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Evaluating Complete Streets Projects:
A guide for practitioners

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The National Complete Streets Coalition, a program of Smart Growth America, is a non-profit, non-partisan alliance of public interest organizations and transportation professionals committed to the development and implementation of Complete Streets policies and practices. A nationwide movement launched by the Coalition in 2004, Complete Streets is the integration of people and place in the planning, design, construction, operation, and maintenance of transportation networks. To date, over 700 agencies have adopted Complete Streets policies.

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

For additional information, visit www.smartgrowthamerica.org/completestreets.

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Cover photo: Counting bicycles in Victoria, BC. Photo by John Luton via Flickr.

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Foreword from AARP

The State Advocacy & Strategy Integration team has created this Evaluating Complete Streets Projects tool kit in our ongoing efforts to assist AARP state offices and others in successful efforts to enact and implement Complete Streets policies. This tool kit will help transportation practitioners in their efforts to identify and establish performance measures to evaluate transportation projects. Performance measures are generating significant attention as policy makers look to allocate scarce transportation resources.

Introduction to this resource

Across the country, government agencies are working to meet residents' demands to be more responsive, transparent, and accountable in decisions and investments. Transportation agencies are not exempt from this call—and they face the additional challenges of dwindling capital and maintenance budgets. Performance measures, in the broad sense, provide a quantitative and, sometimes, qualitative indicator of potential or actual performance of a specific street, a corridor, or of the whole transportation network.

Performance measures are not new, but they have typically been used to review system-level outcomes specific to motor vehicles, such as pavement quality, congestion, and injurious crashes. Over the last decade, the National Complete Streets Coalition has promoted the use of performance measures that better reflect multimodal needs and that are relevant to individuals using the system. Expanding the range of performance measures and deploying them to understand individual projects allows transportation agencies to clearly connect investments to community goals. Ultimately, communicating how projects perform can bolster support among residents and elected officials for continued investment in Complete Streets efforts.

Performance measurement includes establishing performance targets, modeling impacts, and monitoring results. This document focuses on the final step: evaluating the results of projects. While some agencies have done multimodal analyses before and after completing a project, they are in limited company. But measuring conditions before a project and comparing the post-construction environment to that baseline can be the most valuable aspect of performance measurement. For elected leaders and residents, before-and-after analyses demonstrate how well a project achieved its intended goals. For transportation planners and engineers, measuring the actual results of projects allows them to make better-informed choices for future projects. The results may be rolled up into corridor- or network-wide measures that show the impact of an annual transportation budget and how a community is achieving its Complete Streets vision.

This resource, meant for agencies interested in but just beginning their project evaluation efforts, intends to:

- Provide general steps to take in evaluating projects.
- Discuss useful measures for common Complete Streets goals of access, economy, environment, equity, place, public health, and safety, and the metrics that a jurisdiction may use.
- Offer a few tips for using those measures to tell the story of a project once it is completed.
- Share further resources for those ready to dive deeper into the why and how of performance measurement for Complete Streets.

About transportation performance measures

Performance measures allow public agencies to align their decisions at each phase of project development and delivery with established community goals. The adage "what gets measured gets done" is helpful in understanding how performance measures affect results. Conventional transportation measures, focused on automobile movement, have resulted in projects that expand roadway capacity and speed.

Success in a Complete Streets paradigm means adopting different measures of success—what we want to get done must get measured. This shift requires agencies to adopt measures that reflect the quality of place and environment, that better relate to how people interact with and understand their community, that direct investments toward creating transportation systems that are comfortable and convenient for accessing jobs, health care, education, and civic life by foot, bicycle, and transit in addition to the automobile.

Performance measures, generally, can be interpreted to mean the data inputs used when:

- Undertaking long-range planning efforts
- Selecting projects to fund
- Performing an alternatives analysis—an evaluation of all reasonable options for a transportation project
- Considering specific elements when finalizing a project's design
- Evaluating the outcomes of a built project—the focus of this document
- Displaying the current state of a system, as with a dashboard

Scale matters. It is important to apply the right performance measures for the scale of the decision. Within the range of opportunities to align planning and design decisions, measures are applied at different scales: an intersection, a street segment, a corridor (including multiple intersections and some intersecting street segments), a regional network, and as part of a state or interstate system. Choose measures thoughtfully to avoid misinformation in decision-making and evaluating results. For example, measuring vehicular Level of Service (LOS) at just one intersection and concluding that a wider intersection or changed signal timing is the solution may cause bottlenecks elsewhere on the corridor, and will potentially reduce safety and quality of the environment for those walking or bicycling through that intersection. In another example, doing a before-and-after measure of the number of people walking or bicycling on a street segment alone may be misleading if the segment does not yet connect to a larger walking and bicycling network.

Distinguish between measured outputs and measured outcomes. Outputs are generally easy to collect, countable factors such as the change in crossing distance at an intersection, the amount of stormwater filtered via new plantings, and the number of people who engage in the planning process. Outputs are generally tangible evidence of a project's impact. They are directly caused by an agency's choices, such as a change in crossing distance or new bus stations. Outcomes, on the other hand, are the ultimate results of a project as it contributes to the larger environment. Outcomes include measures such as rates of chronic disease, rates of fatal or injurious crashes, and changes in economic activity. Jurisdictional collaboration and shared responsibility for influencing outcomes is necessary. Despite being more difficult to directly relate to transportation investments, outcomes tend to be more meaningful to the public and non-transportation agencies because they relate to the condition of the environment and the quality of one's experience within it.

Lessons in performance measurement

Early successes in and continued discussion of what Complete Streets performance measurement means has revealed several key lessons for agencies:

1. Data can help us make better decisions, but they are not a substitute for community vision adopted through consensus. Numbers may appear to be objective points of fact, but take on a subjective meaning when presented without context. For example, an agency may find that pedestrians have not suffered injurious crashes on a corridor and decide that street should not be prioritized for improved walking facilities. Yet, the reason there are no crashes may be that no one walks there because of perceived lack of safety or inadequate facilities. By focusing only on the data—zero crashes—the agency misses the real safety concerns residents may have. Take care in collecting and comparing data to ensure they support decision-making but are not the sole drivers.

2. Transportation investments can support broader community goals and efforts, but cannot be solely responsible for outcomes such as employment or property values. Even transportation-oriented outcomes, such as mode choice, are difficult to pin to a project on one street segment or corridor without alignment in land uses, economic development plans, and other transportation policies.

3. Performance measures can be simple. The transportation profession has used complex mathematics in its conventional performance measurement and continues to explore complex modeling and formulas that account for multimodal travel and denser or sparser development patterns. Some goals do require sophisticated metrics, but others can be much more simple. Each new tree planted, for example, is a move toward a goal of a greener community. Each block of new sidewalk fills a gap in the network. These are valid measures of success.

4. An over-reliance on quantifying everything and translating goals into monetary terms can over-complicate the process and delay needed infrastructure improvements. Demanding a strict monetary return on investment also can deter efforts to ensure equitable impact of investments. For example, a city may prioritize painting bicycle lanes where bicycle commuting numbers already are high because a cost-benefit analysis shows more people using the facilities per dollar spent. But that may leave out neighborhoods where more people would like to bike, but don't because facilities are not present, safe, or convenient. This specific cost-benefit analysis says the dollars spent per bicyclist is too high here. When goals are set through policy-making and plan adoption, appropriate evaluation measures should be discussed and set, including the understanding that hard monetary benefits may need to take a lower priority in achieving goals, for example, providing access to the bicycling network to more residents.

5. People respond to outcomes, but if well communicated, outputs can also resonate. By avoiding technical jargon and sharing why certain outputs can be meaningful, more residents will be able to understand what changed because of the investment. For example, identify outputs such as a shorter crossing distance because of new curb extensions or a median, improved crosswalks, and new signal heads. Then share them by connecting the outputs to a narrative that explains how these outputs can improve safety.

6. After evaluating a project, it is possible that the data gathered will not show a dramatic shift in some goal areas. This should not be interpreted as a failure. Instead, it should raise questions and shape ideas for how to tweak the project or modify future projects. Perhaps a different type of

facility would attract more types of people riding bicycles or that sidewalks needed to be a bit wider to better accommodate a restaurant's outdoor café tables. Not all projects will have dramatic results in all measures.

7. Transportation professionals in many communities note the lack of funds or standard tools to collect and use multimodal data points or other related data. However, it is most often institutional and organizational obstacles—not technical ones—that pose the greatest barrier. Existing practice and culture in individual agencies, or offices within the same agency, can make it challenging to implement Complete Streets priorities, especially if they collide with other needs and priorities. Sustained coordination and champions among upper management are necessary.

> "We should be aware of how our performance measures relate to the values and desires of the public which we serve. If there is a substantive disconnect between the recommendations that emerge from our performance measures and the projects sought by our stakeholders, then we are using the wrong performance measures."
>
> — Eric Dumbaugh, PhD, AICP, Jeffery Tumlin, and Wesley Marshall, PhD, PE in "Decisions, Value, and Data: Understanding Bias in Transportation Performance Measures" *ITE Journal*, August 2014

Basic steps in project evaluation

In deciding to undertake project evaluation, an agency should consider the following general steps to identify meaningful goals, gather appropriate data, and communicate findings:

1. Agree to goals and objectives of the project.
Establishing the purpose of and need for a capital project can be challenging, with different needs and desires expressed by residents, elected officials, and transportation leaders. Encouraging participation and dialogue during this step leads to consensus and allows each group to understand what is and what may not be possible. It is best not to come to the public to simply present pre-established goals. Instead, ask for their ideas and learn which measures are relevant to them. Knowing what the public cares about helps an agency communicate with them about the investments being made.

Clearly relate the purpose of a project to existing plans and policies. This step is especially relevant when projects are prioritized for funding and construction according to long-range plans or project selection criteria. Some projects may also contribute to citywide goals, such as building a specific number of accessible curb ramps each year or building out a network of bicycling facilities. A single project may not achieve some goals, such as improved physical activity or improved transportation safety, but can contribute to that goal when viewed in context of an entire funding program.

2. Determine the best ways to measure goals.
Once goals have been set, the next step is figuring out which data will indicate success. Ask community members what they would like to know about a project once it is completed and consider their responses when setting up data-collection practices. The most significant data may not be collected by the transportation agency. Explore alternative data sources; it is possible that another agency already collects relevant information. For example, some Business Improvement Districts may have sales data. The local police department, emergency responders, and hospitals will have information on injurious crashes. If no relevant data is already collected, decide which agency could collect it and what tools and funding resources would be necessary. Explore ways to engage community members in identifying potential tools or methods of analysis where appropriate.

