best scope to consider non-motorized safety. Because roadway speeds and design have such a strong impact on non-motorized use and crashes, safety

problems are rarely found in hotspots (as they are for vehicle accidents) but rather along corridors. Therefore, data should be analyzed for both dangerous hotspots and corridors.

Economic health and resilience

Table 2: Recommended safety measures

Measures that are starred are required by MAP-21.

- **Total Fatalities***
- **Total Serious Injury***
- **Total Crashes***
- **Fatality Rate*, per VMT**
- **Serious Injury Rate*, per VMT**
- **Crash Rate*, per VMT**
- **Unrestrained Passenger Fatalities***
- **Fatalities Involving Drunk Drivers***
- **Motorcyclist Fatalities***
- **Unhelmeted Motorcyclist Fatalities***
- **Speed-Related Fatalities***
- **Young Drivers Involved in Fatal Crash***
- **Pedestrian Fatalities***
- **Bicycle Fatalities**
- **Unrestrained Child Occupant Fatalities***
- **Fatalities Involving Texting while Driving**
- **Observed Seat Belt Use***

Economic health can be assessed based on a variety of measurable factors that contribute to economic competitiveness at the local, regional and state levels, including:

- Business access to freight service, as measured by buffer time;
- Conserving valuable land, as measured by the share of development occurring in designated growth areas and/or acres of agricultural and other important lands conserved;
- Creating employment opportunities, as measured by the number of long-term jobs created;
- Generating wealth, as measured by regional GDP;
- Redevelopment opportunities, as measured by vacancy rates;
- Increasing access to the labor pool, as measured by households within a 45 minute commute of jobs; and
- Community affordability, as measured by percent of household budgets spent on housing and transportation.

As a measure, business access to freight services demonstrates how reliable transportation systems and

improved access to markets move goods efficiently and conveniently. The MAP-21 freight performance measure looks only at how freight moves on the Interstate system. Though important, that represents just one component of a vast freight transportation system. These standards fail to adequately address how freight moves on non-Interstate roads, especially first and last mile issues, where the roads are not always well designed to accommodate trucks and their deliveries. Other options to move freight — such as rail — and options that remove commuters from important freight corridors can help drive down the cost of goods movement, thereby making a region more economically competitive.

Fiscal health refers to considerations that create long-term financial stability for state and regional governments. These considerations include:

- Avoided infrastructure costs associated with prioritizing projects in areas where utilities already exist, as measured by impact on infrastructure/utility capacity;
- Availability of other funds to offset project costs;
- Long-term maintenance costs of completed projects, as measured by the ability to maintain the project over its lifecycle; and
- Expansion of the local tax base through additional revenues from real estate.

Table 3: Recommended economic health and resilience measures

- **Return on Investment/Benefit-Cost Analysis**
- **Availability of Matching Funds**
- **Ability to Financial Maintain Project over Lifetime**
- **Jobs Created**
- **Vacancy Rates**
- **Tax Yield per Acre**
- **Regional Gross Domestic Product**
- **Transit Frequency**
- **Associated Infrastructure Cost**
- **Industrial Access to Freight Services**

CASE STUDY: ECONOMIC HEALTH & RESILIENCE

TRANSPORTATION RETURN ON INVESTMENT *An Analysis for the Minnesota Department of Transportation*

Looking to build a case for raising new state revenue in the Minnesota legislature, the state's DOT sought expert help to develop a cutting-edge method for assessing the return on investment (ROI) for their transportation projects. MnDOT wanted a way to quantify and compare a full range of possible benefits, including economic development, social equity, environmental protection, public health and placemaking.

With support from the McKnight Foundation, MnDOT tapped Smart Growth America (SGA) and Economic & Planning Systems, Inc. and launched an effort to develop ROI in spring 2014. The team will develop and test quantitative metrics for hoped-for outcomes as they apply to capital reconstruction and expansion projects, such as corridor pavement reconstruction, urban and main street pavement reconstruction, congestion mitigation and capacity development projects.

