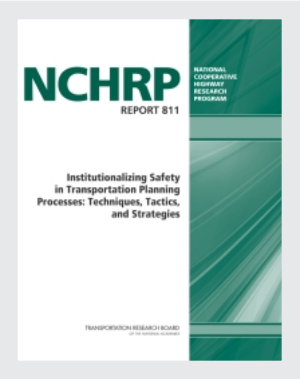


# Institutionalizing Safety in Transportation Planning Processes: Techniques, Tactics, and Strategies

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**AUTHORS**

Cambridge Systematics, Inc.

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

NCHRP REPORT 811

# Institutionalizing Safety in Transportation Planning Processes: Techniques, Tactics, and Strategies

CAMBRIDGE SYSTEMATICS, INC.
Bethesda, MD

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TRANSPORTATION RESEARCH BOARD

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**Christopher W. Jenks,** *Director, Cooperative Research Programs*
**Christopher Hedges,** *Manager, National Cooperative Highway Research Program*
**Lori L. Sundstrom,** *Senior Program Officer*
**Danna Powell,** *Senior Program Assistant*
**Eileen P. Delaney,** *Director of Publications*
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## NCHRP PROJECT 08-76 PANEL
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# FOREWORD

By Lori L. Sundstrom
Senior Program Officer
Transportation Research Board

*NCHRP Report 811* provides state departments of transportation (DOTs) and metropolitan planning organizations (MPOs) with a practical, field-tested guidebook on institutionalizing the continuous integration of safety into transportation planning and programming processes. The guidebook provides techniques, tactics, and strategies for agencies to use to institutionalize safety as a decision and planning factor. This guidebook should be useful to state, regional, and local transportation agencies; professional associations; and interest groups in examining how, and how effectively, safety has been integrated into transportation planning processes.

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More than 30,000 people are killed in crashes every year on the U.S. road system. In addition to the tragic loss of life, traffic fatalities cost the American economy $280 billion annually. In 1991, the Intermodal Surface Transportation Efficiency Act (ISTEA) added safety as a required decision factor in the transportation planning process. Fourteen years later, the Safe, Accountable, Flexible, Efficient Transportation Act: A Legacy for Users (SAFETEA-LU) required each state department of transportation (DOT) to prepare a Strategic Highway Safety Plan (SHSP), a coordinated plan that provides a roadmap for improving safety on all public roads. Every state DOT has developed an SHSP. Developing an SHSP and expanding the transportation planning process to explicitly include safety are unique and separate actions intended to complement each other. However, realizing the SHSP's goal of improving transportation safety requires robust implementation of both plans and planning processes.

State DOTs, metropolitan planning organizations, and other agencies involved in transportation safety are using a variety of approaches to integrate safety into the overall transportation planning process. Under NCHRP Project 08-76, Cambridge Systematics, Inc., was asked to analyze these different approaches from a national perspective and to develop comprehensive guidance on successful techniques, tactics, and strategies that contribute to sound safety, planning, and policy decisions. The state of practice was documented; common barriers to successful implementation as well as critical success factors were identified; and guidance for state DOTs and their safety partners was developed and vetted by a variety of agencies.

The guidebook provides state, regional, and local transportation agencies, professional associations, and interest groups with tools and techniques to integrate safety into traditional transportation planning and to measure the effectiveness and success of their integration efforts.

# CONTENTS

CHAPTER 1

# Introduction

Transportation planners stand at the center of planning, prioritizing, and programming federal transportation funds. Federal legislation has required safety as a planning factor in statewide and metropolitan transportation planning processes since 1998, and subsequent legislation, including the Moving Ahead for Progress in the 21st Century Act (MAP-21). The federal requirement strengthens the role of safety in the planning process and ensures transportation plans are consistent with Strategic Highway Safety Plans (SHSPs). State departments of transportation (DOTs) and metropolitan planning organizations (MPOs) are required to consider and implement projects, strategies, and services that increase the safety of the transportation system for motorized and nonmotorized users.

This guidebook focuses on identifying opportunities to explicitly consider safety in long-range transportation plans (LRTPs), shorter-range statewide and regional transportation improvement programs (S/TIPs), and other planning documents. Adopting and/or adapting the strategies provided throughout this guidebook will assist planners, regardless of their planning responsibilities, by providing them with the information and tools necessary for ensuring the transportation network is safe for all road users.

In Phase I of this project, institutionalization was defined as seven principles that lead to a coordinated and comprehensive approach to safety. The principles, collectively known as the *Transportation Safety Planning (TSP) Framework*, are based on a literature review, practitioner outreach surveys and interviews, onsite visits in three states, review by an expert panel, a beta test involving students in transportation safety planning courses, and a series of workshops with DOT and MPO planners. The principles are as follows:

1. Ensure DOT and MPO committees, policy boards, and other planning structures include safety expertise (e.g., safety professionals, practitioners, and stakeholders) or discuss transportation safety topics;
2. Collect and analyze crash and road data for identifying and prioritizing safety issues, projects, and programs;
3. Define and include transportation safety in the vision, goals, and objectives;
4. Integrate safety performance measures into the agency's overall performance management system;
5. Incorporate transportation safety issues, such as pedestrian and bicycle safety, safe mobility for older citizens, and transit safety, in planning programs and documents;
6. Establish safety as a decision factor to prioritize and allocate funds to safety issues, projects, and programs; and
7. Implement a monitoring system to track the transportation system's safety performance and regularly evaluate the performance of safety programs and policies.

Figure 1.1 depicts a high-level view of how and where to integrate each of these principles throughout the planning process.

Evidence from NCHRP 08-76 suggests DOTs and MPOs have addressed, and in varying degrees implemented, some of the TSP Framework, but additional research was necessary to add substantive new information on how to apply these principles during LRTP updates and project prioritization processes. Phase II of NCHRP 08-76 identified seven states to test the framework and develop this guidebook based on the experience of and input from practitioners.

The research team conducted five state workshops in Nevada, Arkansas, Louisiana, Maine, and Florida and two peer exchanges in Oregon and Vermont. Each workshop was attended by a mix of

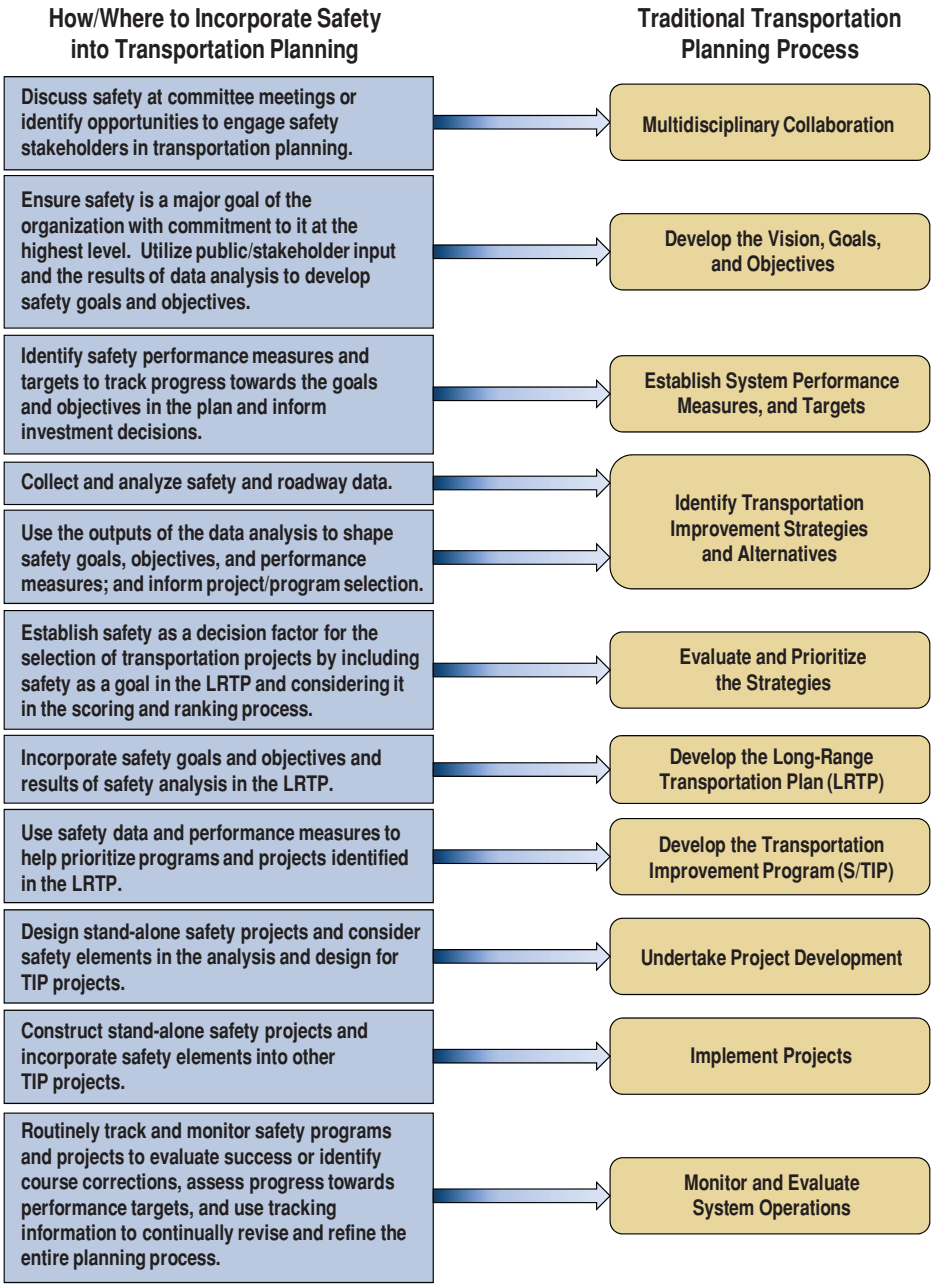


***Figure 1.1. Framework for integrating safety in the transportation planning process.***

participants, including state transportation planners, state safety engineers, modal representatives from the state DOTs, MPO planners, and federal representatives. The purposes of the workshops were (1) to provide participants with background on transportation safety planning research, highlighting the TSP Framework; (2) to learn how workshop participants could and would implement each of the seven principles to understand which principles were useful to practitioners; and (3) to learn about participant implementation practices and challenges to identify real-world applications for illustration in the final guidebook.

The information in Chapter 2, A Transportation Safety Planning Framework, presents a compilation of results from the original research and input gathered from the participating workshop states. This guidebook is intended to help DOT and MPO transportation planners integrate safety into the transportation planning process.

CHAPTER 2

# A Transportation Safety Planning Framework

This chapter lists the seven principles that can be implemented and institutionalized during each task in the transportation planning process to ensure safety is explicitly recognized. The intent of the framework is to provide MPO and DOT transportation planners with a range of ideas, strategies, and techniques for addressing safety or considering it in a more comprehensive and explicit manner. Each of the following sections, 2.1–2.7, describes the principle; asks questions to illuminate the purpose of the principle; identifies challenges; presents opportunities and strategies for success; and provides examples, case studies, or potential solutions to assist with implementation.

At the end of each planning section is a worksheet designed to assist MPOs and DOTs in (1) understanding the extent to which they are implementing the suggested strategies in the document and (2) identifying future priorities to plan for a safer system. The worksheets can be used at stakeholder and committee meetings or in individual conversations between MPO and DOT staff to identify a preliminary list of strategies an organization can implement to move forward with transportation safety planning.

Once strategies have been identified for all or some of the planning tasks, the next step is to select the top priority planning areas and address them through the development of specific action steps. Chapter 3 provides an action plan template to guide this process.

## 2.1 Include Safety Experts on Planning Committees or Discuss Safety at Committee Meetings

### 2.1.1 Description

The transportation planning process is a cooperative effort, designed to engage agencies, elected officials, operators, system users, citizens, and interested stakeholders in decisions regarding transportation policies, strategies, and investments. State DOTs and MPOs are required to seek participation from these partners during the development of LRTPs and S/TIPs. To do so, they convene committees or working groups or host workshops to provide opportunities for diverse communities and stakeholder groups to discuss transportation issues for consideration during the planning process. DOTs often form one or more ad hoc committees to provide input during the LRTP update process. MPOs are more formally structured to solicit and incorporate stakeholder input into all their activities. A policy committee governs the MPO and exercises final approval authority over all significant planning documents, including the LRTP and TIP. The policy committee is typically supported by a technical advisory committee, as well as other modal and special topic committees, that manages and supports the development of and update of planning documents. To truly incorporate safety in any transportation plan, safety stakeholders should be involved and/or safety issues should be discussed during meetings.

### 2.1.2 Ask Yourself

Would your agency update its LRTP without input from highway, transit, bicycle, pedestrian, or freight planners? To develop effective multidisciplinary transportation safety goals, policies, and objectives for inclusion in the LRTP, it is important to include transportation safety stakeholders in the process and discuss safety at committee meetings.

### 2.1.3 Challenges

The committees organized to guide the MPO and DOT planning processes may not currently include representatives of the safety community, such as safety engineers, law enforcement, emergency responders, safety educators, or other safety practitioners. Identifying these participants, defining their role in the planning process, and consistently engaging them may present initial hurdles to overcome.