3. Implement measures.
For each measure and standard of measurement, collect baseline data and establish an appropriate time frame for evaluation after completion. A best practice is to measure conditions one year before construction and then after one year and after three years. Ongoing, continuous data collection is appropriate for some measures, including the number of people using the street and by which mode.

Not all measures must be quantitative. Qualitative measures may be appropriate and more relevant to stakeholders. These results can be explained via a post-construction project narrative and with before-and-after photos. Collect quotes from people participating in the project outreach about how they experience the street and what they'd like. Take photos. Revisit the location during and after construction to collect additional interviews and photos of the completed project. Photos are an especially easy and low-cost way to demonstrate project impacts.

4. Share results.
While project evaluation is useful to the transportation agency tracking the actual results of its investments, it can be an even more powerful tool for explaining results to the public, elected officials, and partner government agencies. When communicating the impact of a project, transportation agencies should spend the time to attractively package the information, using a standard design and clear, concise writing. Share what was changed (the direct outputs) as well as the measured outcomes as they relate to a project's goal. Include color photos of the project showing what it looked like before and what it looks like now, preferable with people in the frame. Quotes from neighbors, community leaders, or business owners can help tell the story as well.

Project reports can be released one-by-one or packaged together for an annual report that also includes the total output and key outcomes of the year's investments. Either way, such reports should be easy to find online. Additionally, the raw data collected may be made available to the public as part of an open government initiative, allowing residents to analyze and use the information in new and helpful ways.

Useful measures and metrics for project evaluation

A community's transportation investments should advance goals established through planning processes and with representative input from residents. Common goals include providing access to destinations, supporting the local economy, ensuring environmental quality, providing vital public places, and improving safety for all travelers. Additionally, many communities focus on the goals of improving public health and addressing equity, both of which have measures cut across other goals.

This section lists potential Complete Streets measures and metrics (ways to quantify each measure) for each of these goals that can be used before and after a specific project is completed. For elected leaders and residents, before-and-after analysis demonstrates how, and to what degree, a project achieves its intended goals. For transportation planners and engineers, measuring the actual results of projects allows them to make better-informed choices for future projects.

While the focus is on project-level evaluation, some related network-level measures are included. Network measurement can provide a clear picture of the changes across a community over time or reveal larger patterns and trends than a single project can. Some project-level measures can be rolled up to the network-level, such as number of new or repaired accessible curb ramps. In other cases, a network-level measurement that correlates to the project-level can reveal additional insight, such as the number of people walking. Again, scale matters when using performance measures.

These are options, not mandates. A community's transportation agency should pursue a subset of measures most relevant to its community's goals. The following measures and metrics form a partial list of possibilities at the project-level. Additional measures, both for outputs and for outcomes, may be used at the network- or regional-level. Importantly, communities should decide on and apply an objective—a desired direction and magnitude—related to their goals for each measure.

Goal: Access

Effective transportation systems allow people to access destinations safely and reliably, by foot or assistive device, bicycle, transit, car, or truck by creating comprehensive, integrated, multimodal transportation networks. The measures and metrics below help quantify how well people are connected to places via various modes of travel.

TABLE 1

Recommended access measures and metrics

Measure	Scale	Metrics
Auto trips	Project	▪ Driving trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status
Auto trips	Network	▪ Vehicle Miles Traveled (VMT) per capita ▪ Driving commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status ▪ Driving trips to primary and secondary school (ages 5 to 18 years)
Bicycle trips	Project	▪ Bicycling trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status
Bicycle trips	Network	▪ Bicycling trips as portion of total trips in community; measured by gender, age, income, race, ethnicity, and disability status ▪ Bicycling commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status ▪ Participation in community bicycling events ▪ Bicycling trips to primary and secondary school (ages 5 to 18 years)
Community connections	Project	▪ Percent of persons living or working within ½-mile (for walking) and 3 miles (for bicycling) of facility; by gender, age, income, race, ethnicity, and disability status ▪ Percent of persons living or working within a set distance of transit stop; by gender, age, income, race, ethnicity, and disability status ▪ Connects important destinations, e.g. schools, employment centers, homes, parks
Freight movement	Project	▪ Freight trips as portion of total trips along project

On-street parking	Project	▪ Presence of parking per goals established in process
Presence of bicycling facilities	Project	▪ Count of new or refurbished facilities by type, e.g., bike lane (and type), advanced stop lines or bike boxes, bike signal heads, bike racks ▪ Percent of intersections with advanced stop lines or bike boxes, painted bike lanes through the intersection, bicycle signal heads, bicycle loop detectors
Presence of transit facilities	Project	▪ Number of transit stops with new or upgraded shelters ▪ Percent of accessible transit stops and stations ▪ Miles of new or refurbished transit-only lanes ▪ Intersections with transit signal priority
Presence of walking facilities	Project	▪ Count of new or refurbished facilities by type, e.g., sidewalks, marked crosswalks, islands, curb extensions, countdown signals, Leading Pedestrian Intervals, accessible curb ramps, Accessible Pedestrian Signals ▪ Percent of intersections with marked crosswalks, islands, curb extensions, countdown signals, Leading Pedestrian Intervals, accessible curb ramps, Accessible Pedestrian Signals ▪ Average distance between signalized or protected crosswalks
Transit reliability	Network	▪ Frequency of transit service ▪ Connectivity of routes (transit-to-transit) ▪ Transit trips as portion of total trips in community; measured by gender, age, income, race, ethnicity, and disability status ▪ Transit commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status
Transit trips	Project	▪ Transit trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status ▪ Scheduled headways between transit vehicles ▪ Average speed of transit vehicles ▪ Average wait time for passengers ▪ Number of paratransit trips shifted to fixed-route transit trips
Transportation connections	Project	▪ Closes gap between existing bike/walk facilities ▪ Makes "last mile" connection to transit: ½-mile for walking, 3 miles for bicycling

Trip consistency	Project	▪ Travel time along project length, by mode ▪ Travel time reliability (reduced non-reoccurring delay), measured by mode and purpose
Trip consistency	Network	▪ Travel time for trips, by mode and purpose ▪ Travel time reliability (reduced non-reoccurring delay), by mode and purpose ▪ Percent of person-hour change in delay, by mode and purpose ▪ Emergency response and travel time to health facilities
Walk trips	Project	▪ Walking trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status
Walk trips	Network	▪ Walking trips as portion of total trips in community; measured by gender, age, income, race, ethnicity, and disability status ▪ Walking commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status ▪ Participation in community walking events ▪ Walking trips to primary and secondary school (ages 5 to 18 years)

EXAMPLE

Phoenix, AZ: Measuring walk trips

Downtown Phoenix Inc. (DTPHX), a community development organization, conducts pedestrian counts twice a year in March and September. DTPHX uses pedestrian counts to quantify the organization's progress in creating a desirable business locale and help attract businesses to Phoenix's downtown core.

DTPHX launched its ongoing program to count pedestrians in Fall 2012 to gather evidence that the last decade's investments in the area were paying off. The ongoing effort grew out of a request from a retailer located in downtown Phoenix who wanted to include pedestrian numbers in a funding application to expand her business. Today, DTPHX uses its counts in a similar way: to attract tenants interested in capitalizing on foot traffic during daytime hours, like restaurants, to locate downtown. Commercial brokers, in particular, use DTPHX's pedestrian counts to market the downtown district to prospective tenants. According to David Noble, DTPHX's Economic Development Coordinator, "these numbers have surprised our commercial real-estate brokers and caused them to think about their spaces in different, more urban ways."

DTPHX sends out a staff member to count the number of people walking at various intersections through downtown Phoenix in 30-minute intervals between 11:30 AM and

1:30 PM on different weekdays. They use a people counter (or “clicker”). The counts are doubled to represent an hourly total. For the purposes of the counts, “pedestrian” is defined as any person who approaches the intersection on foot, in a stroller, or using an assistive device. Total pedestrian counts reflect an average of at least three counts per location.

DTPHX releases its findings in a straightforward, one-page document with a map and table that show the total count at each intersection. DTPHA publishes the count data with a blog post that makes the connection between areas of high pedestrian activity with its own work to create a vibrant district.

Since DTPHX began counting in 2012, as many as 1,600 people have walked across intersections in downtown Phoenix each hour. At the same time, DTPHX has made numerous investments to the streets, including installing or replacing street trees and shade structures, such as two air-cooled facilities at light rail stations. The City of Phoenix, working with DTPHX, also installed a demonstration Complete Streets project in the heart of downtown. Along one mile of First Street, the city added many walk-friendly elements: unique decorative pavement, planters, curb extensions, public art, crosswalks, bike racks, and a parklet. According to Noble, the pedestrian counts “tell the story of how the downtown area has become a vibrant, urban, pedestrian-friendly area.”

EXAMPLE

National Bicycle and Pedestrian Documentation Project: Measuring walk and bicycle trips

The National Bicycle and Pedestrian Documentation Project (NBPD) is a nationwide effort to document the number of people walking and bicycling that provides a consistent model for collecting data to use in future transportation decisions. Communities across the United States and Canada use the NBPD’s methodology and resources to generate consistent bicycle and pedestrian counts on specific days each year, including the cities of Chicago, Nashville, TN, Missoula, MT, Salt Lake City, and Seattle.

The NBPD will provide a free, 3-page summary reports when a community submits yearlong data gathered by Eco-Counter automatic count technology. These reports include graphs showing how many people are using the facility by day and time of day. Such reports help transportation decision-makers, and the public, understand trends in mode choice at specific locations.

EXAMPLE

Orlando, FL: Measuring multimodal access

While the main objective was to improve safety on a dangerous 4-lane road, a redesign of Edgewater Drive in Orlando, FL, demonstrated the importance of working with residents to define and measure success. In 2001, the City of Orlando took advantage of the scheduled

resurfacing of Edgewater Drive to propose a 4-to-3 lane conversion for 1.6 miles between Par Street and Lakeview Street, creating bicycle lanes, a center turn lane, and wider on-street parking lanes.