In addition to making the case for state transportation funding, MnDOT officials are now considering ways to build the ROI analysis into future decisions about how they design, prioritize and allocate funding.

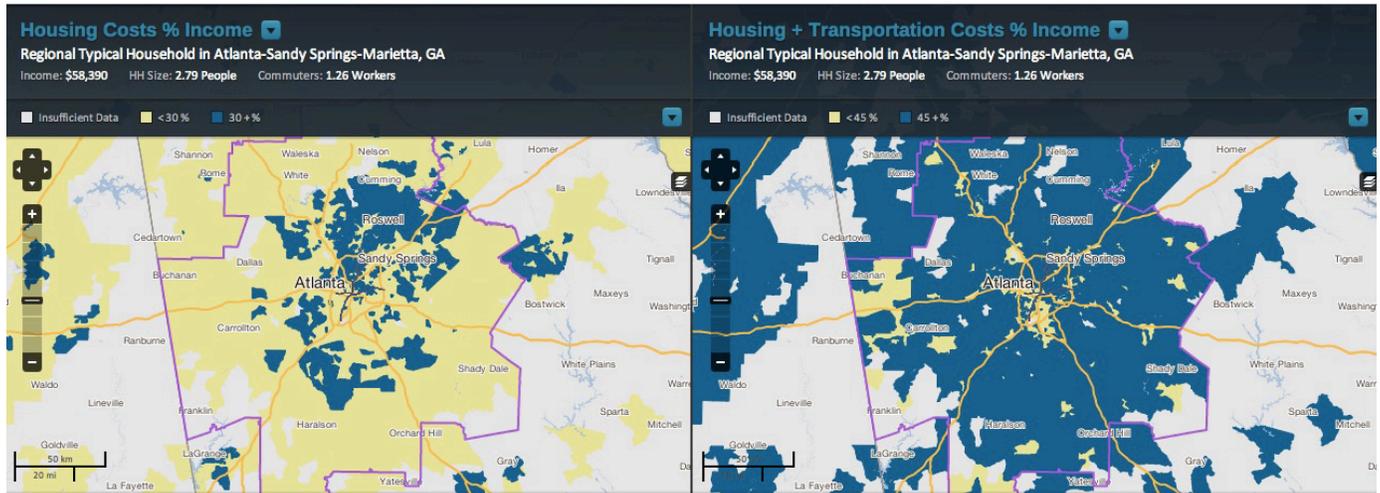
For more information, see "Assessing Return on Investment in Minnesota's State Highway Program" (Smart Growth America, 2013). <http://www.smartgrowthamerica.org/technical-assistance-2/dot-innovation/minnesota-2014/>

Access to destinations

Access to destinations refers to how well transportation projects provide connections to employment centers, education and services; minimize household transportation costs; and complete links within the transportation network.

Examining combined housing and transportation costs aims to capture overall community affordability and household cost-burden. After housing, transportation often comprises the largest expense for households. In the last decade, policymakers have started to recognize the shortcomings of only supporting housing affordability; lowering the cost of transportation from home to work and other destinations also contributes to upward mobility, long-term financial success and general quality of life among residents.

Land-use patterns and the presence of transportation options, particularly transit or biking/walking connections to transit and market dynamics all influence the combined cost of housing and transportation. Several publicly available tools capture combined housing and transportation costs, including the Center for Neighborhood Technology's H+T Affordability Index (available at <http://htaindex.cnt.org/map/>) and the U.S. Department of Housing and Urban Development's Location Affordability Index (available at www.locationaffordability.info/) developed in partnership with USDOT.



A sample map set from the H+T index of Atlanta shows the difference between housing costs as a percentage of income at left and housing + transportation costs at right. The yellow is considered affordable. From the Center for Neighborhood Technology's Housing + Transportation Index: <http://htaindex.cnt.org/map/>.