Transportation planners have a different perspective than safety practitioners, whose perspectives are short term and focused on 1- to 4-year planning cycles. This condition may contribute to a disconnect, which may work against coordination on long-term safety planning efforts.

Some committee representatives may have an interest and level of expertise in safety, but they may be reluctant to represent safety interests because they were assigned to the committee for different reasons. On the other hand, in today's world, "safety planners" or transportation planners with safety expertise may not be available in DOTs and MPOs.

Adding a new committee, such as a safety committee, to the MPO decision-making structure is often difficult due to institutional barriers.

A subtle yet important issue, particularly for states and MPOs with a robust SHSP process, is that transportation and safety stakeholders may perceive the SHSP process as the only vehicle to discuss transportation safety issues and therefore exclude it from discussions at the transportation committee meeting, specifically during an LRTP update.

Elected officials on executive or policy committees may hear complaints and recommendations from constituents on issues of mobility and congestion more often than safety and tend to support transportation investments reflecting their constituents' concerns.

### 2.1.4 Opportunities and Strategies

#### *2.1.4.1 Identify Stakeholders and Establish a Safety Committee*

This approach could be the most challenging due to institutional issues associated with creating a new committee or the effort it takes to staff a new committee, but it will ensure safety is discussed on an ongoing basis. Transportation safety committees should include representatives for infrastructure, operations, human factors, and transportation planning, as well as modal experts with experience and/or interest in safety. The first step for forming a safety committee is to identify a cross section of individuals with technical and policy-oriented knowledge on the subject.

Individuals to consider for the MPO safety committee include:

- **Law Enforcement**—Officers can assist with understanding the nuances of crash reports, provide local crash data, and offer first-hand knowledge of high-risk intersections and road segments.

**Erie Regional Planning Commission (PA)**

The Erie Regional Planning Commission (RPC) in Pennsylvania established a safety committee to ensure regional plans and programs were inclusive of transportation safety considerations. The committee consists of representatives from engineering, enforcement, education, and emergency management. More information about the committee role and membership can be found at the following link: http://www.eriecounty.oh.gov/departments-and-agencies/economic-development/erie-regional-planning-commission/mpo/committees/safety-committee.

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- **Local Planners and Engineers**—Transportation safety is often a low priority for local jurisdictions, since they typically lack staff expertise, time, or resources to address safety issues. Engaging local planners and engineers in the committee provides opportunities for them to learn about safety issues and provide input during development of safety policies. Their participation will also establish the practice of including attention to safety in all local project decisions.
- **Multimodal Planners**—LRTPs address issues affecting the entire transportation system and all of its users, including drivers and roadway infrastructure, transit systems and their users, the multimodal freight system and its users, bicyclists, pedestrians, and others. Planners from each of these areas may provide valuable perspectives on current safety issues and needs, as well as effective methods for addressing them.
- **Traffic and Safety Engineers**—State and district traffic and safety engineers are familiar with the contents of the SHSP and safety performance, which will help during goal and objective setting. They also analyze and maintain safety data, which is necessary during the planning process.
- **Staff Representative(s)**—MPO or DOT staff will coordinate and lead this committee, so it is critical to engage staff interested in safety. Staff can also lend technical expertise (e.g., additional data analyses or mapping). MPO staff often have a direct connection to local elected officials and can serve as liaisons between the safety committee and the policy and/or technical advisory committees, keeping both groups updated on relevant activities. Perhaps the most important role is to encourage the policy or executive committee to explicitly consider safety throughout the planning process.
- **Other Safety Stakeholders**—At the MPO level in particular, already-existing safety groups [e.g., safe communities groups, American Association of Retired Persons (AARP) branches, Mothers Against Drunk Driving (MADD)/Students Against Destructive Decisions (SADD) advocacy groups, university/college programs] should be identified and reached out to for input on effective safety programs.

If unfamiliar with methods for identifying safety stakeholders, options include the following:

- Attend an SHSP steering committee meeting or a safety summit. These forums present an opportunity to make connections with state safety professionals and identify their regional equivalents and safety champions and leaders. Regular attendance at safety meetings enables planners to learn from example and observe firsthand how the SHSP process fosters collaboration.
- Ask the SHSP coordinator or manager to recommend safety professionals for engaging in the LRTP steering and advisory committees. SHSP coordinators work with each of the safety disciplines; hence, the recommendations of safety professionals to engage will move beyond transportation planning and engineering and include nontraditional partners, such as persons who address road user behavior issues.

The safety committee can review available safety data; develop transportation safety goals, key objectives, and performance measures; prioritize programs and projects eligible for funding; identify opportunities to include safety in the context of all transportation projects; act as champions for transportation safety; and provide updates on transportation safety activities, especially during a LRTP update.

Potential Solution—If a safety committee cannot be established, transportation safety can be added to the agenda of other committee meetings (at the DOT, it may be the executive committee and, at the MPO, the technical advisory committee, policy committee, or statewide MPO meetings). If safety is regularly discussed, it is more likely to become part of the transportation culture.

#### *2.1.4.2 Create an Ad Hoc Safety Committee*

Another option is to form a safety task force or coalition outside the institutionalized decision-making structure to influence decisions made by existing committees. This group, composed of the same stakeholders previously identified, would convene only during the LRTP update process to provide guidance on transportation safety planning issues and help ensure safety goals, policies, and strategies are established or updated.

Potential Solution—Identify existing safety coalitions in the state or region. At the DOT, it is likely the SHSP committees and, at the regional level, it may be safe communities coalitions, enforcement task forces, or other committees. Attend a meeting to discuss current and planned transportation safety efforts.

#### *2.1.4.3 Include Safety Representatives on Established Committees*

Identify and engage one or more safety professionals on existing committees to ensure planners are briefed on safety issues, which could lead to greater integration of safety into the LRTP.

#### *2.1.4.4 Identify and Include Safety Experts on Discrete Planning Activities*

States and MPOs initiate other planning efforts from time to time (i.e., corridor plans, access management studies, bicycle and pedestrian plans). Including safety stakeholders in these efforts will strengthen the safety elements of the documents. These planning efforts often feed into and inform the long-range planning process.

#### *2.1.4.5 Discuss Safety at Committee Meetings*

Safety stakeholders do not always need to be added to established committees to have meaningful conversations about transportation safety. Transportation planners often work with modal crash data or have an interest in the topic and can brief committees on general crash concerns or safety issues by specific modal areas.

Potential Solution—Add safety to the agenda item for a committee meeting, such as the bicycle and pedestrian committee or transit committee, to see what types of topics arise, where interest lies to enhance transportation safety in the state or region, and what is necessary to continue the conversation (e.g., a presentation on the SHSP, additional crash data, a presentation from local law enforcement).

#### *2.1.4.6 Identify a Safety Champion*

State and regional elected officials influence transportation decisions. Identifying or cultivating a safety champion on a statewide executive committee or MPO policy board provides a consistent voice for transportation safety needs and investments.

### 2.1.5 Strategy Ranking and Prioritization Worksheet

Rate your organization's progress/status on the strategies on a scale of 1 to 5 using the criteria in Figure 2.1 and prioritize the strategies by the preferred order of implementation.

| Score Key | | | | | |
|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **N/A** |
| Not started | Early initial stages | Some elements complete | Substantial portion complete | Complete | Not applicable |

| **Strategy** | **Score** | **Priority Ranking** |
|---|---|---|
| Identify stakeholders and establish a safety committee | | |
| Create an ad hoc safety committee | | |
| Include safety representatives on established committees | | |
| Identify and include safety experts on discrete planning activities | | |
| Discuss safety at committee meetings | | |
| Identify a safety champion | | |

| **Other Potential Priority Strategies** |
|---|
| 1) |
| 2) |

***Figure 2.1. Strategy ranking and prioritization worksheet for Principle 1.***

## 2.2 Collect and Analyze Transportation Safety Data

### 2.2.1 Description

Improving transportation safety is a data-driven process. To better identify multimodal safety problems, develop and implement effective strategies, and evaluate effectiveness, state DOTs and MPOs collect and analyze modal crash data, traffic volume data, and roadway geometric data. Vehicle data, driver data, law enforcement data, injury surveillance data, demographic and land use data, as well as the characteristics of the built environment are also helpful and should be considered. Armed with the information derived from analyzing these data, planners are able to perform the following:

- Identify systemic safety issues, as well as high-crash corridors, intersections, and/or facility types [ideally via geographic information system (GIS) mapping];
- Identify crash types (e.g., rear-end collisions, lane departures, bicycle);
- Identify roadway facility types where crashes are likely to occur (e.g., urban arterials, low-volume rural roads);
- Identify contributing crash factors (e.g., failure to yield, excessive speed, distraction, improper or confusing signage, inadequate sight distance, etc.);
- Identify roadway characteristics associated with crashes, such as lane width, pavement markings, horizontal curves, signage, etc.;
- Identify key human factors or behaviors associated with the number and severity of crashes (e.g., nonuse of safety belts or helmets, alcohol or drug impairment, etc.); and
- Determine crash risk inequities across jurisdictional boundaries by using travel data to establish crash rates.

This knowledge provides the basis for developing transportation safety goals, strategies, and projects with the highest potential to reduce crashes and save lives. It also enables planners to evaluate the effectiveness of implemented strategies and projects and monitor safety performance.

### 2.2.2 Ask Yourself

Would your agency allocate its limited resources to fund transportation projects without analyzing traffic data, such as volumes, delay, or reliability? It is important to review crash and exposure data, as well as the geometric characteristics of problem locations, to understand the most significant safety issues and locations to establish transportation safety goals and objectives and apply safety resources in the most effective manner.

### 2.2.3 Challenges

Often, planners face challenges in both collecting and analyzing safety data. Sometimes important safety data are unavailable or unknown. Data included in police crash reports can vary across jurisdictions and may not be available electronically in a timely fashion. Licensing information, medical records, insurance records, citations, and roadway information may not be available and, if they are, may not be linked to crash data. Converting the wide variety of safety data into a format that is clear and understandable to safety stakeholders, elected officials, and the general public is difficult but necessary to gain support for programs and projects to reduce crashes, serious injuries, and fatalities.

### 2.2.4 Opportunities and Strategies

#### *2.2.4.1 Identify Crash Data and Analysis Capabilities*

After data are collected at a crash scene, various elements are entered into a state database. Data and data management systems differ from state to state. Some states manage a repository for crash data associated with state-owned roads and local roads, but others may only have complete data on the state road system. Depending on the state, crash data are managed either by the DOT, department of motor vehicles, state highway safety office, a university, or other state agency. Local law enforcement agencies may also manage safety data associated with their respective missions and jurisdictions. In addition, the Fatality Analysis Reporting System is an online database that allows users to search for fatality crash statistics by state (www.nhtsa.gov/FARS). As a planner, the first step is to identify the available crash data, the data manager(s), and existing tools to analyze the data. Opportunities to accomplish this include the following:

- **Initiate Informal Meetings**—Regional and local governments benefit through improved access to safety data and technical support for data analysis. DOT safety planners and engineers and MPO planners are encouraged to collaborate to identify regional safety data and analysis needs, perceived gaps, and protocols for data sharing.
- **Provide or Attend Training Opportunities**—State DOTs that manage crash portals can provide training to MPOs and local agencies on how to use the resource. Planners interested in learning more about the Highway Safety Manual (HSM) and other analysis tools can receive training from the National Highway Institute. Some DOTs, such as Louisiana, deliver HSM trainings throughout the state to any interested planner or engineer.
- **Participate in the Traffic Records Coordinating Committee**—States are required by the National Highway Traffic Safety Administration to establish a Traffic Records Coordinating Committee (TRCC). TRCCs include members who collect, manage, and analyze safety data. Among other requirements, they identify data gaps and develop grant proposals to support data improvement

**Ohio DOT Crash Data and Analysis Training**

The Ohio DOT has two tools: one allows users to search for crash data and another helps users analyze the data. Training is provided to local agencies, law enforcement officials, MPOs, and other approved users so stakeholders can maximize use of the tool. More information about the tool and the training itself can be found at: www.dot.state.oh.us/Divisions/Planning/SPPM/SystemsPlanning/Pages/GCAT.aspx.

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strategies. Planners should (1) identify a point of contact within the planning agency to participate in TRCC deliberations and (2) establish relationships with its members to better understand where and how to access safety data and to enlist TRCC support in the collection of additional safety data.

- **Collaborate with Law Enforcement**—Many states and some MPOs are collaborating directly with law enforcement agencies to gain access to critical local safety data. Enforcement agencies generally have working knowledge of the behaviors associated with crashes and are the source of nearly all crash data. Inviting law enforcement officers to committee meetings is a starting point for discussing the availability and accessibility of local crash data.
- **Engage in the SHSP**—State DOTs are increasingly engaging metropolitan and regional planning organizations in the SHSP process by inviting them to SHSP meetings; hosting regional summits; making educational presentations about the SHSP, the planning process, and the Highway Safety Improvement Program (HSIP); and discussing regional crash data. Regional governments benefit from these meetings by learning about improved access to safety data and technical support for data analysis. The SHSP document itself also contains valuable statewide data.
- **Coordinate with Other Statewide Entities**—Other agencies in the state may collect crash data relative to specific issues. For instance, local technical assistance programs and tribal technical assistance programs may have traffic or crash data for local roadways. Organizations such as MADD or AAA usually maintain data sets for specific safety areas. Transit agencies will also have crash data available.
- **Review Other Planning Documents**—The SHSP and the Highway Safety Plan (HSP) both summarize annual crash data and trends for a state and by emphasis areas. This information is not typically broken down by region but contains valuable statewide data to help planners understand the core safety issues in the state.
- **Ask the Public and Stakeholders**—Information collected from the public and stakeholders can be a good source of qualitative data. It provides planners with insights into what the public perceives as the key issues and has the potential to shape transportation safety goal areas. Agencies can use surveys, interviews, or workshops to collect this information. Figure 2.2 depicts a worksheet used by the Corvallis MPO in Oregon during a workshop to solicit feedback.