The City's Transportation Planning Bureau cataloged the results of this project in a comprehensive nine-page study that explains how the redesign met the intended goals of the project: improving safety and creating a bicycle- and walk-friendly environment. The study grew out of comments from public meetings, where residents wanted to discuss how the project would create "a vibrant, pedestrian-friendly commercial district with cafes and shops." During the public meetings for the project, residents created nine "Measures of Effectiveness," to help determine if the project met its objectives: 1) avoid increasing traffic on neighborhood streets; 2) reduce speeding; 3) increase bicyclist volumes; 4) increase pedestrian volumes; 5) reduce crashes; 6) increase on-street parking; 7) increase pedestrian satisfaction, as measured by surveys of residents; 8) increase pedestrian satisfaction, as measured by surveys of merchants; and 9) increase parking satisfaction, as measured by surveys of residents.

The City of Orlando assessed the first six measures through data collection and analysis and the last three measures through surveys. Specifically, the City evaluated:

- Safety, as measured by crash and injury rate and frequency of crashes. The crash and injury rates and crash frequency are based on a three-year average of pre-project crash and injury data and four months of post-project crash and injury data. The crash and injury rates are calculated based on the number of million vehicle miles of travel on the corridor. Frequency of crashes and injuries are reported as the number of crashes or injuries occurring per day.
- Speeding, as measured by percentage of drivers exceeding 36 miles per hour. Speed was measured as part of traffic counts at three locations (northern, center, and southern segments) along the corridor during "typical" autumn days.
- Daily automobile traffic volumes, as measured by mechanical counters at 11 mid-block locations on Edgewater Drive. The counts for each location were then averaged to determine daily traffic volumes from the redesigned segment (from Par to Lakeview Streets). An average of automobile volumes measured on 37 parallel and side streets demonstrated how traffic volumes changed not only along Edgewater Drive but also nearby roadways. These mechanical traffic counts were validated by manual turning movement counts at signalized intersections.
- Parking utilization, as measured by on-street parking and side and rear-parking use during morning, mid-day and evening periods. To calculate the utilization rate, these counts were then totaled and compared to the total number of available parking spaces on the corridor.
- Bicycle counts, as measured by the total number of people on bicycle traveling north/southbound or east/westbound at 18 locations for seven hours on a typical autumn day. An outside consultant conducted both bicycle and pedestrian counts manually.
- Pedestrian counts, as measured by total pedestrians traveling north/southbound or east/westbound at 18 locations for seven hours on a typical autumn day.

- Corridor travel times for drivers, measured as part of the Regional Computer Signal Systems Project that connects all signalized intersections in the region to the City of Orlando's Traffic Signal Maintenance Facility. Travel time and delay studies were conducted during peak commuting windows (7–9 AM and 4–6 PM) by linking a device (in this case a JAMAR TDC-8 Traffic Data Board) to the axle of a vehicle traveling at least 10 times along the area with the greatest density of traffic signals. The change in time is calculated individually for the AM and PM commuting windows for both northbound and southbound vehicles. The time is reported in minutes.
- Transit use and operations, as measured by bus operator surveys to estimate the average delay (in seconds) to board LYNX-run buses serving the corridor.
- Property values, as measured by the growth rate in property values for residential and commercial properties within the College Park neighborhood boundary and Orange County.
- Resident and merchant satisfaction, as measured through statements collected through feedback forms for residents and merchants.

The study concludes with a table that compares the nine "Measures of Effectiveness" to the results from the before-and-after study. It answers the "Did the re-striping accomplish the objective?" question with a simple "yes" or "no" for each objective. The project accomplished eight of the nine "Measures of Effectiveness," hitting every goal but merchants' "pedestrian satisfaction." The table serves as a quick, straightforward way to communicate more intricate data analysis and directly connect a project's results to the public's desires and expectations.

Lastly, the study recommends extending the conversion and coordinating future improvements around Edgewater High School with Orange County Public Schools and the Florida Department of Transportation, demonstrating that even a successful project may require additional effort to fully meet public expectations.

EXAMPLE

New York City: Measuring multimodal access

The New York City Department of Transportation (NYCDOT) issued annual Sustainable Streets Index reports, describing traffic and transit trends and cataloging recently completed major DOT projects in neighborhoods across the city. Alongside the department's Sustainable Streets Strategic Plan, these documents provide the goals and data used for performance-based transportation policy.

The Index fulfills a requirement of Local Law 23, which directs NYCDOT to collect and monitor data to help the city "reduce automobile traffic and encourage more sustainable means of transportation vital to combating congestion, pollution and improving the City's long term economic health." Before Mayor Bloomberg signed the law in 2008, the agency largely measured performance in terms of potholes filled, operable parking meters, and automobile traffic flow.

The Sustainable Streets Index tracks the department's progress on measures including:

- Citywide traffic and transit use, measured by total traffic volume and ridership and indexed to their 1993 and 1990 levels, respectively.
- Ridership on buses and subways, as reported by New York City Transit.
- Total traffic levels citywide and within the Manhattan Central Business District.
- Number of people commuting by bicycle, as measured by total commute trips by bicycle, indexed to the number of bicycle commutes in 2000. To count these trips, NYC DOT manually collects 12-hour screenline (non-intersection) bicycle volumes entering and exiting Manhattan at the East River bridges, the Hudson River Greenway at 50th Street, and on the Staten Island Ferry weekdays from 7 AM to 7 PM. Such counts are conducted 10 times per year. NYCDOT adjusts the numbers to account for non-commute trips, bicycle facilities installed after the counts began, and variations in the counts due to changes in their collection methods.
- Average traffic speeds within Manhattan's central business district, measured as average taxi speeds. This data, which reflects both time spent in motion and at red lights, is collected 24/7 through GPS technology on all customer-carrying taxi trips. The Taxi and Limousine Commission supplies this data to NYCDOT.
- Citywide traffic fatalities, as indexed to those suffered during 2000.
- Engagement with Citibike, NYC's bikeshare system, as measured by total trips, total miles traveled, busiest stations, attendance at planning meetings, and number of locations for new stations submitted via the bike share website.

The Index includes before-and-after evaluation of recently completed projects. Project-level indicators include:

- Safety, measured by total number of injurious crashes involving people in cars, by people on foot, and by people on bicycle. The New York City Police Department reports this data. "Before" represents a three-year average of crash data and "after" represents 12–18 months of crash data, depending on when the project was completed.
- Person trips, measured by total people traveling by mode (automobile, bicycle, foot) along the corridor.
- Transit ridership, measured by change in ridership along routes that serve the redesigned corridor.
- Vehicle travel times, as measured by change in travel time along the corridor at weekday morning, mid-day, and evening peak hours and Saturday mid-day peak hours.

In addition to collecting and analyzing a wealth of transportation performance data helpful to NYCDOT's planning and design efforts, the Index clearly communicates the performance of recently built projects to the public and to policy-makers. To visually demonstrate the projects' impacts, the report uses full-page photos of residents traveling around the city and highlights notable statistics and design changes on photos of individual projects. A narrative of the project's inception, public input, and approach accompanies each project included in the Index. Data is presented in clear, easy-to-understand ways, via illustrations and charts.

As an example, average traffic speeds are illustrated by a series of color-coded calendars to show the fastest and slowest days for automobile travel, as well as when traffic patterns were affected by a significant event such as Hurricane Sandy in October and November of 2012. Project reports in the Index also use readily available yet often overlooked data on the outputs of the project design, such as “adding 3,000 square feet of new pedestrian space” or “crossing distance reduced by 79 feet.”

EXAMPLE

Redmond, WA: Measuring multimodal access across the system

The 60,000-person city of Redmond, WA has monitored the impacts of its 2005 Transportation Master Plan (TMP) and reports its progress annually through Mobility Report Cards. A chapter of Redmond’s TMP is devoted to the establishment of clear measures and objectives and the Mobility Report Cards feature easy-to-understand graphs, maps, and charts. The measures include:

- Downtown transit performance, as measured by number of travel time and service frequency targets met for regional transit connections to and from the downtown area. Redmond determines if the targets are met by collecting travel time and frequency of service for routes connecting downtown Redmond to Seattle’s downtown and University District, Kirkland, and Bellevue.
- Overlake transit performance, as measured by travel time and service frequency targets met for regional transit connections to and from the Overlake Transit Center. Redmond determines if the targets are met by collecting travel time and frequency of service for routes going from the Overlake Transit Center to downtown Seattle and its University District, Kirkland, and Bellevue.
- Metro & Sound transit ridership, as measured by average weekday boardings. Redmond determines if the targets are met by collecting travel time and frequency of service for routes going to downtown Seattle’s downtown and University District, Kirkland, and Bellevue.
- Transit service hours, as measured by number of local targets met. Redmond uses service frequency to local destinations to assess its progress. Service totaling 18 hours or more meets the target, while more exceeds the target.
- Transit connection frequency, as measured by number of local targets met. Redmond uses total service hours to local destinations to assess its progress. Service every 15 minutes or less meets the target.
- Changes in automobile traffic, measured by changes in Vehicle Miles Traveled during the PM peak, traffic volumes at screenline locations, and Level of Service on arterials.
- Bicycle environment, as measured by percentage of 2022 bicycle system plan priorities completed by mileage. As of 2010, 58 percent of the system was completed.
- Pedestrian environment, measured by the percentage of streets designed to “pedestrian supportive” levels in specific areas of the city.

- Crashes, as measured by crashes involving vehicles only and crashes involving bicyclists and pedestrians.

For each measure, the Report Card presents a baseline value, observed value, and objective value, with nearly all the data collected through the city's Public Works Department. To demonstrate progress toward meeting the performance measure objective, the report uses arrows to denote positive change, negative change, or no change. When Redmond reports trends in crashes, it notes that a downward–facing arrow denotes a positive result because here the goal is to reduce crashes.

In addition to the comprehensive report cards, the city reports these values on its Community Indicators and Budgeting by Priorities webpage in a straightforward way and includes additional measures, like "Network Completion" (i.e., percent of each modal corridor considered complete by length) and "Connectivity" (i.e., percent, by developed square footage, achieving connectivity levels of medium or higher). The city publishes a snapshot of some of the notable numbers annually in an eye-catching summary pamphlet.

Goal: Economy

Evaluation of transportation projects can include metrics that show how the project contributes to economic performance, whether by connecting people to jobs, by providing employment in transportation construction and operation, or by boosting the value and attractiveness of abutting land.