A 2010 Natural Resources Defense Council study draws a direct link between locations with easy “access to an array of transportation options to meet their daily travel needs” and lower mortgage foreclosure rates. The study concludes that residents in such “location-efficient” areas are better prepared to weather economic shocks, especially higher gas prices. It also finds that the likelihood of mortgage foreclosure increases as vehicle ownership levels increase.¹

Similarly, lack of access to employment centers hinders upward mobility — the ability to move up the economic ladder. As the Brookings Institution notes “the typical metropolitan resident can reach about 30 percent of jobs in their metropolitan area via transit in 90 minutes.” However, the same study also underscores that these connections are not uniform across metropolitan regions: One-quarter of low- and middle-skilled workers lack transportation options to access employment centers. The Equality of Opportunity Project, a joint effort of researchers at Harvard University and University of California-Berkeley, also finds that location shapes access to opportunity. It suggests that racial segregation, economic segregation, family structure and social capital have the strongest influence on upward mobility. In many cases, the commuting zones with the lowest rates of upward mobility are in sprawling metro areas, which lack connections to public transportation or other transportation options that make a community more affordable.

Tracking whether investments support better connections to job centers can be accomplished with measures such as transit access and connection to jobs.

1 Henry, J. and Goldstein, D. (January 2010). Reducing Foreclosures and Environmental Impacts through Location-Efficient Neighborhood Design. Natural Resources Defense Council. Retrieved August 27, 2014, from www.nrdc.org/energy/files/LocationEfficiency4pgr.pdf.

Table 4: Recommended access to destinations measures

- **Housing + Transportation Household Expenditure**
- **Connection to Jobs**, including separate target for low income households
- **Connection to Activity Centers**, such as schools, medical, etc.
- **Transit Access**, measured by transit within ½ mile of homes
- **Jobs Within 45 Minute Transit Trip**
- **Walkscore**
- **Bikescore**
- **Number of Residents Using Carpool and Vanpool Services**
- **Number of Residents with Telecommuting Option**

CASE STUDY: ACCESS TO DESTINATIONS

LOCATION AFFORDABILITY INDEX
USDOT and HUD

This online tool enables decision-makers to better compare household affordability by location, neighborhood and region. Traditionally, housing has been considered “affordable” when it accounts for no more than 30 percent of a household budget. The picture can change significantly when housing and transportation are considered together. The Location Affordability Index considers 45 percent of total household income the threshold of affordability for the combined costs.

Taking Cleveland, Ohio as an example, the Index shows the median household with two commuters spending only 27 percent of its income on housing. However, housing and transportation costs together comprise 49 percent of the same household’s income, exceeding the 45 percent affordability threshold.

This tool expresses location affordability in both dollars and as a percent of income, and enables users to modify households to reflect different income-levels and household composition. It reports data for a specific street address, zip code or county. Data can be downloaded and used as part of existing spatial analysis. The cost is derived from estimates of vehicle ownership, annual vehicle miles driven and annual transit trips, and it draws data from the U.S. Census Bureau – specifically from the American Community Survey and Longitudinal Employer-Household Dynamics.



Cleveland, Ohio data from HUD's Location Affordability Index. www.locationaffordability.info/lai.aspx.

Public health and environment

Public health criteria measure how transportation systems promote healthier, more active lifestyles and mitigate negative environmental issues — or conversely, reinforce existing health disparities. These public health metrics focus on creating better air and water quality by reducing pollutants and understanding the existing health conditions of people living near a proposed project and the possible ways to promote better conditions.

Minimizing stormwater runoff and the associated pollutants not only protects public health but also often achieves this protection at a lower cost than treating the runoff generated by transportation infrastructure. Several MPOs and states recognize the need to consider how transportation projects affect stormwater management goals, although they capture this measure in variety of ways. For instance, the Puget Sound Regional Council scores higher the projects that preserve natural hydrological functions that naturally manage stormwater or projects that reduce stormwater runoff.