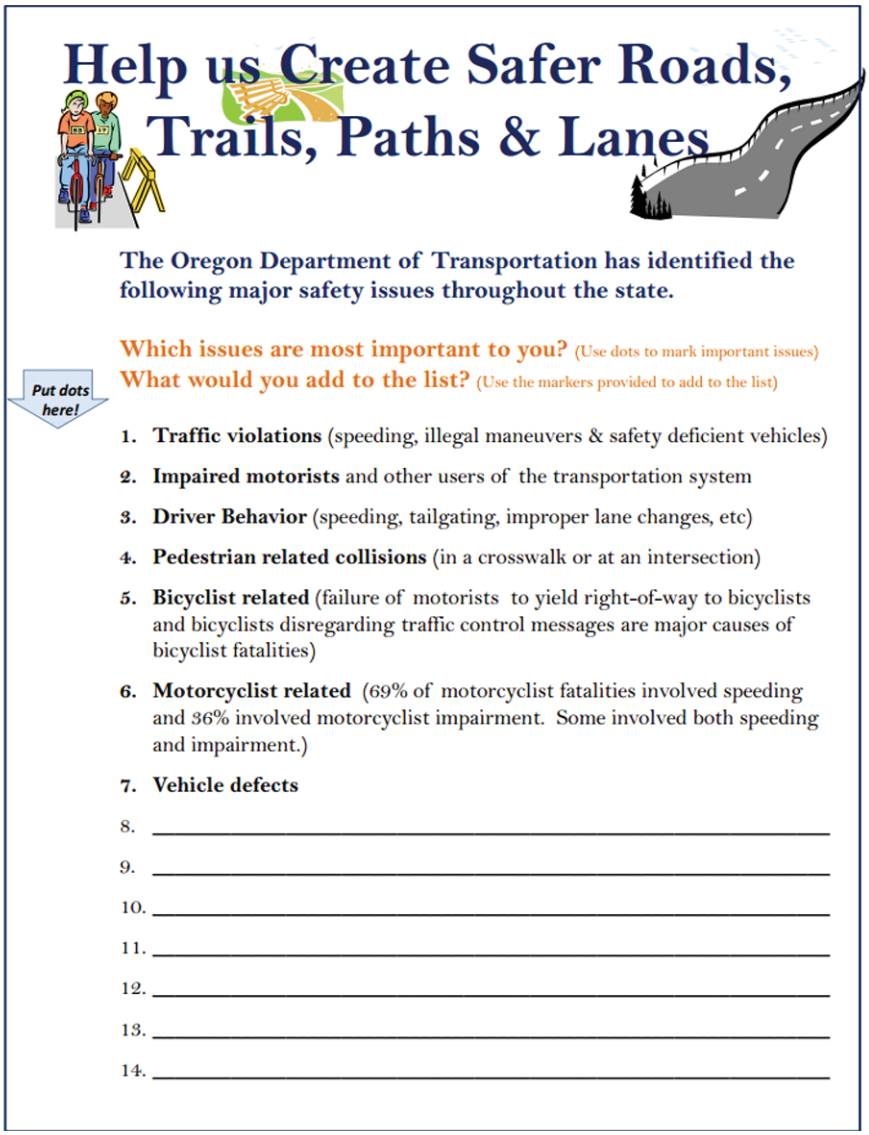
**Louisiana DOTD SHSP Reporting Dashboard**

The Louisiana DOTD, in partnership with the Louisiana State University Highway Safety Research Group, developed a website that displays fatality and serious injury data by parish for all of the SHSP Emphasis Areas. Anyone can use this site to get a sense of the regional and local crash trends and issues. See: http://lashspdata.lsu.edu/#/Home.

#### *2.2.4.2 Analyze Crash Data*

Once the location and accessibility requirements of crash data are known, a number of approaches are available to analyze or review crash data sets to identify transportation goals and strategies for all transportation modes:

- **Analyze Fatal and Injury Crashes**—MAP-21 requires DOTs and MPOs to measure safety performance for the number and rate of fatalities and serious injuries and to develop targets. By reviewing the crash data trends in each of these areas, it is possible to make the case that transportation safety is a major issue in the state or for a specific region. Analysis of the data can also assist an agency with the development of realistic fatality and serious injury safety goals based on prior years' results. For instance, the sample data in Figure 2.3 show annual crash frequency and the annual rate of reduction each year. The reductions can be averaged to help an agency develop a safety goal (i.e., reduce fatalities by 2.2 percent each year).
- **Analyze Crash Trends, Types, and Contributing Factors**—Data analysis allows safety issues to be described quantitatively so resources can be applied to the areas with the greatest potential to save lives and reduce injuries. It can determine a number of items, including the relative magnitude of certain crash types (e.g., rear-end, angle, head-on), of contributing crash factors (e.g., excessive speed, failure to stop, impaired driving), and of the facility types (i.e., arterials, collectors) experiencing crashes. Goals and objectives can be based on the results of these

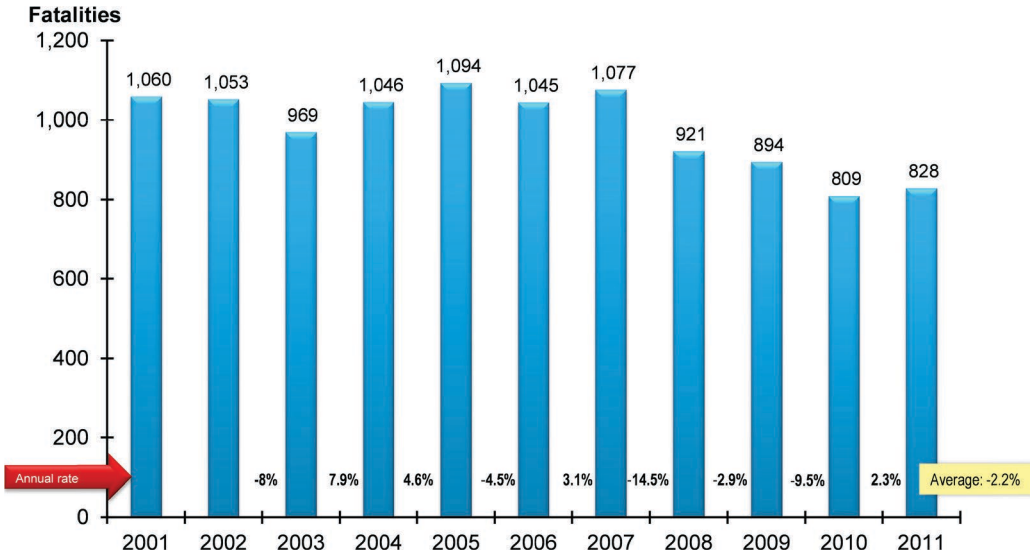



Source: Oregon DOT.

***Figure 2.2. Method to solicit public and stakeholder input.***

analyses. Figure 2.4 shows a risk matrix that was developed for a state DOT's SHSP update process. The cells highlighted in red and orange represent the more common issues. This type of matrix can be created for a variety of different cross tabulations to look for similarities and distinctions to inform the selection of goals.

- **Analyze High-Crash Locations or Crash Clusters**—High-crash location reports for corridors and/or intersections provide planners with information on locations for immediate and future improvements. Typically, improvements are identified through road safety audits or engineering studies intended to glean additional information about the causes of the crashes and recommend solutions. Information about crash causation in one location may be applied to a future location with similar characteristics. In addition, high-crash corridors/clusters can be reviewed in coordination with maintenance or preservation projects. When a road is scheduled for improvements, safety treatments can also be constructed at the same time.
- **Use Systemic Analysis**—This type of analysis looks at crash history on an aggregate basis to identify high-risk roadway characteristics (e.g., sharp curves combined with higher traffic volumes, or sharp curves and narrow shoulders). Solutions and countermeasures are then




*Sample data created for guidebook.

***Figure 2.3. Analysis of crash data* to develop a safety goal.***

**Colorado SHSP Emphasis Area Data Analysis (2007–2012)**

| | Crash-Level Characteristics | | | | | | | | | Person-Level Characteristics | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | All Crashes | Roadway Departure | Intersection-Related | Alcohol Suspected | Drugs Suspected | Young Driver Involved | Older Driver Involved | Rural | Urban | Unrestrained Occupants | Motorcyclists | Pedestrians | Bicyclists |
| **Fatalities & Serious Injuries** | **23,395** | **7,874** | **9,212** | **4,993** | **1,182** | **4,502** | **3,121** | **5,159** | **18,234** | **4,999** | **4,010** | **1,791** | **805** |
| **2007** | 4,511 | 1,564 | 1,777 | 1,034 | 206 | 956 | 521 | 1,022 | 3,490 | 1,050 | 723 | 303 | 124 |
| **2008** | 4,132 | 1,403 | 1,540 | 933 | 165 | 732 | 523 | 924 | 3,208 | 875 | 742 | 287 | 122 |
| **2009** | 3,868 | 1,345 | 1,501 | 820 | 166 | 779 | 496 | 905 | 2,964 | 838 | 616 | 287 | 132 |
| **2010** | 3,546 | 1,143 | 1,424 | 701 | 180 | 667 | 493 | 767 | 2,779 | 719 | 623 | 287 | 126 |
| **2011** | 3,624 | 1,237 | 1,471 | 767 | 244 | 676 | 487 | 754 | 2,867 | 798 | 619 | 294 | 133 |
| **2012** | 3,714 | 1,182 | 1,499 | 738 | 221 | 692 | 601 | 787 | 2,926 | 719 | 687 | 333 | 168 |
| | | | | | | | | | | | | | |
| **Summary** | | | | | | | | | | | | | |
| % Total | | 19% | 44% | 6% | 1% | 21% | 12% | 16% | 84% | 23% | 3% | 2% | 1% |
| % Fatalities | | 44% | 25% | 29% | 9% | 16% | 18% | 32% | 68% | 35% | 18% | 10% | 2% |
| % Serious Injuries | | 32% | 41% | 20% | 4% | 20% | 13% | 21% | 79% | 19% | 17% | 7% | 4% |
| % Fatalities & Serious Injuries | | 34% | 39% | 21% | 5% | 19% | 13% | 22% | 78% | 21% | 17% | 8% | 3% |
| | | | | | | | | | | | | | |
| **Fatalities & Serious Injuries per 100 Crashes** | 3.8 | 6.6 | 3.3 | NA | | 3.4 | 4.2 | 5.3 | 3.5 | | | | |
| **Fatalities & Serious Injuries per 100 Persons** | | | | | | | | | | 3.4 | 23.7 | 14.9 | 9.6 |
| | | | | | | | | | | | | | |
| **Overrepresentation of Fatalities & Serious Injuries** | | 1.8 | 0.9 | 3.5 | 4.4 | 0.9 | 1.1 | 1.4 | 0.9 | 0.9 | 6.3 | 4.0 | 2.6 |

Source: Cambridge Systematics, Inc.

***Figure 2.4. State-level risk matrix to inform safety goals.***

identified for implementation on a systemwide basis. This analysis can result in future goals and objectives that promote the widespread implementation of countermeasures at applicable locations.

- **Use Network Screening Methods and Crash Prediction Models**—Sophisticated tools such as the Federal Highway Administration's (FHWA's) Safety Analyst and the HSM provide crash prediction methods. They require a fairly complete set of crash data, traffic volume data, and roadway characteristic data, but the analysis results can better inform the infrastructure goals and objectives.

For in-depth information on any of the data analysis tools available, view the FHWA Office of Safety website (safety.fhwa.dot.gov/tools/data_tools/fhwasa09002/).

#### 2.2.4.3 Display Data

Presenting data to stakeholders, the public, and decision-makers can achieve multiple purposes. It helps shape or refine the goals, objectives, and measures in an LRTP or S/TIP. It emphasizes problem areas that may warrant attention in a stand-alone planning document, such as a pedestrian safety plan. Finally, it emphasizes to decision-makers the importance of collecting and analyzing data to support science-based decision-making. Crash data can be complicated, so using maps, tables, and charts are the best ways to convey the information. Figures 2.5 though 2.9 depict approaches for displaying crash data.

**Florida Traffic Safety Portal**

The State Safety Office of the Florida DOT maintains the Florida Traffic Safety Portal. This web application serves "as a central location for the exchange and sharing of tools, data, information, and ideas among the traffic safety professionals in Florida" (Florida DOT 2014).

One helpful feature of this web application is its mapping function that allows anyone to see high-crash location details, including number of fatalities, number of crashes, crash rates, roadway characteristics, and many other elements, along with a map of the high-crash location.