TABLE 2

Recommended economy measures and metrics

Measure	Scale	Metrics
Access to opportunities	Network	▪ Jobs accessible by 30- or 45-minute transit trip ▪ Ratio of jobs accessible by a 30- or 45-minute automobile trip to those accessible by a 30- or 45-minute transit trip
Employment	Project	▪ Temporary and permanent jobs created by project ▪ Use of local workforce ▪ Stability of employment numbers on segment/corridor
Investments from other sectors	Project	▪ Amount of private and foundation/grant/non-transportation investment in adjacent properties
Land value	Project	▪ Tax yield per acre ▪ Monetary value of residential, commercial properties
Parking utilization	Project	▪ Portion of provided spaces for cars, bicycles used over course of day
Retail vibrancy	Project	▪ Retail and restaurant sales at businesses directly adjacent to project ▪ Number of customers, by mode of travel ▪ Number of tourists visiting ▪ Customer experience surveys ▪ Vacancy rates

EXAMPLE

West Jefferson, NC: Measuring investment and retail vibrancy

Using Complete Streets principles to transform its main street, West Jefferson, a mountain town of 1,300 in northwestern North Carolina, evaluated the project's success with economic and transportation measures.

Once a rail hub and center of regional industry, West Jefferson's main roads

accommodated tractor-trailers and the shiftwork traffic from local textile factories. As the domestic textile industry disappeared and commercial transportation moved to other modes, West Jefferson had more road capacity than it needed, and its historic main street—Jefferson Avenue—was losing customers to big-box stores on the edge of town. Realizing the town was at a crossroads, local leaders engaged a landscape architect to design a streetscape plan for the main street. In cooperation with the North Carolina Department of Transportation (NCDOT), the town took advantage of a scheduled resurfacing project and a grant from the Centers for Disease Control and Prevention to redesign Jefferson Avenue, extending curbs, adding landscaping, and replacing traffic signals at two intersections with four-way stops.

After the project was completed, the town planner collected information on the adjacent buildings, including how much was spent on any renovations and vacancy rates. The Ashe County Chamber of Commerce counts the number of visitors to West Jefferson and looked at the numbers before and after the reconfiguration.

The $300,000 reconfiguration dramatically changed the feeling of downtown. No crashes have occurred at the main street intersections—once considered among the state's most dangerous. Local leaders specifically credit the slower traffic and improved pedestrian environment with bringing 10 new businesses, 55 new jobs and $500,000 worth of investment to Jefferson Avenue. The Chamber of Commerce reports that the number of visitors increased an average of 14 percent—with a high of 27 percent in September 2013.

NCDOT invites representatives from other North Carolina towns to experience the new look and feel of West Jefferson. As Dean Ledbetter, Engineer with NCDOT, explains, "The people [from other communities] we took up there and showed it to met with the town manager, the planner, the Chamber of Commerce. Just seeing it done with the paint was enough to really sell people." He adds, "The economic argument is nice, too."

EXAMPLE

New York City: Measuring retail sales

The New York City Department of Transportation (NYCDOT) developed a robust methodology to assess the impact of its Complete Streets projects on retail sales. By analyzing quarterly sales tax reports from ground-floor businesses in the year before and three years after infrastructure improvements, NYCDOT found that a majority of businesses saw an increase in revenues, even when compared to borough averages and to businesses on comparable streets that hadn't been redesigned.

NYCDOT's landmark study began with an exploration of existing research and data collection efforts. The agency looked at measures like property values, health expenditures for traffic fatalities, business surveys, job creation, and numbers of building permits. Ultimately, the agency, and the consultants that they worked with, felt that the retail sales tax data was the most comprehensive way to measure the immediate impact of Complete

Streets projects--and would be impartial, third-party data. In New York City, the retail sales tax data is reported quarterly and can be tied to a specific location and business type. NYCDOT focused its analysis on ground floor stores that were coded as retail, food, and accommodation businesses.

Collecting the data from retail sales taxes was a collaborative effort. NYCDOT worked with the New York State Department of Taxation and Finance and the City's Department of Finance to set up a third-party sharing agreement. Privacy was a primary concern. Business names and other identifiers were scrubbed from the data before it was shared.

The City found that in eight of the eleven projects studied, businesses adjacent to Complete Streets corridor or plaza projects exceeded their peers in revenues. One of the case studies highlights improvements at a three-way intersection in the Washington Heights neighborhood, where the shortest crossing distance was 100 feet. Pedestrian islands, protected bicycle lanes, and back-in angled parking were introduced, and one of the streets was converted to a one-way traffic flow. Two years after the improvement, sales at businesses along the street had risen by 48 percent compared to a 7 percent increase for neighboring streets. In the Bronx, improvements to bus service, including the designation of a bus-only lane, led to an 71 percent increase in revenues in the third year after the improvement, compared to 23 percent increase for the borough and a 38 percent average increase in four comparison sites.

NYCDOT's methodology can be adapted for areas that collect sales tax data. Its 2012 report outlines each of the steps that the agency took, and then identifies ways that other jurisdictions may want to adapt their methodology for their community context. The report also flags situations and businesses that have the potential to skew the data, and how they addressed outliers in the data analysis.

Goal: Environment

Minimizing the impact on the natural environment can lead to fiscal savings in the cost of project materials and maintenance. It also can influence public health outcomes by minimizing pollutants.

TABLE 3

Recommended environment measures and metrics

Measure	Scale	Metrics
Air quality	Project	▪ Air toxics along project: diesel particulate matter, benzene ▪ Clean Air Act contaminants: particulate matter, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, lead
Energy efficiency	Project	▪ Use of reflective surfaces ▪ Use of dark-sky, low-energy lighting
Providing/preserving habitat for native species	Project	▪ Connects or restores habitat ▪ Wildlife crossings
Stormwater runoff	Project	▪ Treats runoff to a higher level of quality than set threshold ▪ Corrects poor drainage/flow ▪ Reduces rate and volume of runoff ▪ Percent of stormwater runoff absorbed through biofiltration ▪ Use of pervious surfaces ▪ Presence of rain gardens
Sustainable sourcing for construction materials	Project	▪ Percentage or recycled materials used in new pavement/construction ▪ Use of locally or regionally sourced materials to reduce transportation costs
Vegetation	Project	▪ Number of trees retained and/or newly planted ▪ Use of native plants/trees ▪ Xeriscaping/water-conserving landscaping

EXAMPLE

Los Gatos, CA: Measuring air quality

Local Safe Routes to School (SRTS) programs are a potential source of data for Complete Streets evaluations, especially for projects near or at a school. SRTS programs often require coordinators to conduct parent surveys and travel tallies, yielding a rich source of data on school commute mode share and perceptions of safety. Some schools also track the

number of students that skateboard or use a scooter to reach school, since these are other forms of active commuting.

Some SRTS programs have gone above and beyond the standard data collection. Elementary and middle school students in Los Gatos, CA used ozone counters to measure air quality in front of their school. The local SRTS coordinator, Thomas Cook, worked with a science teacher at the school to organize the project. Cook researched on the impact of idling cars on air quality and wanted to know how the cars waiting for morning drop-off impacted the schools in his town. He made some calls and found a local environmental engineering firm that was able to source an ozone counter sophisticated enough for the job.

With the help of engineers from that firm, the students recorded ozone levels during the morning drop-off on a SRTS day that promoted walking, bicycling, and carpooling and again during a normal school day. The students found that on normal school days between 8:00am and 8:21am, ozone levels peaked at 10 parts per billion (ppb) before the morning bell. On the SRTS day, there were 74 fewer cars at the morning drop-off, and ozone levels peaked at 4 ppb, a 60 percent decrease. The students also found that 6 percent more students walked or bicycled to school on SRTS days, and 7 percent more students carpooled. While the ozone levels outside the schools in Los Gatos did not reach dangerous levels on those days, children are especially vulnerable to the effects of vehicle pollution. Cook says that he could smell the difference in air quality outside the school.

Los Gatos was featured in a National Center for SRTS report with other examples of schools that have assessed the environmental impacts of SRTS programs. While the Los Gatos program was able to source an air quality monitor from a local engineering firm, the cost of air quality monitors has dropped to between $100 to several thousand dollars. The U.S. EPA has produced a toolkit on measuring air quality for citizen scientists. Both the National Center for SRTS report and the EPA toolkit can be found in the resources section of this report.

Goal: Place

For better or worse, transportation investments influence the community's quality of life. Being aware of the community context, including existing and planned land use and buildings, transportation needs, and residents' culture, can result in streets that are vital public spaces. Place-related evaluation measures help ensure a product that fits and enhances the community.

TABLE 4

Recommended place measures and metrics

Measure	Scale	Metrics
Building vacancy	Project	▪ Rate of vacancies along project, and as compared to larger community or comparable corridor
Embrace of cultural, historical, and architectural resources	Project	▪ Presence, preservation, or augmentation of local assets in project process and completion
Public art	Project	▪ Number of permanent (or temporary) installations, as part of project or inspired by project
Quality of automobile trips	Project	▪ Driving LOS/MMLOS—at segment and/or intersection ▪ Travel lane pavement condition ▪ Appropriate and easy-to-read signage
Quality of bicycling environment	Project	▪ Bicycle Level of Service/Multimodal Level of Service (MMLOS)—at segment and/or intersection ▪ Bicycle Environmental Quality Index (BEQI)—at segment and/or intersection ▪ Bicycle Level of Traffic Stress (LTS), Level of Comfort ▪ Separation from traffic is in accord with volume, speed of cars and with land use ▪ Width of bicycle facilities ▪ Right Turn on Red restrictions ▪ Pavement condition of bicycling facility ▪ Presence of bicycle network wayfinding
Quality of pedestrian environment	Project	▪ Pedestrian Level of Service/Multimodal Level of Service (MMLOS)—at segment and/or intersection ▪ Pedestrian Environmental Quality Index (PEQI)—at segment and/or intersection ▪ Crossing distance and times ▪ Wait time at intersection ▪ Width of walking facility ▪ Width of pedestrian medians ▪ Presence of enhanced crosswalks

		▪ Right Turn on Red restrictions ▪ Surface condition of sidewalk/pathway ▪ Wayfinding signs, maps
Quality of transit environment	Project	▪ Transit Level of Service/Multimodal Level of Service (MMLOS)—at segment and/or intersection ▪ Quality of accommodations for passengers at stops ▪ Presence of wayfinding and system information ▪ Real-time arrival information ▪ Off-board payment option
Resident engagement in place	Project	▪ Number of people using the project space, measured by activity, age, race, ethnicity, and disability status, gender ▪ Number of new and/or returning participants ▪ Number of resident-led (non-governmental) placemaking initiatives ▪ Instances of temporary activities or installations ▪ Frequency of community events/programmed activities
Resident participation in process	Project	▪ Number of responses gathered ▪ Number of people at meetings/outreach events ▪ Public input is representative of community demographics and population size
Satisfaction	Project	▪ Survey of visitors, residents, commercial staff and ownership
Scenic views	Project	▪ Provides or preserves views of scenery or vistas
Seating	Project	▪ Presence and quantity of seating available ▪ Square feet of outdoor dining space per foot of restaurant façade
Shade	Project	▪ Percent of public space and travel areas shaded by trees, shelters, tents, etc.