Integrating commonly used health indicators, such as minutes of physical activity and rates of chronic disease, into transportation planning helps build healthier, more productive communities. For example, the Nashville Area MPO is using health impact assessments (HIAs) as part of its transportation planning process to better understand this link. Broadly, HIAs are “a combination of procedures, methods and tools by which a policy, program, or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population (Gothenburg Consensus Paper, 1999).” The results of these assessments can be used to demonstrate the need for new policies, change programming decisions (including funding allocations and project selection) and create a baseline to monitor future progress in influencing health.

Table 5: Recommended public health and environment measures

- **Minutes of Physical Activity Per Day**
- **Chronic Disease Rates by Census Tract**
- **Impervious Surface Area**
- **Mobile Source Emissions***
- **Energy Efficiency of Transportation Facilities**, *such as street lights, signals, facilities, etc.*
- **Fuel Use per Vehicle Trip**
- **Number of Residents Using Carpool and Vanpool Services**
- **Natural Resource/System Disturbance**
- **Recycled Construction Waste**

CASE STUDIES: PUBLIC HEALTH AND ENVIRONMENT

INTEGRATED TRANSPORT AND HEALTH IMPACT MODELING TOOL (I-THIM)

Available by request from the UK-based research institute, Centre for Diet and Activity Research, the Integrated Transport and Health Impact Modeling Tool (I-THIM) can develop scenarios, estimate changes in exposure and project health outcomes. Transportation professionals at the Metropolitan Transportation Commission, which plans, coordinates and finances transportation for the nine-county San Francisco Bay Area, are using I-THIM to compare the effect of travel patterns, as well as the effect of proposed interventions.

USING HEALTH IMPACT ASSESSMENTS

Nashville Area MPO

The Nashville Area MPO in 2010 adopted its 2035 Regional Transportation Plan, with three overarching goals: 1) a bold new vision for mass transit; 2) support for active transportation and walkable communities; and 3) preservation and enhancement of strategic roadways. In scoring projects for funding in the plan, the MPO has incorporated the criteria to be evaluated in health impact assessments. Planners award points for improvements to health and the environment, according to the degree to which the project:

- Provides increased accessibility for low-income & minority communities;
- Corrects ADA non-compliance;
- Provides transportation choices for the disabled;
- Provides transportation choices for aging population;
- Provides transportation choices in health impact areas;
- Promotes physical activity;
- Reduces vehicle hours traveled/vehicle miles traveled; and
- Reduces vehicle emissions.

It deducts points for potential negative impacts on health and the environment, as measured by:

- Project located close to natural resources/environmental constraints; and
- Project located close to socio-cultural resources.

The Nashville Area MPO also restructured its funding sources to spend more on active transportation projects. In its Urban Surface Transportation Program Investment Strategy, the MPO allocates 60 percent of its funding to location-specific roadway improvements, including 15 percent going to sustainable development and multimodal options and 10 percent going to health and environment, safety and security and congestion management. The remaining 40 percent is spent on local investment (15 percent); system preservation and enhancement (15 percent); and freight and goods movement (10 percent).

As part of its FY2014-2017 Transportation Improvement Program, the MPO plans to spend more than \$12 million in federal funds on active transportation projects and \$115 million in federal funds over the next 25 years as part of its Active Transportation Program.

In the final 2035 Regional Transportation Plan, 70 percent of the approved roadway projects include active transportation infrastructure (compared with 2 percent of projects in its previous plan).

Applying performance measures

Performance based decision-making

Not every state DOT, MPO or municipality will use all of the same measures, nor will they use them in the same way. But for performance measures to be effective, they should:

- Represent widely supported goals for the transportation system;
- Be clearly communicated to the public in terms of how they are employed and the region's progress under those measures;
- Generate dialogue with stakeholders and the public to bring more clarity to, if not ownership in, project selection and decision-making;
- Be used to test assumptions and modeling to determine if projections are accurate; and
- Impact how projects are prioritized for funding.