#### 2.2.4.4 Address Data Gaps

Access to quality data combined with the analysis capability enhances the integration of safety into the planning process. However, lack of quality data need not prevent transportation planners from obtaining practical safety information.

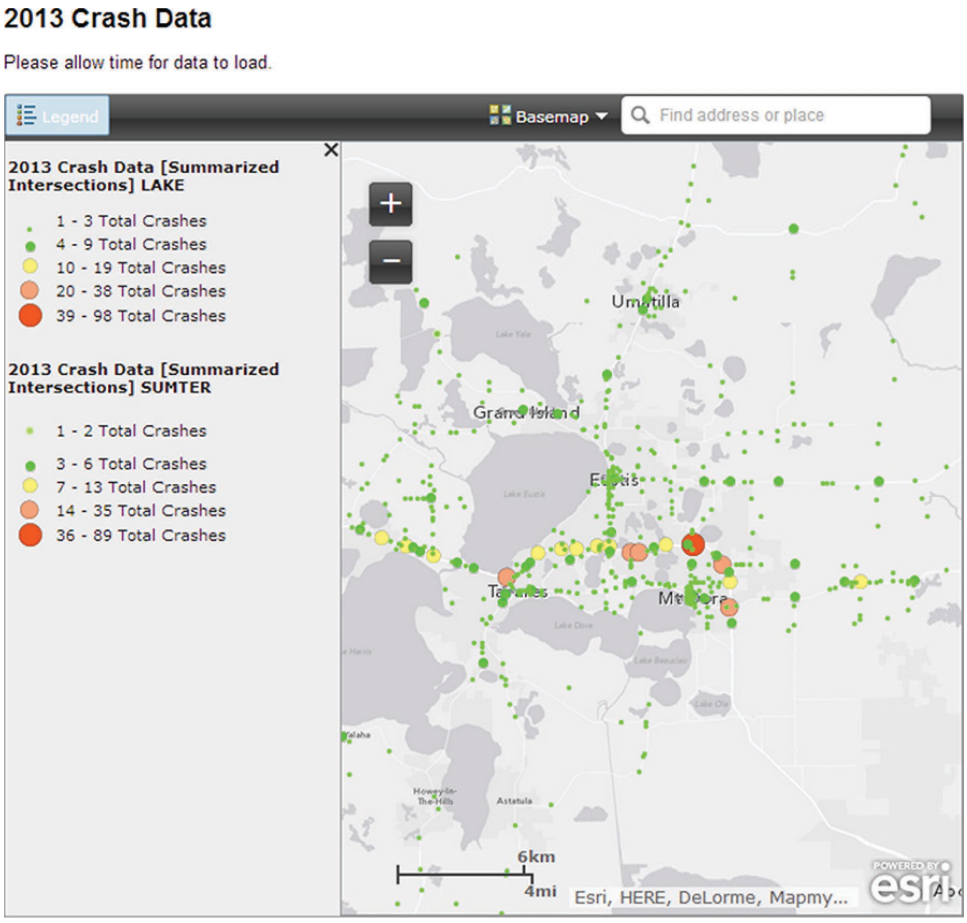
Potential Solution—Collaborate with multidisciplinary safety committees, decision-makers, law enforcement officers, and the general public to gain clues about what the most important safety problems are. Fortunately, planners are experienced in working with diverse groups to help them understand issues and develop solutions. Simply bringing people together to talk about their safety concerns can provide a starting point for addressing safety in the planning process.

Potential Solution—The absence of data is limiting, but discussions among state, MPO, and local planners can help identify areas where data are desired and a data collection approach can be built. For example, many DOTs and MPOs are interested in better addressing the safety of vulnerable road users, such as bicyclists and pedestrians. Discussing opportunities for collecting new data (i.e., bicycle and pedestrian counts) or improving current data (i.e., exposure information) will focus collective resources and time on the effort.

| Key Indicators | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|
| Total Crashes on Public Streets | 1,997 | 1,844 | 1,781 | 1,824 | 1,733 |
| Total Fatalities | 3 | 6 | 2 | 10 | 8 |
| Average Crashes Per Day | 5.5 | 5.1 | 4.9 | 5.0 | 4.7 |
| Most Frequent Crash Day | Friday | Friday | Friday | Friday | Friday |
| Least Frequent Crash Day | Sunday | Sunday/ Tuesday | Sunday | Sunday | Sunday |
| Most Frequent Crash Hour | 3:00 PM | 5:00 PM | 5:00 PM | 3:00 PM | 3:00 PM 5:00 PM |
| Least Frequent Crash Hour | 4:00 AM | 4:00 AM | 5:00 AM | 4:00 AM | 4:00 AM |
| Most Frequent Crash Month | November | March | October | February | December |
| Least Frequent Crash Month | February | June | January | September | April |
| Days Per Year Without a Crash | 5 | 2 | 6 | 3 | 5 |
| Most Frequent Crash Type | Rear End | Rear End | Rear End | Rear End | Rear End |
| No. of Speeding Related Crashes | 105 | 80 | 73 | 87 | 63 |
| No. DWI Related Crashes | 82 | 77 | 76 | 60 | 79 |
| No. Crashes Involving Pedestrians | 19 | 17 | 27 | 19 | 10 |
| No. of Bicycle/Motorcycle Crashes | 51 | 41 | 42 | 60 | 43 |
| State of NC Crash Ranking * (City of Rocky Mount) | 10 | 9 | 13 | 9 | Not Available |

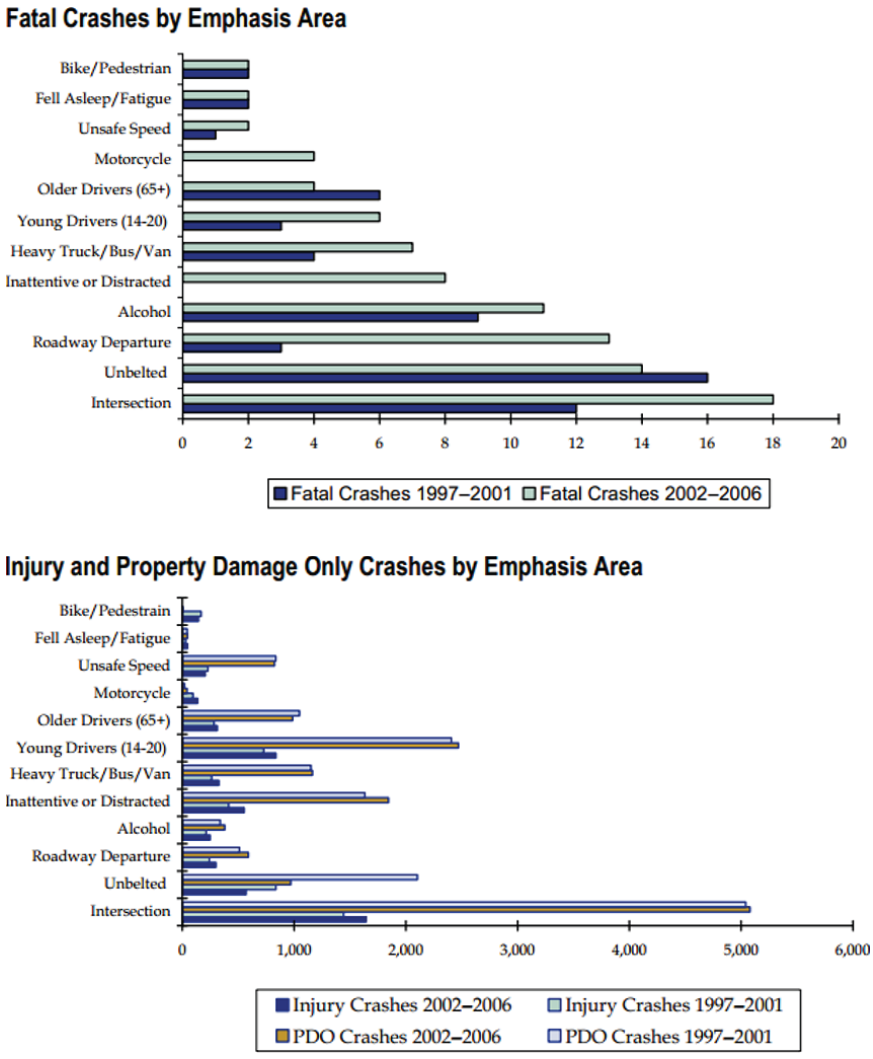
Source: City of Rocky Mount, North Carolina.

***Figure 2.5. Crash statistics for the City of Rocky Mount (North Carolina).***



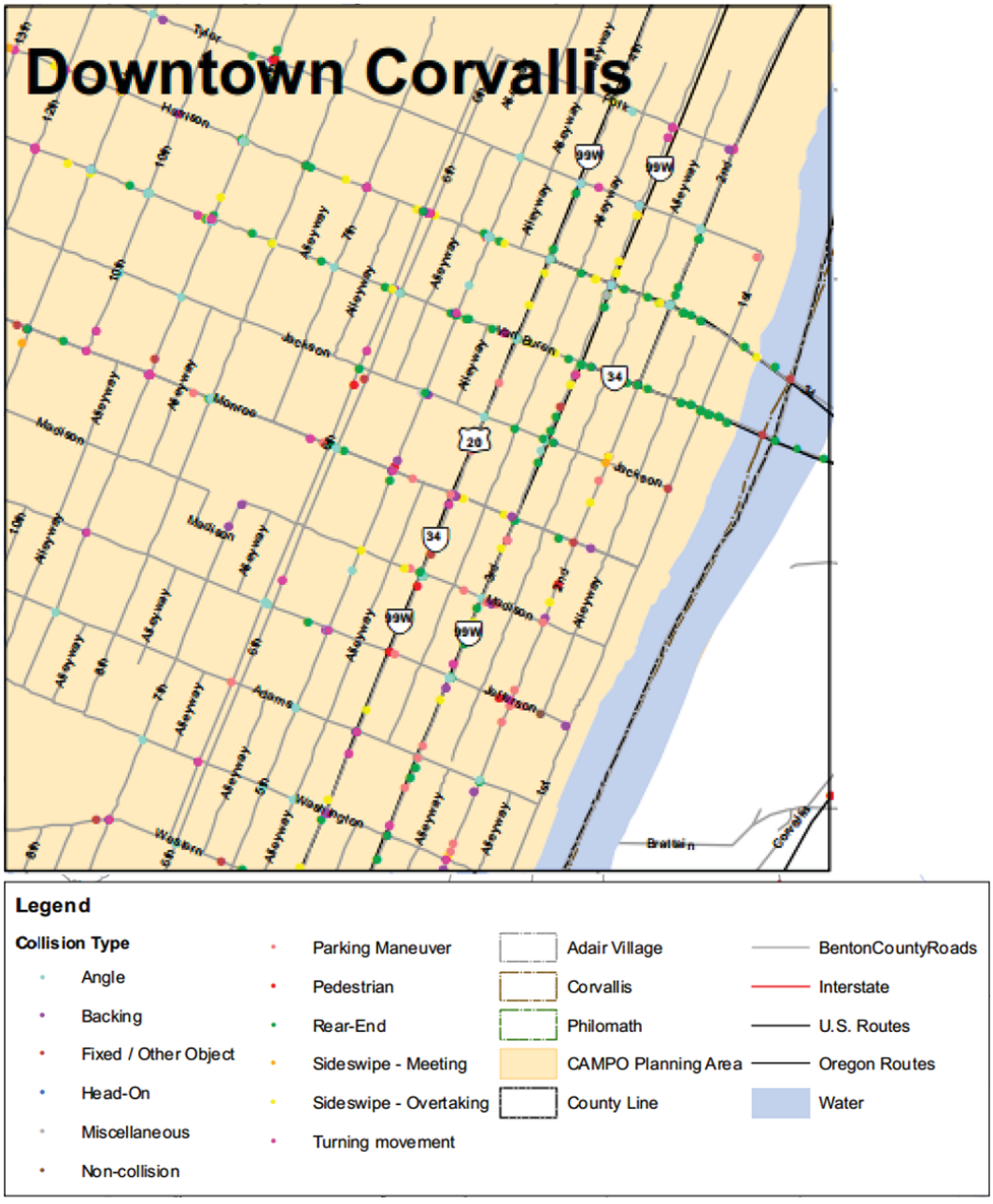

Source: Lake-Sumter MPO (Florida).