EXAMPLE

Florida and San Francisco: Measuring the quality of walking, bicycling, and transit environments

While measuring automobile LOS, or Level of Service, made sense for the initial development of freeways and interstates, this measure did not consider other modes of travel, community priorities for multimodal safety, and other considerations on city streets. In response, some agencies, including the state of Florida and the City-County of San

Francisco, have developed measures that reflect the quality of traveling by foot, bicycle, and transit on different types of city streets.

Florida's Multi-Modal Level of Service (MMLOS) measure includes LOS for people using transit, walking, and riding bicycles by measuring the quality of their experiences. MMLOS looks at a variety of factors beyond the number and speed of automobiles. Pedestrian LOS includes things such as the presence and width of sidewalks and the lateral separation between people walking and people driving. Bicycle LOS includes measures such as pavement condition and the presence of trucks. Transit LOS looks at wait times, frequency, and amenities at transit stops. Florida's 2013 Quality/Level of Service Handbook includes methods for analyzing features such as intersection and mid-block crossings. FDOT recommends MMLOS for long-range estimates and scenario comparisons.

In 2008, the San Francisco Department of Public Health (SFDPH) developed the Pedestrian Environmental Quality Index (PEQI). The PEQI is an extensive observational tool that measures five factors that influence walkability: intersection safety, traffic volume, street design, land use, and perceived safety. Each of the PEQI factors was selected for its scientifically established connection to travel behavior. SFPDH consulted with transportation planners and bicycle and pedestrian safety advocates during the tool's development. It is updated to reflect new research in transportation and public health. Jurisdictions across the country, including Pittsburgh and Denver, have used the instrument. SFDPH has also created a Bicycle Environmental Quality Index (BEQI), which measures similar factors to the PEQI such as safety, traffic, and land use, but as they pertain to bicycle infrastructure.

Both Florida's MMLOS and San Francisco's PEQI and BEQI require intensive staff time for data collection and analysis. As they gain wider use, further adjustments to their methodologies are likely. Simpler tools and checklists to measure the quality of the walking and bicycling environment are available from the Pedestrian and Bicycle Information Center and other organizations. These tools are listed in the resources section of this report.

EXAMPLE

Washington, DC: Measuring resident participation in process

Mobile workshops and walking tours were just some of the innovative techniques used for an area study in the neighborhoods north of Washington D.C.'s Union Station. The District's Office of Planning and its Department of Transportation undertook a comprehensive study of the area in 2013 and hired a consultant, Nelson/Nygaard to lead the public outreach effort.

Understanding the District's residents were people with varying needs helped shape the plan's outreach. For example, families with young children, residents juggling multiple jobs or working late shifts, and people who are not native English speakers often find it difficult to participate the traditional one-time evening workshops or open houses.

In the end, an estimated 500 people were touched through traditional and nontraditional outreach. In addition to the standard open houses and public meetings, outreach included efforts to connect with community members where they live, work, study, and play. Six walking tours and ten mobile workshops were held at local schools, bus stops, a park, cafes, a popular off-street trail, and a street corner near public housing. Some of the residents had not heard of the planning study. Over 100 ideas and 20 photos were submitted on a forum on the project's website, which received over 2,000 unique visits.

While multi-faceted pro-active outreach is still new, several other communities have employed these non-traditional measures. San Francisco's planning department used the "meet people where they are" approach by conducting on-the-street surveys for its comprehensive plan. Residents in Sioux Center, IA, and Cleveland, OH, used an interactive web application called StreetMix to propose changes to their streets. (StreetMix is a website that allows users to design streets by simply dragging and dropping many common design elements.) Other jurisdictions have offered to provide childcare, simultaneous language interpretation, and/or small monetary reimbursements for those who attend meetings. They have asked community non-profits for input on where and when to hold community workshops. Non-traditional engagement approaches can be more effective at reaching a more representative sector of constituents by reaching people in the places where they already are: churches, community centers, transit stops, day care and schools, labor centers, and the like.

EXAMPLE

Los Angeles: Measuring resident engagement in place

"Parklets" are extensions into existing rights-of-way that contain amenities for people using the street, such as green space or a bench. First seen in San Francisco in 2010, the parklet movement launched in Los Angeles in 2011, by order of the City Council. Councilmembers mandated that the Department of Planning work with the Department of Transportation and the Department of Public Works to support demonstration projects. The research collaborative Parklet Studies, a project launched from the University of Southern California School of Architecture, partnered with parklet organizers to evaluate the spaces. The evaluation team developed methodologies and tools that included activity scans, inventories of physical assets, intercept surveys, surveys for business owners, and walking and bicycling counts. The methodologies were informed by work done by William Whyte, Project for Public Spaces, and Gehl Architects, and from evaluations done in other cities.

Parklet Studies evaluated two parklets in downtown Los Angeles in 2013, authoring a final report with the Complete Streets Initiative at the University of California, Los Angeles. Both parklets were on Spring Street, adjacent to cafes and other local businesses, and were designed by the Downtown Los Angeles Neighborhood Council's Complete Streets Working Group. The evaluation team used activity scans, complemented by surveys, to assess how the space was utilized. Their results showed that eating and drinking were the most common uses of the space, but that children also used the benches and stools in the parklets as play areas. Surveys found that although pet waste ranked as the most significant

concern, it only accounted for one percent of the nuisance behaviors on the street. Public smoking was common, but there were few observations of panhandling or public drunkenness. The evaluators also stratified users by gender, race, and age to gauge any disparities in usage.

The evaluation also tracked important information on when the parklets were used: mostly on the weekend, with peaks in the mid-morning and afternoon. The largest difference between pre- and post-installation, however, was in the evening hours, when the number of people walking increased by 74 percent. Parklet design influenced how they were used: the evaluation found that while one parklet saw a steady stream of users throughout the day, the more “active” parklet with swing seats and a foosball table, saw short “intense bursts” of activity. Similar to results from other cities, most people stayed in the parklets for 30 minutes.

Robin Abad, a principal with Parklet Studies and now Program Manager with Pavement to Parks in San Francisco, says although planners and other professionals have “instincts that these places are highly valued,” evaluations allow stakeholders to “speak in a cogent way about the value of the spaces, and empirically describe those changes.”

Goal: Safety

Ensuring people are able to safely travel to their destinations is a fundamental transportation goal. With Complete Streets projects, this means prioritizing safety for all who use the street—walking, bicycling, riding public transportation, and driving cars or trucks. Safety measures should track both the characteristics related to injurious crashes and those related to perceptions of safety.

TABLE 5

Recommended safety measures and metrics

Measure	Scale	Metrics
Adequate lighting	Project	▪ Presence of ADA/AASHTO compliant lighting for all modes ▪ Addition of lighting to dark corners
Compliance with speed limit	Project	▪ Percent of drivers exceeding the speed limit ▪ Match between target speed, design speed, and 85th percentile
Crashes - minor	Project	▪ Number of crashes on project; by mode, age, gender, income, race, ethnicity, and disability status
Crashes - minor	Network	▪ Total number ▪ Rate and location by mode; per 100,000 miles
Fatalities	Project	▪ Number of fatalities; by mode, age, gender, income, race, ethnicity, and disability status
Fatalities	Network	▪ Total number of fatalities suffered by all users ▪ Progress toward achieving zero serious injuries ▪ Rate of serious injuries as measured per 100,000 miles/use; by mode, age, gender, income, race, ethnicity, and disability status
Personal security	Project	▪ Survey of visitors, residents, commercial staff and ownership ▪ Number of crimes, violent and non-violent ▪ Number of calls for service ▪ Removal of obstructions to pedestrian line of sight at intersections and crossings
Serious injuries	Project	▪ Number of injurious crashes; by mode, age, gender, income, race, ethnicity, and disability status

Serious injuries	Network	▪ Total number of serious injuries suffered by all users ▪ Progress toward achieving zero serious injuries ▪ Rate of serious injuries as measured per 100,000 miles/use; by mode, age, gender, income, race, ethnicity, and disability status

EXAMPLE

Charlotte, NC: Measuring compliance with speed limits

In the Dilworth neighborhood of Charlotte, the city's first streetcar suburb, a Complete Streets project transformed a major thoroughfare and improved safety for its residents. East Boulevard in Dilworth was a city road with high travel speeds. The boulevard split the neighborhood in half, with few options to safely cross the street. While the speed limit was posted at 35 mph, many drivers traveled at speeds of 43 mph or higher, and the road had a high number of crashes compared to similar roads in Charlotte. Residents wanted a more walk-friendly community that reflected the historic character of their neighborhood. When the opportunity arose to transform the boulevard, the City of Charlotte reduced the number of vehicle lanes from four lanes to two. The City also added bicycle lanes, pedestrian refuge medians, curb extensions, accessible curb ramps, and landscaping. The on-street bicycle lanes connect an off-street rail-trail with the Little Sugar Creek Greenway, a multi-use urban trail.

Charlotte's Department of Transportation measured traffic speeds before and after construction, using a portable traffic analyzer to measure speeds on both the east-bound and west-bound lanes during both peak and off-peak hours. In the morning rush, the percentage of drivers traveling at the 85th percentile of the speed limit dropped from 50 percent to 41 percent. During the afternoon peak, 85th percentile speeds also dropped nine percent. During off-peak morning and afternoon hours, 85th percentile speeds dropped four percent to seven percent for drivers traveling in both directions.

The feedback from Dilworth residents echoed the hard data on traffic speeds. One parent told the city, "I feel more comfortable letting my kids walk to the park and cross the road. Before the redevelopment, I would not allow my kids to cross the street."