Long range planning

The Salt Lake City area used performance measurement beginning in the late 1990s through an effort called Envision Utah. Planners developed four possible scenarios for how to invest in infrastructure to manage the growth in the region:

- Business-as-usual (sprawling);
- Growth following existing municipal plans (still sprawling, but less so);
- More compact, focusing growth around town centers and walkable areas; and
- Very compact, requiring half of all new growth to be within existing urban areas.

These scenarios were then compared based on their performance in associated infrastructure costs, land consumption, transportation choices, housing and transportation costs to households, air quality and others. The selected scenario – the third one – was chosen with unprecedented public involvement through workshops, public meetings, comments through a website and surveys. The winning scenario enjoyed strong support in the region, making it easier for the community to implement and fund the projects that flowed from it.

TAKING AN ASSET MANAGEMENT APPROACH

Pennsylvania DOT

Performance measures are central to the concept of asset management, defined as “a strategic and systematic process of operating, maintaining, upgrading and expanding physical assets effectively throughout their lifecycle...based upon quality information and well-defined objectives.”

The Pennsylvania DOT (PennDOT) uses performance measures to help allocate formula funds for highways, bridges and railroads, an analysis that accounts for vehicle miles traveled, lane miles, bridge deck area and population, among others factors. PennDOT uses its performance measures to set baselines for its transportation assets and drive improvement from those baselines. It uses a three-tiered rating system to track its internal rate of improvement: above, at or below statewide goal. It draws from state data sources for bridge and roadway conditions to help understand needs across the state, as well as track its statewide progress.

This approach enables the agency to identify and focus funding decisions on assets that are in danger of falling from “good internal rate of improvement” to “fair internal rate of improvement”, or to boost “fair” segments. PennDOT emphasizes system preservation, considering reconstruction as funds become available.

PennDOT established a new Asset Management Division which aims to strengthen PennDOT’s asset management approach at the system, program and asset levels and coordinate more effectively with its regional partners. The Asset Management Division will develop the state’s asset management system, including creating guidelines for its application, developing maps and data systems as well as auditing and training procedures.¹

Prioritizing projects

The federal performance management system required by MAP-21 will be applied to Transportation Improvement Program and State Transportation Improvement Program. As MPOs and state DOTs identify the suite of projects to be included, they also will be required to establish targets under each of the measures specified by MAP-21 and any additional measures agreed to locally. These measures should assist agencies in engaging the public, setting priorities and improving projects. But for this to be the case, agencies need to make clear how projects are prioritized and selected for funding, the outcomes expected from each and which performance targets they support.

Every state, MPO, city and county has considerably more projects than funding. Measuring projects against a list of regional goals and performance measures is a smart way to target limited dollars by prioritizing the projects that bring the greatest outcomes. However, thinning a list is not easy to do, especially in a political environment. For political and public buy-in, it is essential that agencies use a transparent process for selecting projects that is clearly understood before the projects are selected.

¹ Wasserman, D. (2012, May). North Carolina’s transportation reform: Prioritization, outreach and reality. Presentation at TRB Planning and Programming Conference, Denver, CO. Retrieved November 17, 2014, from <http://onlinepubs.trb.org/onlinepubs/conferences/2012/MakingProgress/presentations/3pWasserman.pdf>.

One method for doing so involves analyzing the business case for the project through an economic analysis, like benefit-cost (BCA) or return on investment (ROI) analysis. This can be a useful way to clearly differentiate projects based on ratings that consider all of the benefits from a project to determine whether they justify the cost. It is important to be clear up front how this methodology will be applied, if chosen. For example, an agency could set a threshold rating and only consider projects that exceed it. Then a subsequent rating system would be used to prioritize within the finalists, in which harder to quantify benefits and issues like geographic equity, extent to which projects serve low income areas, rural-urban split, etc. would be considered. Another way is to pick only projects with the top ratios. Yet a third way is for the BCA or ROI to be one of the factors or criteria considered in picking projects.