***Figure 2.6. Crash cluster interactive map for Lake-Sumter MPO (Florida).***



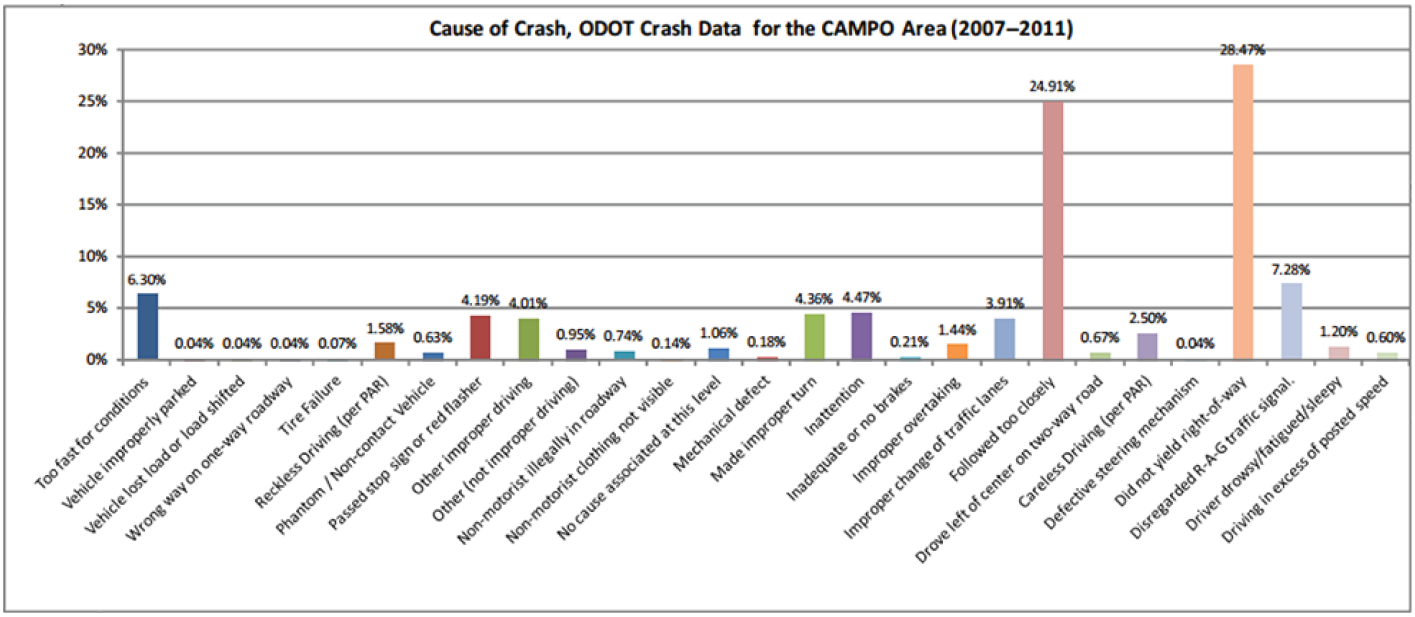

Source: Cheyenne MPO (Wyoming).

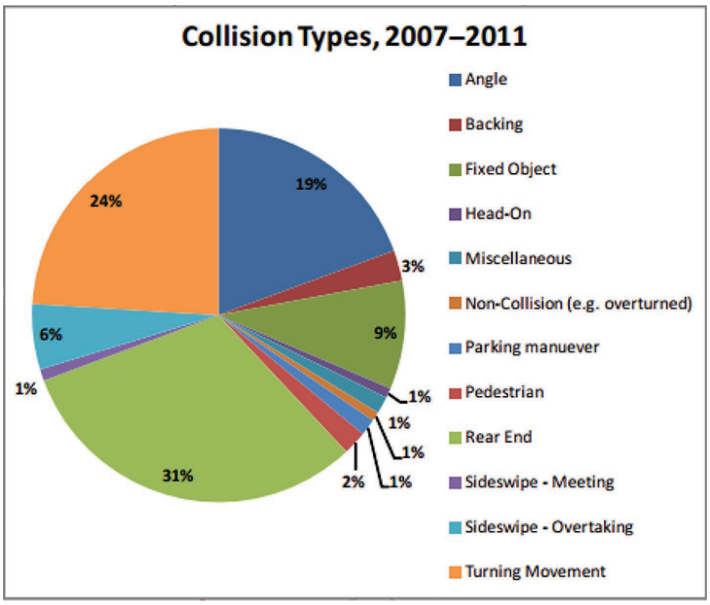
***Figure 2.7. Crash data by emphasis areas for Cheyenne MPO (Wyoming).***




Source: Corvallis MPO (Oregon).

***Figure 2.8. Clusters by collision type for Corvallis MPO (Oregon).***




Source: Corvallis MPO (Oregon).

***Figure 2.9. Collision types in Corvallis MPO (Oregon).***

| Score Key | | | | | |
|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **N/A** |
| Not started | Early initial stages | Some elements complete | Substantial portion complete | Complete | Not applicable |

| Strategy | Score | Priority Ranking |
|---|---|---|
| Identify crash data and analysis capabilities<br>• Initiate an informal meeting<br>• Host or attend training<br>• Participate in the TRCC<br>• Collaborate with law enforcement<br>• Engage in the SHSP<br>• Coordinate with other statewide entities<br>• Review other planning documents<br>• Ask the public and stakeholders | | |
| Analyze crash data<br>• Analyze fatal and injury crashes<br>• Analyze crash trends, types, and contributing factors<br>• Analyze high-crash corridors and crash clusters<br>• Use systemic analysis<br>• Use network screening methods and crash prediction models | | |
| Display crash data | | |
| Address data gaps | | |

| Other Potential Priority Strategies |
|---|
| 1) |
| 2) |

*Figure 2.10. Strategy ranking and prioritization worksheet for Principle 2.*

### 2.2.5 Strategy Ranking and Prioritization Worksheet

Rate your organization's progress/status on the strategies on a scale of 1 to 5 using the criteria in Figure 2.10 and prioritize the strategies by the preferred order of implementation.

## 2.3 Incorporate Safety into the Vision, Goals, and Objectives

### 2.3.1 Description

A vision, goals, and objectives provide a framework to guide decisions made when identifying transportation safety policies, programs, and projects. A safety vision helps staff and elected officials focus on a desired state, whether it is zero fatalities or another aspirational vision. Transportation safety goals demonstrate what an agency is committed to achieving, whether it be improving transportation safety or something more specific such as improving intersection safety. Objectives are specific, attainable, and measurable actions used to achieve the goals.

### 2.3.2 Ask Yourself

Does your agency's LRTP reference the word "safety" in the vision and goals, and go further to define specific objectives to guide multimodal transportation safety investments? Does the LRTP reference SHSP goals and objectives and take into account how they can be implemented

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or supported? A vision, goals, and accompanying objectives inclusive of safety and SHSP principles sets the stage for identifying and later selecting safer transportation programs and projects.

### 2.3.3 Challenges

Data and/or analysis may not be available to develop specific transportation safety goals or objectives.

Safety may not be given much attention in the long-range planning process because a safety vision, goals, and objectives are outlined in the SHSP, so planners do not feel the need to address safety in LRTPs. In other cases, planners may adopt the goals and objectives from the SHSP but not customize them to meet the unique long-range multimodal needs for a state or a region.

### 2.3.4 Opportunities and Strategies

#### *2.3.4.1 Develop a Vision Statement Inclusive of Safety*

A vision statement is meant to encompass the values for a state or region. A vision statement commonly found in an LRTP will list the attributes the community, elected officials, and stakeholder groups think are most important for a transportation network. A sample vision statement may be, "Transform transportation to achieve optimum mobility while promoting economic vitality, protecting the environment, enhancing the quality of life, and providing for a safe network." Including safety in the vision statement is an important first step for establishing safety as a priority. If it is not included, safety may not be seen as equal to the other transportation issues or as a key value for which goals, objectives, and performance measures should be developed.

Another option is to create or adopt a safety-specific vision. The advantage is it elevates safety as a specific priority, increasing the likelihood that funds will be directed toward programs and projects that move people to destinations safely. In many states, the SHSP contains a Halve Fatalities by 2030 vision or a Zero Fatalities vision, which can be adopted and used in LRTPs. These goals have been promoted by the American Association of State Highway and Transportation Officials (AASHTO) at different times. The first relates to a goal set and achieved by the governor of Victoria, Australia, to cut fatalities in half within 10 years. The AASHTO members determined this could be accomplished in the United States over 20 years. The second vision relates to a growing phenomenon around the world that promotes the idea of zero as the only true goal (i.e., no traffic death is acceptable—*One death is one too many*—the vision set by the Iowa SHSP in 2007).

> Potential Solution—A number of "Man on the Street" safety videos have been created to illustrate the public's personal goal for traffic safety. These videos can be shown during involvement events or committee meetings to help people understand why safety is so important and aid in developing a vision for transportation safety. Go to this Rhode Island DOT video to view an example: http://www.youtube.com/watch?v=E9sImnOIS3M.

#### *2.3.4.2 Bring Safety into the Conversation*

Discussing transportation safety with stakeholders and the public early in a plan update increases the likelihood that safety will be seen as a priority and goals and objectives will be developed. Methods for accomplishing this include the following:

- Safety discussions can be held at meetings, independent of other topic/modal areas. For example, the Regional Transportation Commission (RTC) of Washoe County, Nevada, established four discussion groups during the first round of "input" meetings for the LRTP update, with

one dedicated to "Safe and Healthy Communities." Because the group focused on safety, stakeholders saw it as a priority, and eventually it became a goal area in the LRTP.

- Questions about safety can be asked when surveys are conducted or focus groups held to gather input on a plan. For example, the following questions are from an LRTP focus group discussion guide from the Gainesville, Florida, MPO, which represents the north central Florida urbanized area:
  - Are there specific areas where traffic safety is a major concern?
  - What transportation modifications could be made to improve safety for all users of the transportation network?
  - What is needed to enhance transit options, expand bicycle and pedestrian mobility, and provide for safer streets?
- MPOs and DOTs often hold open houses to initiate a plan update. Showing crash data at these meetings can justify the development of safety goals and objectives and helps stakeholders better understand and make informed decisions about transportation safety.
- A safety workshop or summit could be held to identify specific safety concerns, discuss crash data, develop safety goals and objectives, and identify strategies to reduce fatalities and serious injuries. Workshops can be used to educate stakeholders on transportation safety issues but also to ask them to provide input into future safety projects and priorities through breakout groups.

**MPO Meetings and Events to Solicit Feedback on Transportation Safety**

San Antonio–Bexar County MPO in Texas hosted a Safety Summit, displaying data and discussing current safety initiatives in the region to better understand priorities moving forward. See: http://www.alamoareampo.org/safety/Summit2013/index.html.

The Broward MPO in Florida hosted a Safe Streets Summit to explore with stakeholders the benefits of designing safe and accessible streets that enhance the economy. See: http://www.browardmpo.org/services/complete-streets/safe-streets-summit.

The Alamo Area MPO in Texas hosted a Traffic Congestion and Safety Workshop prior to its most recent LRTP update and conducted a mapping exercise to identify safety issues and priorities. See: http://www.alamoareampo.org/News/PR/2014/News%20Release%20-%20Traffic%20Congestion%20and%20Safety%20Workshop%20June%202014%20final.pdf.

#### *2.3.4.3 Develop Safety Goals and Objectives*

Transportation safety goals and objectives can be represented in a number of different ways but should be included in LRTPs to inform stakeholders of the safety focus areas for a state or region.

**Goals.** Transportation safety goals are "big picture" priorities, which describe the desired results for a safe multimodal system for all road users. Although the safety goal (or goals) may appear generic in nature, they accomplish two things: (1) establish safety as a priority in the state or region and (2) set the stage for the development of specific objectives to achieve safety results.

As discussed in Section 2.2, goals can be developed based on crash types, trends, and contributing factors or the results of certain analysis strategies, such as systemic analysis. If data are not available, an overarching safety goal should still be developed to emphasize safety is an important factor, and resources can be appropriately directed to data collection efforts.

Plans may have one overarching safety goal, multiple safety goals, specific numeric goals, or a combination of the three.

- A single overarching goal may be: "Increase the safety of the transportation system for motorized and nonmotorized users."
- In plans that have multiple safety goals, these goals are usually organized by mode or crash factor. Sample goals may be: "Reduce intersection fatalities and serious injuries" or "Reduce rear-end crashes."
- A numeric goal may be: "Reduce the number of fatal crashes by 5 percent by 2030." If a numeric goal is being discussed, coordinating it with the goal in the SHSP can ensure all agencies in the state are working toward the same result.

Some agencies choose not to develop specific safety goals but weave safety considerations into other goal areas. For example, Metroplan, the MPO for Little Rock, Arkansas, has a number of goals; one is "Quality Transportation Corridors." The goal focuses on a number of approaches to enhancing corridors, such as access and mobility, but also includes specific safety elements.

**Objectives.** Transportation safety objectives are specific approaches, policies, ideas, and actions for implementing the safety goal or goals. Objectives are derived based on the same data used to establish the safety goals. However, depending on the availability and completeness of data, objectives may range from general focus areas to specific actions.

The FHWA and Federal Transit Administration (FTA) desk reference, *Advancing Metropolitan Planning for Operations: The Building Blocks of a Model Transportation Plan Incorporating Operations* (FHWA and FTA 2010) establishes three types of objectives: outcome, output, and activity. Outcome objectives reflect the concerns of the public, customers, or stakeholders; output objectives reflect the quantity of activities that affect outcomes; and activity objectives reflect actions taken by transportation agencies. Public engagement activities and available data will affect the extent to which objectives are developed.

For instance, Table 2.1 shows four outcome objectives, or focus areas, identified by the Miami Dade MPO to achieve its safety goal.

Table 2.2 shows a combination of output and outcome objectives to achieve multiple safety goals established by the Regional Planning Commission, the MPO for the New Orleans region.

Table 2.3 shows activity objectives to achieve a safety goal developed by the RTC of Washoe County, the MPO for the Reno, Nevada, metropolitan region.