EXAMPLE

Minneapolis, MN: Measuring crash rates and perception of safety

Hennepin Avenue is one of the busiest streets in downtown Minneapolis, connecting residential areas on both sides of the city to workplaces, businesses, and cultural sites in the city center. For many years, the one-mile stretch of Hennepin in downtown Minneapolis was a one-way road. In 2007, a Downtown Action Plan identified the avenue for a conversion project, adding a contraflow lane and converting a two-way bicycle lane into a shared lane for bicycles, buses, and right-turning vehicles. Feedback after the initial phase of the project led to striping the shared lane with a green-painted bicycle lane.

Due to the experimental nature of the project, the Minneapolis Public Works Department conducted a before and after evaluation of the green lanes. The Department compared crash reports from the Minnesota Department of Public Safety from three years before to six months after the installation of the green lane. The number of crashes involving a person on a bicycle and person driving a car was divided by the number of daily bicyclists, as estimated from 12-hour manual counts. Bicycle crash rates dropped from 1.03 percent to 0.4 percent.

Public surveys found that, in addition to the drop in crash rates, the green lanes also improved the perception of safety. The Public Works Department distributed a survey using multiple outreach methods to ensure a large number of responses. The survey was distributed online through bicycle groups, by leaving paper surveys in the spokes of parked bicycles, and by approaching people on the street. The results showed that one-third of bicyclists felt that the green lanes neither helped nor hindered safety on the downtown stretch of Hennepin, but that an additional one-third of bicyclists felt safer on the road.

EXAMPLE

Minnesota Department of Transportation: Measuring injurious crashes

The Minnesota Department of Transportation (MnDOT) measures their Complete Streets successes by project as well as across the state's transportation system. Minnesota's Complete Streets policy specifies increased safety as a priority. Tracking crashes, injuries, and fatalities are a sobering but essential element of MnDOT's directive.

At the network level, MnDOT reports 13 indicators as part of an annual Complete Streets Performance Snapshot, including overall traffic fatalities, pedestrian fatalities, and serious injuries on all state and local roads, and bicyclist fatalities and serious injuries on all state and local roads. MnDOT's Complete Streets Performance Snapshot also reports system use and system condition, including state highway compliance with ADA requirements for sidewalks and the percentage of signalized state highway intersections with Accessible Pedestrian Signals.

At the project level, MnDOT's evaluations also include measures of bicycling and walking safety. In 2008 and 2009, a 10-block stretch of Lyndale Avenue in South Minneapolis was reconfigured. Four general travel lanes were reduced to two lanes, and some of the right-of-way became parking lanes. Raised medians and left-turn lanes were also added. Engineers compared safety data from 40 months before construction to data from 27 months after construction. While the average daily traffic estimate slightly increased from a range of 12,200 to 14,440 vehicles to 13,600 to 14,600 vehicles, the total number of crashes dropped from 94 before construction to 34 post-construction. The severity of the crashes decreased. Bicycling and walking crashes also decreased, from six crashes in the years before the construction to two crashes afterward. Crashes were also analyzed by crash type,

showing over 50 percent drops in the number of rear-end and angle crashes.

Goal: Equity

Transportation services and infrastructure often impact certain populations and neighborhoods disproportionately, with important implications for social equity. In project evaluation, agencies should look at the distribution of impacts and benefits for traditionally disadvantaged communities, including people of color, older adults, low-income households, and people with disabilities. Many equity measures can be integrated in project evaluation.

TABLE 6

Equity measures and metrics

Goal	Measure	Scale	Metrics
Access	Auto trips	Project	▪ Driving trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status
Access	Auto trips	Network	▪ Vehicle Miles Traveled (VMT) per capita ▪ Driving commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status ▪ Driving trips to primary and secondary school (ages 5 to 18 years)
Access	Bicycle trips	Project	▪ Bicycling trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status
Access	Bicycle trips	Network	▪ Bicycling trips as portion of total trips in community; measured by gender, age, income, race, ethnicity, and disability status ▪ Bicycling commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status ▪ Participation in community bicycling events Bicycling trips to primary and secondary school (ages 5 to 18 years)
Access	Community connections	Project	▪ Percent of persons living or working within 1/2 mile (for walking) and 3 miles (for bicycling) of facility; by gender, age, income, race, ethnicity, and disability status ▪ Percent of persons living or working within a set distance of transit stop; by gender, age, income, race, ethnicity, and disability status ▪ Connects important destinations, e.g. schools, employment centers, homes, parks

Access	Transit reliability	Network	▪ Frequency of transit service ▪ Connectivity of routes (transit-to-transit) ▪ Transit trips as portion of total trips in community; measured by gender, age, income, race, ethnicity, and disability status ▪ Transit commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status
Access	Transit trips	Project	▪ Transit trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status ▪ Scheduled headways between transit vehicles ▪ Average speed of transit vehicles ▪ Average wait time for passengers ▪ Number of paratransit trips shifted to fixed-route transit trips
Access	Transportation connections	Project	▪ Closes gap between existing bike/walk facilities Makes "last mile" connection to transit: ½-mile for walking, 3 miles for bicycling
Access	Walk trips	Project	▪ Walking trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status
Access	Walk trips	Network	▪ Walking trips as portion of total trips in community; measured by gender, age, income, race, ethnicity, and disability status ▪ Walking commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status ▪ Participation in community walking events ▪ Walking trips to primary/secondary school (ages 5 to 18 years)
Economy	Access to opportunities	Network	▪ Jobs accessible by 30- or 45-minute transit trip ▪ Ratio of jobs accessible by a 30- or 45-minute automobile trip to those accessible by a 30- or 45-minute transit trip
Economy	Employment	Project	▪ Temporary and permanent jobs created by project ▪ Use of local workforce
Economy	Land value	Project	▪ Tax yield per acre ▪ Monetary value of residential, commercial properties

Environment	Air quality	Project	▪ Air toxics along project: diesel particulate matter, benzene ▪ Clean Air Act contaminants: particulate matter, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, lead
Place	Embrace of cultural, historical, and architectural resources	Project	▪ Presence, preservation, or augmentation of local assets in project process and completion
Place	Quality of automobile trips	Project	▪ Driving Level of Service (LOS)/Multimodal Level of Service (MMLOS)—at segment and/or intersection ▪ Travel lane pavement condition ▪ Appropriate and easy-to-read signage
Place	Quality of bicycling environment	Project	▪ Bicycle Level of Service (LOS)/Multimodal Level of Service (MMLOS)—at segment and/or intersection ▪ Bicycle Environmental Quality Index (BEQI)—at segment and/or intersection ▪ Bicycle Level of Traffic Stress (LTS), Level of Comfort ▪ Separation from traffic is in accord with volume, speed of cars and with land use ▪ Width of bicycle facilities ▪ Right Turn on Red restrictions ▪ Pavement condition of bicycling facility ▪ Presence of bicycle network wayfinding
Place	Quality of pedestrian environment	Project	▪ Pedestrian Level of Service (LOS)/Multimodal Level of Service (MMLOS)—at segment and/or intersection ▪ Pedestrian Environmental Quality Index (PEQI)—at segment and/or intersection ▪ Crossing distance and times ▪ Wait time at intersection ▪ Width of walking facility ▪ Width of pedestrian medians ▪ Sidewalk surface condition ▪ Presence of enhanced crosswalks ▪ Right Turn on Red restrictions ▪ Wayfinding signs, maps
Place	Quality of transit environment	Project	▪ Transit Level of Service (LOS)/Multimodal Level of Service (MMLOS)—at segment and/or intersection ▪ Quality of accommodations for passengers at stops ▪ Presence of wayfinding and system information ▪ Real-time arrival information ▪ Off-board payment option

Place	Resident engagement in place	Project	▪ Number of people using the project space, measured by activity, age, gender, race, ethnicity, and disability status ▪ Number of new and/or returning participants ▪ Number of resident-led (non-governmental) placemaking initiatives ▪ Instances of temporary activities or installations ▪ Frequency of community events/programmed activities
Place	Resident participation in process	Project	▪ Number of responses gathered ▪ Number of people at meetings/outreach events ▪ Public input is representative of community demographics and population size
Safety	Adequate lighting	Project	▪ Presence of ADA/AASHTO compliant lighting for all modes ▪ Addition of lighting to dark corners
Safety	Fatalities	Project	▪ Number of fatalities; by mode, age, gender, income, race, ethnicity, and disability status
Safety	Fatalities	Network	▪ Total number of fatalities suffered by all users ▪ Progress toward achieving zero serious injuries ▪ Rate of serious injuries as measured per 100,000 miles/use; by mode, age, gender, income, race, ethnicity, and disability status
Safety	Personal security	Project	▪ Perception of safety survey of visitors, residents, commercial staff and ownership ▪ Number of crimes, violent and non-violent ▪ Number of calls for service ▪ Removal of obstructions to pedestrian line of sight at intersections and crossings
Safety	Serious injuries	Project	▪ Number of injurious crashes; by mode, age, gender, income, race, ethnicity, and disability status
Safety	Serious injuries	Network	▪ Total number of serious injuries suffered by all users ▪ Progress toward achieving zero serious injuries ▪ Rate of serious injuries as measured per 100,000 miles/use; by mode, age, gender, income, race, ethnicity, and disability status

Goal: Public health

Common project-level public health measures indicate whether transportation investments allow people to have healthier lifestyles through increased access to physical activity and active transportation, decreased incidence of serious or fatal injury, and reduced exposure to pollutants. The overlap with several common transportation goals means it can be easy to integrate health indicators into transportation project evaluation.