It is important to understand that BCA and ROI can be biased towards benefits that are quantifiable. For example, there is clear agreement on how to quantify the value of time saved, but not the quality of time spent. If an area has found through surveys that their commuters prefer commute time when they can stay connected or the quality of time spent walking or biking, this could be more difficult to quantify and capture in the BCA.¹ If a state or region has set high priority goals that are not easily quantified, they should ensure that their evaluation process captures those priorities just as well as the others.

Another approach is scoring projects based on their performance within each priority area. Agencies should state clearly and publicly how scoring would be conducted. As an example, an agency might award up to 30 points for bringing an asset into a state of repair, 30 points for safety improvements, 10 points for congestion reduction, 10 points for improving access to jobs for low-income households, 10 points for air quality improvements and 10 points for local matching funds. As with the economic analysis discussed above, a threshold score could be required to develop a list of finalists that is further culled for geographic diversity or other equity issues. Or the top scoring projects could be chosen for funding.

This approach is attractive because it puts easily quantifiable and harder-to-quantify benefits on par with one another. However, there is a tendency to make these systems very complex, by trying to capture every possible consideration, so that winning scores come down to fractions of a point. Simpler schemes are easier to use and to explain to the public.

Also, once an agency uses numbers, there will be an expectation that the highest score wins. If issues like geographic equity need to be considered after the scoring, it is very important to make extremely clear that the score is not the final word and there is a further review that is essential to selection.

A final way to capture benefits is with clear but qualitative ratings. Instead of scores, an agency could assign ratings (e.g., strong, fair or weak) to projects within priority areas, such as economic, environmental, safety and equity benefits. Then projects that rate as strong in three or more areas could then be considered against their costs, economic analysis, local or private funding match, geographic equity and other distribution issues.

1 <http://www.washingtonpost.com/news/to-your-health/wp/2014/09/15/the-case-for-walking-or-cycling-or-taking-the-train-to-work/>

This provides equal footing to quantifiable and hard-to-quantify benefits, though the risk is that some will see it as less transparent than using scores. If it's unclear how a project gets a high rating as opposed to a fair rating then this process may not obtain public trust.

Regardless of the scoring scheme, it is important to use a feedback system that makes clear to project sponsors and supporters how projects could be improved to be move up on the priority list. Fundamentally, the process must be open and well understood by policymakers, the public and stakeholders.

The Metropolitan Transportation Commission (MTC) conducts a project-level performance assessment for all potentially eligible projects. Low-cost projects receive a qualitative analysis to screen for how well they support the policy goals agreed to in their regional transportation plan. This includes 11 performance measures with quantitative targets that are organized within the “Three Es” of sustainability – economy, environment and equity. High-cost projects are also submitted to a quantitative, benefit-cost analysis.

This analysis helps to identify outlier projects – the ones that most and least support the region's goals. With this information, MTC can identify which projects to exclude and why. However, in terms of setting final priorities for the projects included in their plan, that analysis includes a consideration of local priorities or other qualitative factors that may outweigh quantitative performance. Their process is fully explained to the public in their regional transportation plan, Plan Bay Area.¹

Project optimization

All projects offer a range of options with different costs, corresponding to different levels of value. However, the importance of understanding alternatives based on the value-to-price ratio is often overlooked. Frequently, one objective is given as an absolute mandate (e.g., traffic flow), which must be met at all costs. This approach makes little sense in the context of a constrained budget. Performance targets and priority setting can be used in project development and alternatives analysis to better understand the return on a proposed investment and to get the greatest benefits from a project for the least costs.

Facing a list of projects that exceeded the available funding by nine times, the Tennessee Department of Transportation (TDOT) audited its project lists for alternatives with large reductions in project costs that entail few reductions in project benefits. For example, two intersection turn lane projects that cost \$500,000 may provide 80 percent of the congestion relief of a \$20 million corridor-widening project. TDOT also prioritized projects with strong partner equity, giving priority to communities that offset project costs to TDOT through local dollars. As a result, TDOT saved more than \$171 million on the projects audited.