Table 2.4 shows four outcome objectives to achieve the long-range safety goal identified by the Louisiana Department of Transportation and Development (DOTD).

#### *2.3.4.4 Adopt Safety Goals and Objectives from Other Plans*

A number of other planning documents, the SHSP in particular, have goals and objectives relevant to the LRTP.

**Table 2.1. Safety goal and objectives of the Miami Dade MPO (Florida).**

| Goal | Objectives |
|---|---|
| Increase the safety of the transportation system for motorized and nonmotorized users | 1. Improve safety on facilities and in operations.<br>2. Reduce roadway and multimodal crashes.<br>3. Increase safety at transit stops and intermodal stations and connections.<br>4. Implement safe routes to school. |

**Table 2.2. Safety goals and objectives of the New Orleans Regional Planning Commission (Louisiana).**

| Goal | Objectives |
|---|---|
| Reduce the number of motor vehicle crashes | 1. Coordinate efforts with the SHSP.<br>2. Identify and address common crash types and low-cost, systemwide improvements.<br>3. Identify high-fatality locations and prioritize safety improvements. |
| Improve bicycle and pedestrian safety | 1. Consider bike/ped improvements in the larger planning process.<br>2. Improve bike/ped facilities.<br>3. Maintain or repair existing bike/ped facilities.<br>4. Conduct outreach for cyclists, pedestrians, and motorists. |
| Improve transit safety and security | 1. Implement advanced technologies to reduce the likelihood of transit crashes.<br>2. Identify and implement methods for reducing criminal activity on transit vehicles and at transit stops. |

**Table 2.3. Safety goal and objectives of the RTC of Washoe County (Nevada).**

| Vision/Guiding Principle – Safe and Healthy Communities | |
|---|---|
| **Goal** | **Objectives** |
| Safety | 1. Improving crosswalks at intersections.<br>2. Decreasing speed on roads with high bicycle and pedestrian use.<br>3. Providing separated bike lanes.<br>4. Creating a network of connected sidewalks and trails.<br>5. Adding concrete bus pads that allow passengers to load and unload. |

**Table 2.4. Safety goals and objectives of the Louisiana DOTD.**

| Goal | Objectives |
|---|---|
| Provide safe and secure travel conditions across all transportation modes through physical infrastructure improvements, operational controls, programs, and public education and awareness | 1. Reduce number and rate of highway-related fatalities and serious injuries.<br>2. Reduce number of highway crashes.<br>3. Reduce number of pedestrian and bicycle accidents.<br>4. Assist modal partners in achieving safe and secure transit, port, and aviation facilities. |

- **Utilize the SHSP.** Planners do not need to recreate the wheel in goal and objective setting. The SHSP is a useful reference document. It lays out a number of goal areas (usually called emphasis areas, focus areas, or critical emphasis areas), which describe the priority transportation safety issues in the state and objectives or strategies (usually proven countermeasures) to mitigate them. These goals and objectives, whether they address near- or long-term safety priorities, can be customized to address the safety of future transportation efforts.

Potential Solution—For state or MPO planners unfamiliar with the SHSP or how to effectively utilize the goals and objectives within it, ask the State Safety Engineer or SHSP Coordinator to provide educational materials and/or presentations on the SHSP, and discuss methods for incorporating it into the LRTP.

- **Utilize Other Planning Documents.** In addition to the SHSP, a number of other planning documents may have already identified data-driven safety goals and objectives, which should be acknowledged/referenced in the LRTP. Planning documents to review may include local comprehensive plans, transit plans, bicycle/pedestrian plans, freight plans, access management studies, complete streets plans, and corridor plans.

Potential Solution—At a minimum, and mainly in cases where data are not available, planners should reference the transportation safety goals and objectives from the SHSP and other planning documents in the LRTP. The purpose is to acknowledge ongoing transportation safety efforts and show that transportation safety is being considered in the state or region.

| Score Key | | | | | |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | N/A |
| Not started | Early initial stages | Some elements complete | Substantial portion complete | Complete | Not applicable |

| Strategy | Score | Priority Ranking |
|---|---|---|
| Develop a vision statement inclusive of safety<br>• Include safety in current vision statement<br>• Develop or adopt a safety-specific vision | | |
| Bring safety into the conversation<br>• Discuss safety at committee meetings or open house events<br>• Ask stakeholders and the public questions about safety to understand priorities and issues<br>• Host meetings/summits to specifically discuss safety with the public and stakeholders | | |
| Develop safety goals and objectives<br>• Develop safety goals<br>• Incorporate safety considerations into other transportation goals<br>• Develop objectives to support safety goals<br>• Develop safety objectives to support transportation goals | | |
| Adopt safety goals and objectives from other plans<br>• SHSP<br>• Other modal or topic plans (e.g., bicycle/pedestrian plan, corridor plan, access management plan) | | |

| Other Potential Priority Strategies |
|---|
| 1) |
| 2) |

***Figure 2.11. Strategy ranking and prioritization worksheet for Principle 3.***

### 2.3.5 Strategy Ranking and Prioritization Worksheet

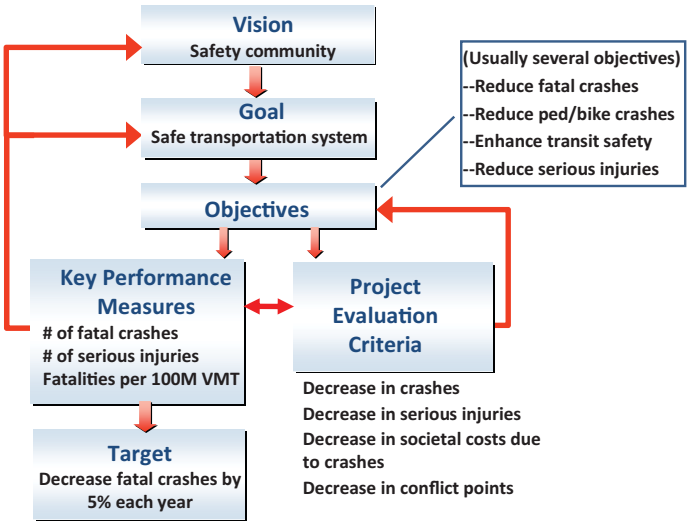
Rate your organization's progress/status on the strategies on a scale of 1 to 5 using the criteria in Figure 2.11 and prioritize the strategies by the preferred order of implementation.

## 2.4 Integrate Safety Performance Measures into the Performance Management System

### 2.4.1 Description

General performance measures are indicators that enable decision-makers and other stakeholders to monitor changes in system condition and performance. Figure 2.12 shows the relationship of safety performance measures to safety-related goals and objectives. Evaluation criteria are used to assess the relative safety benefits and costs of specific projects or for prioritizing alternative safety improvement strategies.

Over the past 15 years, state DOTs, MPOs, and other government units have dramatically increased the use of performance management principles to plan, prioritize, track, and improve




VMT – vehicle miles travelled
Source: Meyer (2005).

***Figure 2.12. Relationship between safety and goals, objectives, performance measures, evaluation criteria, and targets.***

the effectiveness of nearly all functions to achieve fundamental goals. MAP-21 requires the use of performance-based decision-making within metropolitan and statewide transportation planning processes. It also requires DOTs and MPOs to set safety targets and measure performance. The four measures MAP-21 requires for safety includes the number and rate of fatalities and serious injuries resulting from motor vehicle crashes.

Because of these new requirements, considerable research has been focused on performance measures, targets, and performance-based planning in general. The *Performance-Based Planning and Programming Guidebook*, published in October 2013, provides a complete framework, demonstrating how transportation performance fits within a traditional planning and programming process (FHWA 2013a).

Safety performance measures provide the following benefits to the planning and decision-making process (FHWA 2009):

- Greater linkage between safety performance measures and safety goals and objectives identified through long-range planning and policy formulation;
- A better understanding of the impacts of alternative courses of action aimed at improving transportation system safety;
- Improved communication about transportation safety to customers, political leaders, the public, and other stakeholders;
- Increased organizational efficiency to keep agency staff focused on safety priorities;
- Information feedback to promote ongoing improvement of business processes as they relate to supporting safety strategies; and
- Greater accountability to policymakers, customers, and other stakeholders.

### 2.4.2 Ask Yourself

Does your agency's transportation planning process provide a good understanding of the impacts of alternative courses of action aimed at improving transportation system safety? Transportation safety performance measures are particularly important for quantifying safety needs, identifying goals to guide transportation planning efforts, and focusing attention and resources on safety-related challenges.

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### 2.4.3 Challenges

The primary challenge to measuring performance is likely to be the ability to collect, manage, analyze, and report the data. All of these tasks can be resource intensive, including staff time and the financial implications of collecting and analyzing data.

Crash data analysis tools have improved, but not all agencies have access to or know how to use them to predict future safety performance outcomes.

Some safety improvements increase exposure. For instance, a sidewalk may be installed or upgraded to meet safety concerns, but the improvements also increase the number of people using the facility. Initially, this could lead to decreases in safety performance and potentially affect the construction of other, similar improvements.

**Florida Performance Measures Committee**

The Florida DOT has established a Statewide Mobility Performance Team. The coalition consists of representatives from all the Florida DOT districts and seven of the MPOs. The goal is to enhance coordination and communication on MAP-21 performance measures, data needs, and target settings.

### 2.4.4 Opportunities and Strategies

#### *2.4.4.1 Collaborate on and Identify Performance Measures*

Under MAP-21, DOTs and MPOs will need to set targets and monitor four measures: total fatalities, fatality rate, total serious injuries, and serious injury rate. With this is mind, DOTs and MPOs should discuss the availability, accuracy, and completeness of fatality and serious injury numbers and rates, and what steps need to be taken for all agencies to track these specific measures.

Potential Solution—DOTs can prepare region-specific crash reports for MPOs with historical safety data for the four measures. This provides a starting point for regions to look at general crash trends and help them develop realistic performance targets.

Tracking the MAP-21–required measures is the first priority, but DOTs and MPOs may have the data and capability to develop measures in addition to overall fatalities and serious injuries, which may help assess performance by specific safety goals or objectives. DOTs and MPOs can ask the following questions to understand whether a measure is feasible (FHWA 2009):

- Do data supporting the performance measure exist?
- If data exist, then how can the data be collected and monitored systematically over time?
- If data do not exist, the question becomes, should the safety performance measures be used anyway?
- If yes, then a strategy for systematically collecting the data must be identified.
- If no, the next candidate measure is examined.

Addressing the preceding issues can help an agency develop a process to conduct performance-based planning. It opens dialogue between planners and stakeholders on the various reasons particular performance measures are needed. It is also a good tool for DOT and MPO planners to use together (i.e., identifying data needs, availability, gaps, and common performance measures).

Once all the relevant performance measures have been identified, the most basic level needed to understand performance and eventually set targets includes 3- to 5-year rolling averages,

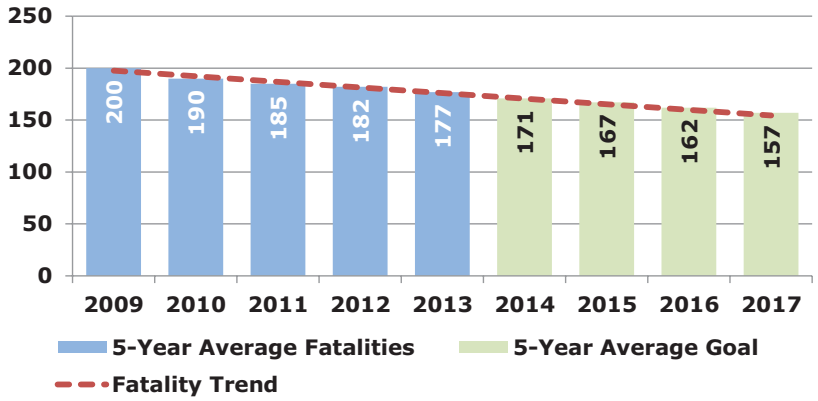


*Figure 2.13. Sample data to determine performance measures.*

where multiple years of safety data are averaged to smooth out years where large decreases or increases occur outside the trend line. Total number of fatalities and serious injuries for the system can also be used, but annual numbers typically show sharp increases or decreases and do not necessarily convey an average or typical year in which to base a performance measure or target. Figure 2.13 depicts the 5-year rolling averages for sample fatality data, which can be used to set a performance measure (e.g., number of fatalities and eventually a target). This approach can be used to set performance measures for issue areas, such as intersection or pedestrians and even specific programs or projects if baseline data are available.

### *2.4.4.2 Link Performance Measures to Decision-Making Framework*

Performance measurement is a tool to help DOTs and MPOs monitor the effectiveness of the process for implementing transportation safety goals and objectives. Although input into performance measures may come from several difference sources (e.g., stakeholders and constituencies, legislative and program requirements, and decision-makers), they should relate to the goals and objectives contained in current plans.

Performance measures can be developed at multiple levels. They can relate to system-level goals (e.g., number of fatalities); to specific modal or crash-type goals (e.g., number of bicycle fatalities); to objectives (e.g., number of low-cost countermeasures implemented at high-crash locations); to a specific program or projects (e.g., number of lives saved at the 12th and G Street roundabout); or a combination of the four. Whichever performance measures are identified, they need to be based on available data so it is possible to track them over time. Ideally, measures will be limited in number to only those that provide critical information on the safety performance of the transportation system.