TABLE 7

Public health measures and metrics

Goal	Measure	Scale	Metrics
Access	Bicycle trips	Project	▪ Bicycling trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status
Access	Bicycle trips	Network	▪ Bicycling trips as portion of total trips in community; measured by gender, age, income, race, ethnicity, and disability status ▪ Bicycling commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status ▪ Participation in community bicycling events ▪ Bicycling trips to primary and secondary school (ages 5 to 18 years)
Access	Transit trips	Project	▪ Transit trips as portion of total trips along project; measured by gender, age, income, race, ethnicity ▪ Number of paratransit trips shifted to fixed-route transit trips
Access	Transportation connections	Project	▪ Closes gap between existing bike/walk facilities ▪ Makes "last mile" connection to transit: ½-mile for walking, 3 miles for bicycling
Access	Trip consistency	Network	▪ Travel time for trips, by mode and purpose ▪ Emergency response and travel time to health facilities
Access	Walk trips	Project	▪ Walking trips as portion of total trips along project; measured by gender, age, income, race, ethnicity, and disability status

Access	Walk trips	Network	▪ Walking trips as portion of total trips in community; measured by gender, age, income, race, ethnicity, and disability status ▪ Walking commutes as portion of total commutes; measured by gender, age, income, race, ethnicity, and disability status ▪ Participation in community walking events ▪ Walking trips to primary/secondary school (ages 5 to 18 years)
Environment	Air quality	Project	▪ Air toxics along project: diesel particulate matter, benzene ▪ Clean Air Act contaminants: particulate matter, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, lead
Environment	Stormwater runoff	Project	▪ Treats runoff to a higher level of quality than set threshold ▪ Corrects poor drainage and flow ▪ Reduces rate and volume of runoff ▪ Percent of stormwater runoff absorbed through biofiltration ▪ Use of pervious surfaces ▪ Presence of rain gardens
Environment	Vegetation	Project	▪ Number of trees retained and/or newly planted ▪ Use of native plants/trees ▪ Xeriscaping/water-conserving landscaping
Safety	Fatalities	Project	▪ Number of fatalities; by mode, age, gender, income, race, ethnicity, and disability status
Safety	Fatalities	Network	▪ Total number of fatalities suffered by all users ▪ Progress toward achieving zero serious injuries ▪ Rate of serious injuries as measured per 100,000 miles/use; by mode, age, gender, income, race, ethnicity, and disability status
Safety	Serious injuries	Project	▪ Number of injurious crashes; by mode, age, gender, income, race, ethnicity, and disability status
Safety	Serious injuries	Network	▪ Total number of serious injuries suffered by all users ▪ Progress toward achieving zero serious injuries ▪ Rate of serious injuries as measured per 100,000 miles/use; by mode, age, gender, income, race, ethnicity, and disability status

Further resources

While not comprehensive, the below resources and examples provide more details about some of the measures and tips discussed in this introductory guide. First are links to tools and further reading, organized by common Complete Streets goals. Then, we briefly discuss common partners in measuring transportation projects' successes. Following that is a list of examples and resources showing how to communicate transportation objectives in ways that are relevant and interesting to the general public. Last, we provide links to general resources on transportation performance measures.

Tools and further reading, by goal

ACCESS

Bicycle and pedestrian count forms, tally sheets, National Bicycle and Pedestrian Demonstration Project (2015)

- Notes: Includes data collection forms, surveys, instructions, and training presentations. Surveys are also available in Spanish.
- Link: http://bikepeddocumentation.org/downloads/

Guidebook on Pedestrian and Bicycle Volume Data Collection, National Cooperative Highway Research Program (2014)

- Notes: Includes best practices for planning and implementing a data collection program.
- Link: http://www.trb.org/PedestriansAndBicyclists/Blurbs/171973.aspx

The Minnesota Bicycle and Pedestrian Counting Initiative: Methodologies for Non-motorized Traffic Monitoring, Minnesota Department of Transportation (2013)

- Link: http://www.dot.state.mn.us/research/TS/2013/201324.pdf

Travel Time Reliability Measures, Federal Highway Administration (2013)

- Notes: Provides overview of measure for laypeople and detailed guidance for agencies
- Link: http://ops.fhwa.dot.gov/perf_measurement/reliability_measures/index.htm

Fort Collins Multimodal Transportation Level of Service Manual, City of Fort Collins (2002)

- Notes: Measures sidewalk continuity, directness of the pedestrian trip, quality and frequency of street crossings, visual interest, and safety
- Link: http://www.fcgov.com/drg/pdf/los-manual.pdf

Guide to Bicycle & Pedestrian Count Programs, Portland State University (n.d.)

- Link: http://www.pdx.edu/ibpi/count

Bicyclist & Pedestrian Count Form, Minneapolis Public Works Department (n.d.)

- Notes: Measures numbers of pedestrians and bicyclists
- Link: http://www.minneapolismn.gov/www/groups/public/@publicworks/documents/images/wcms1p-135322.pdf

Student travel tally, parent survey, National Center for Safe Routes to School (n.d.)

- Notes: Measures mode share and parent attitudes for school programs
- Link: http://www.saferoutesinfo.org/data-central/data-collection-forms

ECONOMY

Business Operator Questionnaire, Los Angeles Department of Transportation and Parklet Studies (2014)

- Notes: Measures change in number of employees, sales, foot traffic, and parking for a parklet/plaza installation
- Link: http://peoplest.lacity.org/wp-content/uploads/2014/11/People_St_Project_Evaluation_Manual_v1.1.pdf

Protected Bike Lanes Mean Business: How 21st Century Transportation Networks Help New Urban Economies Boom, People for Bikes and Alliance for Biking & Walking (2014)

- Link: http://www.bikewalkalliance.org/resources/reports/protected-bike-lanes-mean-business

The Economic Benefits of Safer Streets, The New York City Department of Transportation (2013)

- Link: http://on.nyc.gov/1ezXo64

Examining Consumer Behavior and Travel Choices, Oregon Transportation Research and Education Consortium (2013).

- Link: http://ppms.otrec.us/media/project_files/OTREC-RR-12-15%20Final.pdf

ENVIRONMENT

EPA's Air Sensor Toolbox for Citizen Scientists, U.S. Environmental Protection Agency (2015)

- Link: http://www.epa.gov/heasd/airsensortoolbox/

Air Sensor Guidebook, U.S. Environmental Protection Agency (2014)

- Link: http://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=277996&simpleSearch=1&searchAll=air+sensor+guidebook

Methods for Estimating the Environmental Health Impacts of SRTS Programs, National Center for Safe Routes to School (2012)

- Link: http://www.saferoutesinfo.org/program-tools/environmental-health

Greenroads Rating System (2011)

- Notes: Measures the sustainability of roads by assessing construction practices, materials used, pavement technologies, access, equity, and noise, waste, water and pollution management
- Link: https://www.greenroads.org/366/download-the-manual.html

The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Environmental, and Social Benefits, Center for Neighborhood Technology (2010)

- Link: http://www.cnt.org/repository/gi-values-guide.pdf

PLACE

Activity scans, pedestrian and bicyclist questionnaire, Los Angeles Department of Transportation and Parklet Studies (2014)

- Notes: Measures behaviors, volumes, and demographics of visitors; perceptions of safety and social activity
- Link: http://peoplest.lacity.org/wp-content/uploads/2014/11/People_St_Project_Evaluation_Manual_v1.1.pdf

Mid-City Draft Plan for Final, Part 1, District of Columbia Office of Planning (2014)

- Link: http://1.usa.gov/1KoME6P

Reclaiming the Right-of-Way Evaluation Report, An Assessment of the Spring Street Parklets, University of California, Los Angeles, and Parklet Studies (2013)

- Link: http://www.lewis.ucla.edu/publication/reclaiming-right-way-evaluation-report/

Pedestrian Mobility and Safety Audit Guide, AARP and the Institute of Transportation Engineers (2008)

- Notes: Measures pedestrian infrastructure and environment, including wayfinding
- Link: http://www.aarp.org/livable-communities/Plan/assessments/info-12-2012/aarp-pedestrian-mobility-and-safety-audit-guide.html

Livable Communities: An Evaluation Guide, AARP (2005)

- Link: http://www.aarp.org/home-garden/livable-communities/info-2005/livable_communities__an_evaluation_guide.html

Bicycle Environmental Quality Index, San Francisco Department of Public Health (n.d.)

- Notes: Measures safety and comfort of infrastructure and environment for bicycling
- Link: http://www.sfhealthequity.org/elements/24-elements/tools/102-bicycle-environmental-quality-index

Bikeability Checklist, Pedestrian and Bicycle Information Center (n.d.)

- Link: http://www.pedbikeinfo.org/pdf/bikeability_checklist.pdf

Pedestrian Environmental Quality Index, San Francisco Department of Public Health (n.d.)
Measures: Safety and comfort of infrastructure and environment for walking

- Link: http://www.sfhealthequity.org/elements/24-elements/tools/106-pedestrian-environmental-quality-index

Walkability Checklist, Pedestrian and Bicycle Information Center (n.d.)

- Link: http://www.walkableamerica.org/checklist-walkability.pdf

SAFETY

Vision Zero, New York City Department of Transportation (2015)

- Link: http://www.nyc.gov/html/visionzero/pages/home/home.shtml

Boston Bikes Crash Data Map, City of Boston (2014)

- Link: http://www.cityofboston.gov/bikes/statistics.asp

Resources by Topic, Minnesota Towards Zero Deaths, Center for Transportation Studies at the University of Minnesota (2014)
- Link: http://www.minnesotatzd.org/topics/

Effectiveness of a safe routes to school program in preventing school-aged pedestrian injury. Pediatrics (2013).
- Link: http://www.ncbi.nlm.nih.gov/pubmed/23319533

Understanding Bicyclist-Motorist Crashes in Minneapolis, Minnesota, Bicycle and Pedestrian Section, Public Works Department, City of Minneapolis (2013).
- Link:http://www.minneapolismn.gov/www/groups/public/@publicworks/documents/images/wcms1p-102346.pdf

Propensity to Use Public Transportation: The Role of Perception of Walking Environment and Residential Neighborhood Types, Active Living Research Conference Presentation (2012)
- Link: http://activelivingresearch.org/propensity-use-public-transportation-role-perception-walking-environment-and-residential

Evaluation and Outcomes: How Do You Measure Success? (Chapter 3), Safe Routes to School, Practice and Promise, Center for Health Training, National Highway Traffic Safety Administration (n.d.)
- Link: http://www.albany.edu/ihi/files/9safe.pdf

HEALTH AND EQUITY

Completed HIA Projects, Human Impact Partners (2015).
- Link: http://www.humanimpact.org/projects/past-projects/

County Health Rankings & Roadmaps (2015).
- Notes: County-level measures include demographics, motor vehicle crash deaths, percentage of workers driving alone, and percentage of workers driving a long commute. Notes effective policy interventions.
- Link: http://www.countyhealthrankings.org/

Oregon Bicycle and Pedestrian Plan Health and Transportation White Paper, Oregon Department of Transportation (2014).
- Link: http://www.oregon.gov/ODOT/TD/TP/BikePed/HealthWhitePaper.pdf

BikeWalkNC: North Carolina Statewide Pedestrian and Bicycle Plan, North Carolina Department of Transportation (2013)
- Link: http://www.ncdot.gov/bikeped/planning/walkbikenc/

How Does Transportation Affect Public Health?, U.S. Department of Transportation, FHWA (2013)
- Link: https://www.fhwa.dot.gov/publications/publicroads/13mayjun/05.cfm

Metropolitan Area Transportation Planning for Healthy Communities, U.S. Department of Transportation, FHWA (2012)

- Link: http://www.fhwa.dot.gov/planning/health_in_transportation/resources/healthy_communities/index.cfm

Regional Transportation Plan: Transportation Policy for Health, Nashville Area Metropolitan Planning Organization (2010)

- Link: http://www.nashvillempo.org/regional_plan/health/

Partners

Government agencies and community-led efforts can be helpful partners for transportation engineers that want to collect data that's outside their normal purview. Community-led efforts, especially bicycling and pedestrian advocacy groups, may also be interested in partnering on data collection efforts such as regular bicycle count days, and will have insight on locations for data collection.