Feedback loop

Transportation agencies do their best to project outcomes for each investment and cannot be expected to get those projections exactly right every time. Yet performance measurement can help them to get closer each time by comparing observed outcomes against the modeled projections to determine whether an area's models and assumptions are correct. When gaps are found between expectations and results, models can be improved and assumptions updated to assure policymakers and the public that future projections and promised outcomes are more likely to be accurate.

1 <http://planbayarea.org/plan-bay-area/final-plan-bay-area.html>

Finally, no matter how performance measures are applied, the projections and results must be clearly communicated to the public in order to obtain the full benefits of the process — public confidence and buy-in. Dashboards are a good way to communicate an agency’s goals and accomplishments. Virginia Department of Transportation uses a dashboard to demonstrate its progress in safety, conditions and performance as well as project delivery and financial management. (See an example of the Virginia dashboard in the Introduction.)

However, a dashboard alone is not performance management. A dashboard can communicate existing conditions and goals even if those goals are not being used to prioritize projects that move the ball forward in those areas. Incorporating performance goals into project prioritization is necessary for true performance management.

CONCLUSION

Many are fearful of measuring transportation performance and using those measurements to inform decision-making because it could show the public that the outcomes they expect are not possible with existing financial resources. The concern is that this realization may cause the public to lose faith in the program. But the reality is that if the public's expectations are too high, they are going to be disappointed with the transportation program's results anyway. In many places this is happening already. After decades of promises that the next road widening would end congestion and traffic continuing to worsen anyway, the public can doubt that the transportation program can deliver what they want.

Transportation performance measurement shows the public clearly what each increment of infrastructure funding can buy and how some projects provide benefits in some areas while creating challenges in others. The transparency inherent in performance measures can bring the public in to this discussion in a productive way, increasing their confidence and buy-in. But to do this effectively, states, MPOs and localities must be willing to measure what is important to the public even if it is outside of traditional transportation measures. And they must publicly measure themselves, test their assumptions and models, and make changes when they discover gaps between projections and results.

The public's expectations can be challenging. Residents may want the transportation program to deliver results in other sectors – like housing, economic development or the environment. Measuring these outcomes can be daunting considering that transportation agencies do not have full control over other sectors. They may not have access to the data needed to measure economic results of projects or housing and transportation affordability. But agencies that have taken on the challenge have found that data and better outcomes are available through partnerships. And those partners can bring additional resources as well.

States, MPOs and localities that challenge themselves to measure the performance of their investments can develop a track record of accountability and transparency, demonstrate greater return on investment and build public confidence. With that confidence, they will have a stronger claim on the limited funding resources available today.

Real-world highlights from performance-based management

State DOTs and MPOs across the United States — and the communities they serve — are beginning to realize benefits of using performance measures in significant ways. DOTs and MPOs are allocating their limited resources more efficiently, linking more funding to achieve stated goals, communicating tradeoffs to decision-makers more effectively and developing better measures to replace long-established (and often misapplied) standards. And they are getting results:

- By auditing its project lists, the **Tennessee Department of Transportation (TDOT)** identified large reductions in project costs that entail very few reductions in project benefits. As a result, TDOT saved more than \$171 million on the projects audited.
- By replacing an underused below-grade expressway with an at-grade traditional urban boulevard, the **City of Rochester, NY**, will create development potential among nine acres of land, reinstate connectivity to a distressed neighborhood and save money on maintenance.
- The **Nashville Area MPO** restructured its funding sources to spend more on active transportation projects — a direct connection to one of its three long-range transportation goals to “support for active transportation and walkable communities.” As a result, in the final 2035 Regional Transportation Plan, 70 percent of the approved roadway projects include active transportation infrastructure (compared with 2 percent of projects in its previous plan).
- The **Sacramento Council of Governments (SACOG)** uses a congestion index that measures the time spent driving in heavy congestion on a peak hour trip per capita. As a result, SACOG channels funds to address the biggest bottlenecks that affect the most people for the largest amount of time, pinpointing areas that could benefit from more or need less investment.



This report can be found online at <http://t4america.org/maps-tools/>