Table 2.5, an expanded version of Table 2.2, shown in Section 2.3, illustrates the direct linkage between the goals and objectives and performance measures. The New Orleans region identified a limited number of systemwide and modal-specific measures to evaluate the safety goals and objectives.

Table 2.6 can be found in the Memphis MPO 2040 LRTP and provides an example of how performance measures can relate to a single safety goal but track performance for multiple priority areas.

### *2.4.4.3 Establish Performance Targets to Make Investment Decisions*

Over time, safety performance trends begin to tell a story regarding the extent of fatalities and serious injuries. Performance targets can be used to guide the way funds are invested within a state or a region to advance a linear or downward trend. For instance, the sample data in

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**Table 2.5. Goals, objectives, and performance measures for the New Orleans Regional Planning Commission (Louisiana).**

| Goal | Objectives | Performance Measures |
|---|---|---|
| Reduce the number of motor vehicle crashes | 1. Coordinate efforts with the SHSP.<br>2. Identify and address common crash types and low-cost, systemwide improvements.<br>3. Identify high-fatality locations and prioritize safety improvements. | • Overall crash rates<br>• Fatalities caused by motor vehicle crashes |
| Improve bicycle and pedestrian safety | 1. Consider bike/ped improvements in the larger planning process.<br>2. Improve bike/ped facilities.<br>3. Maintain or repair existing bike/ped facilities.<br>4. Conduct outreach for cyclists, pedestrians, and motorists. | • Number of bike fatalities; number of striped and/or signaled crosswalks<br>• Number of vehicle–pedestrian crashes<br>• Number of vehicle–bicycle crashes |
| Improve transit safety and security | 1. Implement advanced technologies to reduce the likelihood of transit crashes.<br>2. Identify and implement methods for reducing criminal activity on transit vehicles and at transit stops. | • Number of transit vehicle crashes<br>• Number of crimes committed on transit vehicles or at transit stops |

Figure 2.13 depicts three different opportunities to set targets based on previous years' average crash data and can be used to start the conversation on target setting with stakeholders. Some numeric targets agencies may opt to select include the AASHTO "half by 2030" target (red dash line in Figure 2.14), a linear reduction based on previous years' trends (purple dotted line in Figure 2.14), or a logarithmic target (blue dotted line in Figure 2.14). A report recently released by FHWA, *Safety Target Setting Final Report*, presents a framework for developing or updating safety targets (FHWA 2013b).

Once a projected point has been determined, transportation stakeholders can begin to identify how much to invest and in what transportation safety programs. Planners may also have the tools to identify specific types of investments that will positively impact safety performance. The HSM (and related tools) and level of service of safety (LOSS) are data intensive but can be used to quantify and predict the safety performance of roadway elements. These tools can help planners determine where to invest transportation safety resources.

Monitoring these data over time is also important, as it will show whether crash numbers have increased or decreased. An increase would trigger a review of the objectives and/or specific projects to determine where future funding could better be utilized to improve performance. Decreases would suggest that safety programs and projects focused at intersections are working and would help determine future funding levels.

**Table 2.6. Safety goals and performance measures of Memphis MPO (Tennessee).**

| Goal | Performance Measures |
|---|---|
| Safety | • Number of crashes<br>• Number of crash fatalities<br>• Number of bicycle and pedestrian fatalities<br>• Perceptions of unsafe or dangerous conditions for bicycling or walking<br>• Knowledge of local bicycle and pedestrian ordinances |

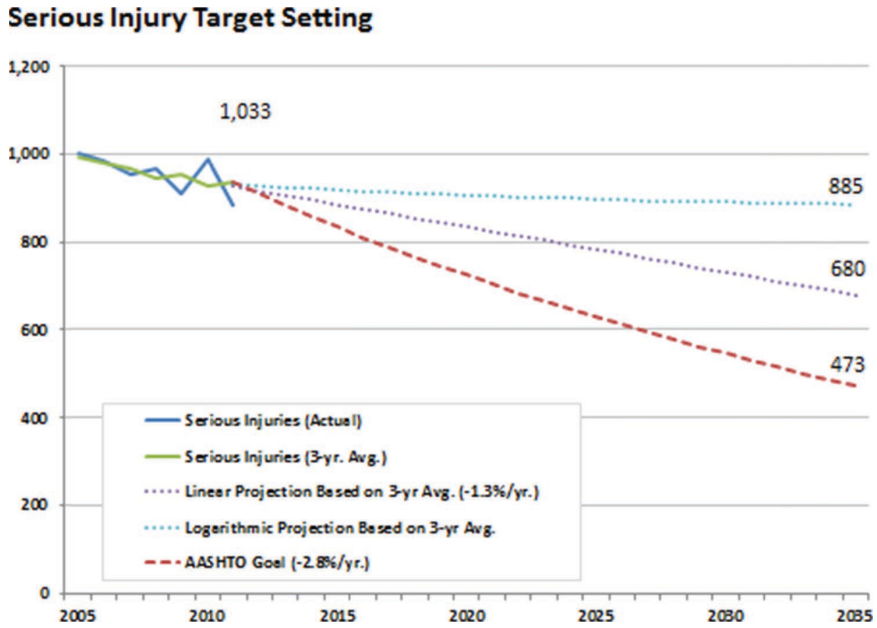


*Figure 2.14. Sample data to set a performance target.*

### 2.4.5 Strategy Ranking and Prioritization Worksheet

Rate your organization's progress/status on the strategies on a scale of 1 to 5 using the criteria in Figure 2.15 and prioritize the strategies by the preferred order of implementation.

## 2.5 Incorporate Safety in Planning Programs and Documents

### 2.5.1 Description

It is often assumed transportation safety goals, strategies, policies, objectives, and projects will be identified through the SHSP planning process; however, the SHSP is meant to be a strategic planning document, aimed at addressing the current most critical safety issues. The LRTP is different because it addresses future policies, projects, and strategies for motorized and nonmotorized users. Although the LRTP must reference the SHSP and should adopt/customize applicable safety goals and objectives, it also needs to frame future transportation safety priorities and account for the safety of all road users on all public roads. In addition to the LRTP, a number of opportunities exist to incorporate safety into other planning processes.

### 2.5.2 Ask Yourself

Safety is one of the eight transportation planning factors, but is it addressed/included in the LRTP or other transportation planning documents? Where it is included, is the emphasis on safety

**Proven Effective Countermeasures**

Countermeasures are research-proven strategies or treatments effective at reducing crashes. Implementing countermeasures by goal area will likely improve transportation safety performance. Below are a number of countermeasure selection resources.

FHWA Office of Safety, Proven Safety Countermeasures: http://safety.fhwa.dot.gov/provencountermeasures

Countermeasures That Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices: http://www.ghsa.org/html/publications/countermeasures.html

Crash Modification Factors Clearinghouse: http://www.cmfclearinghouse.org/

Pedestrian and Bicycle Countermeasure Selection System: http://www.pedbikesafe.org/PEDSAFE/

Part D of the Highway Safety Manual: http://highwaysafetymanual.org/hsm_parts.aspx

| Score Key | | | | | |
|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **N/A** |
| Not started | Early initial stages | Some elements complete | Substantial portion complete | Complete | Not applicable |

| **Strategy** | **Score** | **Priority Ranking** |
|---|---|---|
| Collaborate on and identify performance measures<br>• Work with state or regional partners to implement and track MAP-21–required performance measures<br>• Identify additional performance measures | | |
| Link performance measures to decision-making framework<br>• Measures are linked to systemwide goals<br>• Measures are linked to modal or crash-type goals<br>• Measures are linked to objectives<br>• Measures are linked to specific projects | | |
| Establish performance targets to make investment decisions | | |

| **Other Potential Priority Strategies** |
|---|
| 1) |
| 2) |

***Figure 2.15. Strategy ranking and prioritization worksheet for Principle 4.***

generally implied or explicitly stated? The SHSP is often considered the primary document to address safety needs, so safety may only be referenced in passing in other transportation plans, but in fact, the LRTP and other transportation planning documents can achieve improved transportation safety results beyond the SHSP impact.

### 2.5.3 Challenges

The long-range planning tools (e.g., travel demand modeling) used to drive the LRTP development process do not address safety. These tools focus more on current and future level of service, maintenance, preservation, reliability, and reoccurring congestion. Since the SHSP is seen as the primary document to address safety, safety analyses are not always conducted for the LRTP or other transportation planning documents.

Safety planners may not be actively involved in the long-range planning process, and transportation planners responsible for long-range planning may lack the skills to interpret safety data or measure the safety impact of programs. Data and/or staff resources may not be available to analyze crash data sufficiently to write a safety chapter, develop a stand-alone safety plan, or incorporate safety considerations into other planning documents.

Planners often believe that all transportation improvements are safe because they adhere to standards; however, many, if not most, standards have not been evaluated for their impact on safety.

Safety is a multimodal, multidisciplinary challenge. LRTPs are often organized around modes (i.e., highways, transit, bike/pedestrian, freight), rather than topic areas (e.g., sustainability, economy) making it difficult to dedicate a chapter to safety.

## 2.5.4 Opportunities and Strategies

### *2.5.4.1 Include a Safety Chapter in the LRTP*

Discussing transportation safety data, goals, objectives, and policies in the LRTP, in a section or chapter, confirms safety is a priority in the state or region. It also provides direction to local agencies on how and where to consider safety in the context of all transportation projects. The safety section should concisely capture the safety vision, goals, objectives, and policies; the goals, objectives, and performance measures of the SHSP and how it relates to the LRTP; and an overview of other safety plans, policies, or programs. The RTC of Washoe County LRTP provides an excellent example. The safety chapter is divided into five different sections: (1) Planning for Safety, (2) Community Awareness and Education, (3) Operations, (4) Safety Design Improvements, and (5) Transportation Safety Projects. The entire chapter is only six pages, but it provides an "overview" for all ongoing or planned safety programs, projects, and policies.

### *2.5.4.2 Develop a Stand-Alone Safety Plan*

At the state level, the SHSP is the primary safety plan, but as mentioned in the previous section, state planners can use the LRTP to provide support for SHSP goals and objectives or identify additional safety policies or programs. At the MPO level, planners may develop a regional safety action plan to identify and address local safety priorities since they may differ from state priorities. These plans can include an introduction to safety and the purpose of the plan; an overview of crash data (e.g., trends, crash characteristics, crash types, high-crash locations); a description of current safety programs in the region; and recommendations to improve transportation safety. Metro—the MPO for the Portland, Oregon, region—includes a robust recommendations section in its Regional Transportation Safety Plan, which details short- and long-term opportunities. The short-term priorities list actions for reducing the number of all crashes, particularly bicycle and pedestrian crashes, and for safety problems on surface streets. The long-term priorities cover the same areas and include strategies for data collection and additional research on connecting land use and safety planning (see the "Stand-Alone Safety Plans" sidebar for the URL to the complete plan). The value of stand-alone safety plans is to alert stakeholders and the public about safety issues in the region and to prepare safety information in advance of the development of other regional plans and programs.

**Stand-Alone Safety Plans**

Below are noteworthy examples of MPO safety plans:

Metro (OR): Regional Transportation Safety Plan (www.oregonmetro.gov/)

Denver Regional Council of Governments (CO): The Report on Traffic Safety in the Denver Region (www.drcog.org/resources/231)

Delaware Valley Regional Planning Commission (PA): Transportation Safety Action Plan (www.dvrpc.org/)

Mid-Ohio Regional Planning Commission (OH): Regional Safety Report (www.morpc.org/)

Cheyenne MPO (WY): Cheyenne Transportation Safety Management Plan (www.plancheyenne.org/)

### *2.5.4.3 Include Safety in Other Planning Documents*

The LRTP and SHSP are not the only plans appropriate for addressing safety issues and priorities. During other planning efforts, it may be suitable to conduct a safety analysis to identify transportation safety policies or projects.

**Safety in NEPA Documents.** The National Environmental Policy Act (NEPA) process can be an effective tool for maximizing the safety benefits of transportation projects. The primer *Integrating Road Safety into NEPA Analysis* describes how to take advantage of the latest safety research and analysis techniques at every stage of the NEPA process, and how to link these to safety planning. The primer is available on the FHWA website (safety.fhwa.dot.gov/tsp/fhwasa1136/).

**Safety in Corridor Plans.** Corridor plans are multimodal analyses on transportation corridors or subareas. The purpose depends on the corridor, but they are used to identify transportation and

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land use projects, programs, and policies to increase the accessibility and mobility of people, enhance the environment, and/or improve the quality of life in the region. In conjunction with these factors or perhaps as the primary factor, safety considerations also should be included in corridor analyses.

**Safety in the Congestion Management Process.** The congestion management process uses a number of analytic tools to define and identify congestion within a region, corridor, and activity center or project area, and to develop and select appropriate strategies to reduce congestion or mitigate the impacts of congestion. However, safety considerations also can be woven into these plans. The Sarasota/Manatee MPO identified five goals in the congestion management process, with one directly related to safety: "Provide congestion management strategies that improve the safety and mobility of people and goods and maintain the region's air quality." A number of the strategies identified to reduce congestion are also specific to safety, such as intersection improvements and treatments to bicycle and pedestrian facilities. The MPO's annual priority list for congestion management system funding is also based, in part, on crash analyses and identification of high-crash locations.