- Public safety: Local law enforcement departments are often charged with tracking crash data, which is a useful source of information on vehicle crashes, bicycle-vehicle crashes, and pedestrian-vehicle crashes.
- Transit agencies: Transit agencies collect a wealth of data on transit use and rider experience, such as ridership counts and average headways.
- Federal agencies and Metropolitan Planning Organizations: Economic indicators can often be sourced online from census data and from federal agencies such as the Bureau of Labor Statistics, the Bureau of Economic Analyses, and local Federal Reserve Banks. Metropolitan Planning Organizations may track regional economic statistics for their projections.
- Business or community development associations. Business groups, local business improvement districts, or community development agencies could store data on revenues for local businesses or occupancy rates. They may also be able to introduce you directly to business owners who can supply that information if they do not track the data directly. Industry organizations such as the National Association of Realtors will have specifics in their areas of expertise, such as median home prices.
- Local health departments, health systems, hospital associations, and emergency response departments: Local health departments and some hospitals and health systems may have an injury prevention arm that tracks minor and serious injuries. In addition, local health departments often have epidemiology and statistics divisions which sometimes track injuries, chronic disease rates, and other key data points.
- Safe Routes to School Programs: Local programs to promote walking, bicycling, and other forms of active transportation to school often track school commute mode and parent perceptions of safety. Checking a list of Safe Routes to School grants allocated in your area, or asking a principal at a specific school if they have a Safe Routes to School program is probably the best way to find out about local programs.
- School districts: Some school districts utilize school surveys to assess the health and wellness of their students and many are willing to share aggregate data. In California, some districts participate in the California Healthy Kids Survey, which measures campus safety and exercise habits. Health data is also available at the zip-code level through the University of California at Los Angeles' California Health Interview Survey.

Communicating results

Some cities and agencies chose to present the results of their evaluations through annual reports, project summaries, or in community report cards. This list includes examples of those efforts.

2014 Annual Report, NC Department of Transportation (2014)

- Link: http://www.ncdot.gov/performance/reports/

Active Transportation and Health: Indicators Report, Peterborough City and County, Ontario, Canada (2014)

- Link: http://peterboroughmoves.com/658/

News Advisory: SDOT's 2014 Accomplishments and 2015 Outlook, Seattle Department of Transportation (2014)

- Link: http://www.seattle.gov/news/detail.asp?ID=14791&dept=19

Rethinking Streets: An Evidence Based Guide to 25 Complete Street Transformations, Sustainable Cities Initiative, University of Oregon (2013)

- Link: http://www.rethinkingstreets.com/download.html

SDOT Annual and Quarterly Reports, Seattle Department of Transportation (2013)

- Link: http://www.seattle.gov/transportation/sdotreports.htm

State of the Hub: Boston Bikes 2012 Update, City of Boston (2013)

- Link: http://www.bostonbikes.org/wp-content/uploads/2012/01/Annual-Report-2012-small.pdf?0bbda9

Annual Minnesota Complete Streets Performance Snapshot, Minnesota Department of Transportation (2012)

- Link: http://www.dot.state.mn.us/planning/completestreets/docs/2015/2012CompleteStreetsSnapshot.pdf

2012 Complete & Green Streets Report Card, City of Cleveland (OH) (2012)

- Link: http://webapp.cleveland-oh.gov/aspnet/docs/get.aspx?id=1229&file=ComGrnPerfMeas.pdf

Explain Your Lane, Lessons for Cities from Cities on Building Green Lanes, Green Lane Project, Bikes Belong Foundation (2012)

- Link: http://s.bsd.net/pfbikes/default/page/file/0f3c0ad0143daa7a07_qvm6yz8gh.pdf

Jackson Heights, Sustainable Streets Index, New York City Department of Transportation (2012)

- Link: http://www.nyc.gov/html/dot/downloads/pdf/ssi-2012-jackson-heights.pdf

Transportation to Support a Community: A Report on Progress, City of Boulder (CO) Transportation Division (2012)

- Link: http://www.smartgrowthamerica.org/documents/cs/impl/co-boulder-2012report.pdf

2011 Mobility Report Card, City of Redmond (WA) (2011)

- Link: https://redmond.gov/PlansProjects/Transportation/TransportationMasterPlan/TransportationMasterPlan2005/

Boroughs and Suburbs Maps, New York Metropolitan Transportation Council, Bicycle Data Collection Program (n.d.)

- Link: www.nymtc.org/project/NYMTC_Bicycle_Data_Collection_Program/www_html/index.htm

Complete Streets project examples, North Carolina Department of Transportation (n.d.)

- Link: www.completestreetsnc.org/project-examples/

Nickerson Street Rechannelization, Before and After Report, Seattle Department of Transportation (n.d.)

- Link: http://www.smartgrowthamerica.org/documents/cs/impl/wa-seattle-nickerson.pdf

Vital Signs, Metropolitan Transportation Commission (San Francisco, CA region) (n.d.)

- Link: http://www.vitalsigns.mtc.ca.gov/

Community Indicators and Budgeting by Priorities Dashboard, City of Redmond (WA) (n.d.)

- Link: http://redmond.gov/cms/one.aspx?objectId=3865

General references for performance-based transportation planning

Complete Streets Implementation: Measuring Performance, National Complete Streets Coalition (2015)

- Link: http://www.smartgrowthamerica.org/complete-streets/implementation/measuring-performance

Measuring What We Value: Setting Priorities and Evaluating Success in Transportation, Transportation For America (2015)

- Link: http://t4america.org/maps-tools/performance-measures-report/download

Safer Streets, Stronger Economies, Complete Streets Performance in the DMV and Beyond, 14th Annual New Partners for Smart Growth Conference (2015)

- Link: http://www.hungrymindrecordings.com/ProductListing.aspx?Id_Category=215

Decisions, Values, and Data: Understanding Bias in Transportation Performance Measures, ITE Journal (2014)

- Link: http://trid.trb.org/view/2014/C/1323130

Bicycling and Walking in the United States 2014 Benchmarking Report, Alliance for Biking & Walking (2014)

- Link: http://www.bikewalkalliance.org/resources/benchmarking

Performance Measures for Nonmotorized Transportation, State Smart Transportation Initiative (2014)

- Link: http://www.ssti.us/2014/09/performance-measures-for-nonmotorized-transportation/

TR News: Performance Management in Practice, Transportation Research Board of the National Academies (2014)
- Link: http://www.trb.org/Main/Blurbs/171300.aspx

Performance Measures, Urban Street Design Guide, National Association of City Transportation Officials (2013)
- Link: http://nacto.org/usdg/design-controls/performance-measures/

Performance Based Planning and Programming Guidebook, FHWA, US Department of Transportation (2013)
- Link: http://www.fhwa.dot.gov/planning/performance_based_planning/pbpp_guidebook

Evaluation and Results, Nonmotorized Transportation Pilot Program: 2014 Report, Federal Highway Administration, U.S. Department of Transportation (2012)
- Link: http://www.fhwa.dot.gov/environment/bicycle_pedestrian/ntpp/2014_report/page01.cfm

Measuring the Street: New Metrics for the 21st Century Street, New York City Department of Transportation (2012)
- Link: http://www.nyc.gov/html/dot/downloads/pdf/2012-10-measuring-the-street.pdf

Measuring Success (Chapter 14), Sustainable Transportation Planning: Tools for Creating Vibrant, Healthy and Resilient Communities, Tumlin (2012)
- Link: http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470540931.html

Phase II Performances Measures Development (Section II). The Effects of Transportation Corridor Features on Driver and Pedestrian Behavior and on Community Vitality: Final Study Report, UC Berkeley Safe Transportation Research and Education Center (2012)
- Link: http://www.dot.ca.gov/research/researchreports/reports/2012/2012-12-task_1094.pdf

Context Sensitive Solutions Performance Measures Technical Memorandum, Brian S. Bochner, P.E., PTOE, PTP and Beverly J. Storey, Texas Transportation Institute (2011)
- Link: http://ite.org/css/Task5Memorandum.pdf

Guide to Sustainable Transportation Performance Measures, U.S. Environmental Protection Agency (2011)
- Link: http://www.epa.gov/smartgrowth/transpo_performance.htm

Complete Streets: Best Policy and Implementation Practices, American Planning Association (2010)
- Link: http://www.smartgrowthamerica.org/documents/cs/resources/cs-bestpractices-chapter5.pdf

Quantifying the Benefits of Context Sensitive Solutions, National Cooperative Highway Research Program Report 642 (2009)

- Link: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_642.pdf

The Complete, Green Streets Performance Measures Framework for Urban Arterials, University of California Transportation Center (2009)

- Link: http://www.smartgrowthamerica.org/documents/cs/impl/uctc-completestreets-measures.pdf

Performance Measures for Context Sensitive Solutions--A Guidebook for State DOTs, National Cooperative Highway Research Program Web-Only Document 69 (2004)

- Link: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w69.pdf

Tools for Communicating, American Public Transportation Association. (n.d.)

- Link: http://www.publictransportation.org/community/build/planning/Pages/Communicating.aspx

Smart Growth America
Making Neighborhoods Great Together

National Complete Streets Coalition

The National Complete Streets Coalition, a program of Smart Growth America, is a non-profit, non-partisan alliance of public interest organizations and transportation professionals committed to the development and implementation of Complete Streets policies and practices. A nationwide movement launched by the Coalition in 2004, Complete Streets is the integration of people and place in the planning, design, construction, operation, and maintenance of transportation networks. To date, over 700 agencies have adopted Complete Streets policies.

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

For additional information, visit www.smartgrowthamerica.org/completestreets.

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