**Safety in Bicycle and Pedestrian Plans.** Bicycle and pedestrian plans identify opportunities to support bicycling and walking while also enhancing health, reducing traffic congestion, promoting economic vitality, and improving quality of life. Safety can also be a key component of these planning efforts. A chapter in the document can be dedicated to network collision analysis and mitigation strategies to prevent or reduce pedestrian and bicycle crashes. Some states and MPOs may also choose to develop pedestrian or bicycle safety action plans, which focus solely on crash data, factors, and strategies to improve safety for these road users.

**Safety in Freight Plans.** Freight plans provide a comprehensive evaluation of freight transportation system operations and effects of the movement of goods on economic development, safety, and the environment. Freight plans provide an opportunity to identify safety needs and issues related to the freight transportation system. The Georgia Department of Transportation Freight and Logistics Plan includes a safety needs and issues chapter in the truck modal profile. The plan identified the 50 highest truck volume locations and the most critical freight bottlenecks throughout the state. The data analysis identified high-truck-crash locations, which were discussed with law enforcement to gather additional crash experience not apparent in the data analysis. The plan also identified key connections to statewide safety plans and policies such as the SHSP and Commercial Vehicle Safety Plan. The Freight and Logistics Plan is available on the Georgia DOT website (www.dog.ga.gov/InvestSmart/Freight).

### 2.5.5 Strategy Ranking and Prioritization Worksheet

Rate your organization's progress/status on the strategies on a scale of 1 to 5 using the criteria in Figure 2.16 and prioritize the strategies by the preferred order of implementation.

## 2.6 Establish Safety as a Decision Factor

### 2.6.1 Description

Prioritization is the process for evaluating and selecting individual transportation projects for inclusion in the S/TIP. The goals established in the LRTP serve as one of the filters for ranking, scoring, and selecting transportation programs and projects. Technical considerations, such as volume to capacity ratios, travel time benefits, air quality emissions, and others, may be important factors for prioritizing projects. For safety to be included as a scoring factor when ranking *all* transportation projects (not just safety-specific projects), safety should first be present in the LRTP as a goal, with supporting objectives and policies. Second, technical criteria (e.g., crash rates, crash severity, crash totals) should be identified to effectively score the safety of projects.

| Score Key | | | | | |
|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **N/A** |
| Not started | Early initial stages | Some elements complete | Substantial portion complete | Complete | Not applicable |

| Strategy | Score | Priority Ranking |
|---|---|---|
| Include a safety chapter in the LRTP | | |
| Develop a stand-alone safety plan | | |
| Include safety in other planning documents<br>• NEPA documents<br>• Corridor plans<br>• Congestion management processes<br>• Bicycle and pedestrian plans<br>• Freight plans<br>• Other plans | | |

| Other Potential Priority Strategies |
|---|
| 1) |
| 2) |

***Figure 2.16. Strategy ranking and prioritization worksheet for Principle 5.***

### 2.6.2 Ask Yourself

Are safety criteria factored into the selection process when prioritizing transportation projects for inclusion in the S/TIP, or is it assumed safety improvements will be implemented during the design phase? To improve transportation safety, the safety impacts of multimodal projects should be specifically evaluated during the programming process.

### 2.6.3 Challenges

Safety criteria may be excluded from project prioritization because it is believed that safety concerns are always addressed during a project's scoping and design phase. However, many of the standards included in engineering manuals have not been evaluated for safety impact.

Applying safety funds (i.e., HSIP) to safety improvements for transportation projects where the primary objective is unrelated to safety may present challenges due to funding silos or institutional issues.

Transportation projects may be planned and prioritized based on how well they address safety considerations, but additional safety improvements may be removed from the project during design or implementation.

Safety projects (i.e., proven effective safety countermeasures) are ranked and scored against other safety projects, so safety is not a strong consideration for nonsafety-specific transportation projects.

Perhaps transportation safety goals and objectives have not been identified, which would preclude safety from being a strong consideration during project prioritization and selection.

Data do not exist to understand crash statistics for any/all of the transportation modes, which is necessary to make informed decisions in regards to safety improvements for highway, transit, operations, and bicycle and pedestrian projects.

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## 2.6.4 Opportunities and Strategies

### *2.6.4.1 Incorporate Safety into the Project Prioritization for All Transportation Projects*

DOTs and MPOs use a variety of approaches and criteria to prioritize transportation projects. To improve or consider the safety of a facility (highway, transit, bicycle, or pedestrian), a safety score/factor can be developed and included in this prioritization. The overall safety score can be inclusive of policy factors, such as whether the project met any or all of the safety goals or objectives outlined in the LRTP; it can consider technical information, such as the outputs of the crash data; or both policy and technical considerations can be included in the scoring approach. Ideally, transportation projects that specifically address safety problems would be awarded more points.

**Policy Considerations.** This is a qualitative approach to scoring and evaluates how well the project meets the goals and objectives in the plan. For example, if safety goals in the LRTP include the reduction of intersection and bicycle crashes, a project that affirmatively answers the question "Does this project address an identified safety need in the LRTP?" may receive a check or a number of points (i.e., 0 = no and 2 = yes).

**Technical Considerations.** This is a quantitative approach to scoring projects and is dependent upon data analyses. The goal is to improve the likelihood that when construction, maintenance, mobility, accessibility, and other transportation decisions are made, safety is a weighted consideration. Under this approach, highway or multimodal projects that address a crash problem will receive additional points. To receive safety points, these projects may address high-crash locations, areas with high crash frequencies or crash severity, or other factors. Two examples are as follows:

- *The Northwest Arkansas MPO* uses a 20-point system to prioritize its Surface Transportation Program projects. Safety accounts for three points maximum and is based on the 3-year average crash rate. If the crash rate in the project area is higher than the statewide average for similar facilities, the project receives three points. If the crash rate is near the statewide average, the project receives two points. Projects with a crash rate below the statewide average are awarded one point.

Potential Solution—When soliciting transportation projects, create a section on the form dedicated to transportation safety. It encourages project sponsors to consider potential safety needs in conjunction with other project goals. This is an example from the Southeastern Regional Planning and Economic Development District, the MPO for the southeastern Massachusetts region.

**Safety Assessment:**

Does the project directly address a documented safety problem? How? (+6 to -3)

3 yr Crash Totals:

***Provide crash diagram or safety study!***

| | | | |
|---|---|---|---|
| ACC/MEV (Intersection): | | Threshold: | 0.77 (signalized); 0.62 (unsignalized) |
| ACC/MVM (Corridor): | | Threshold: | 2.5 |
| EPDO: | | Threshold: | 17.7 |

Effect on crash rate? (+6 to -3)

Does the project address severity of crashes? How? (+6 to -3)

Does the project effect bicycle and pedestrian safety? How? Unknown (+6 to -3)

- *The Androscoggin Transportation Resource Center*, an MPO in Maine, includes a safety component in the TIP prioritization process for all projects. The MPO's prioritization process awards points to transportation projects that correct a safety problem at an identified high-crash location. The safety score is based on the state's list of high-crash locations for the preceding 3-year period. However, a project can also receive a partial safety score if it has an identifiable crash pattern that can be corrected, even if it is not on a high-crash location link/node. The intent is to award points to projects that address safety problems, regardless of whether they contain a high-crash location.

#### 2.6.4.2 Consider Safety in Programmed Transportation Projects

Another option is to conduct safety studies and implement improvement projects in conjunction with projects already programmed, specifically preservation, maintenance, or repair projects. Two examples are as follows:

- **MetroPlan**—the MPO for the Orlando, Florida, region—matches large resurfacing projects with high-crash-location corridors to identify opportunities to integrate safety components into the projects. In most instances, the resurfacing projects are planned far enough in the future to allow for an analysis of present conditions leading to high crash rates. Resurfacing projects present a beneficial opportunity to look at and address safety needs for all road users, including bicyclists, transit users, and pedestrians.
- **The Louisiana DOTD** has incorporated safety components into its Stage 0 process. The purpose of the process is to reach a decision regarding a project's feasibility and determine whether the project should continue further through the project delivery process. To determine advancement, Stage 0 checklists must be completed that addresses the project's purpose and need, provides a description of how the purpose and need is met, and reviews impacts to the natural and human environment. As part of this, the Stage 0 checklists require descriptions of any safety analyses and any abnormal crash locations or overrepresented crash types within the project limits. Once projects are selected for addition to the Highway Program, the information gathered from Stage 0 provides the data necessary to proceed with Stage 1, Planning and Environmental. The Stage 0 Manual of Standard Practice, which contains the checklists, is available on the Louisiana DOTD website (wwwsp.dotd.la.gov/).

  The Louisiana DOTD has also developed a policy for Preservation/Rehabilitation/Replacement (PRR), which states that a baseline of safety improvements is required to be considered for applicable projects. For each applicable PRR project, a safety assessment process checklist must be completed. For additional information on the policy, see: "Guidance for Safety Improvements for PRR Projects" available on the Louisiana DOTD website: http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Engineering/Road_Design/Systems_Preservation/Pages/Documents.aspx.

#### 2.6.4.3 Prioritize Safety Projects

This section focuses on methods for including safety in the prioritization approach for all transportation projects, but MPO and DOT planners also may identify safety-specific projects and countermeasures, which could be eligible for HSIP funds. As a first step, HSIP funds can only be spent on projects identified in the SHSP or projects that align with the goals and objectives in the SHSP. As mentioned in previous sections, planners can adopt or customize SHSP goals and objectives for inclusion in the LRTP. Projects that meet these goals and objectives are more likely to receive HSIP funding. Second, many state DOTs have already developed a prioritization process for HSIP funding, but state and MPO planners may not be familiar with the procedures. Asking the SHSP coordinator how HSIP safety projects are identified, countermeasures are selected, and the prioritization process is structured may increase the number of eligible safety projects identified in the LRTP.

| Score Key | | | | | |
|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **N/A** |
| Not started | Early initial stages | Some elements complete | Substantial portion complete | Complete | Not applicable |

| **Strategy** | **Score** | **Priority Ranking** |
|---|---|---|
| Incorporate safety into the project prioritization for all transportation projects<br>• Consider policy criteria<br>• Consider technical criteria | | |
| Consider safety in programmed transportation projects | | |
| Prioritize safety projects | | |

| **Other Potential Priority Strategies** |
|---|
| 1) |
| 2) |

***Figure 2.17. Strategy ranking and prioritization worksheet for Principle 6.***

### 2.6.5 Strategy Ranking and Prioritization Worksheet

Rate your organization's progress/status on the strategies on a scale of 1 to 5 using the criteria in Figure 2.17 and prioritize the strategies by the preferred order of implementation.

## 2.7 Implement a Monitoring System and Regularly Evaluate Performance

### 2.7.1 Description

Evaluation is required to determine if state or MPO safety efforts deserve enhancement, revision, or replacement. For example, evaluation of a particular countermeasure can determine if it should be applied more broadly or be discontinued. The following three types of evaluation are typically relevant to DOT and MPO safety programs:

1. **Process Evaluation**—Process evaluation relates to the overall process through which safety improvements are identified, prioritized, and implemented. It typically focuses on elements such as leadership and management structures, extent of collaboration, level of communication, etc.
2. **Output Evaluation**—Output evaluation relates to implementation activities. It typically focuses on the relationship between actual and planned levels of implementation. For example, if an MPO has identified five locations for installation of pedestrian crossing islands within a given year, an output evaluation would answer the question "How many of the planned installations were accomplished?" This type of evaluation requires coordination with the agency responsible for project implementation. Understanding how many safety projects are being implemented will be important for performance setting and can aid in explaining whether targets were achieved or missed based on how many planned safety projects were actually implemented.
3. **Outcome Evaluation**—Outcome evaluation relates to the actual impact a safety project, strategy, or program has on fatalities, injuries, and crashes. It also can relate to changes in awareness and behavior (e.g., safety belt use rates), awareness of the dangers of distracted driving, etc. Outcome evaluation addresses the heart of transportation safety—fatalities and

serious injuries. However, it is also problematic because the link between an implemented strategy or project to a reduction in crashes is indirect. While it is difficult to scientifically establish a causal relationship between a safety countermeasure and change in crash rate, helpful correlations can be made through the use of outcome evaluation.

The basic components of evaluation are identifying available data, developing performance measures, establishing baselines, monitoring performance, interpreting the performance data, and applying and sharing the results.

### 2.7.2 Ask Yourself

Are your agency's safety improvement efforts having the desired results? A continuous and effective monitoring and evaluation program answers this question and, over time, enables your organization to better allocate limited resources to the strategies, projects, and programs with the greatest potential to reduce fatalities and serious injuries.

### 2.7.3 Challenges

The primary challenges to monitoring and evaluation are lack of data and other resources and the failure to understand the importance of evaluation. Lack of resources is closely related to the lack of understanding. The natural desire is to implement as many projects, programs, and strategies as possible given available resources; and diverting resources to evaluation seems counterproductive. Taking the time to better understand which strategies, projects, and programs are effective, and which are not, enables agencies to replace decisions based on intuition and guesswork with decisions based on evidence of effectiveness. Additional monitoring and evaluation challenges to overcome include the following:

- Baseline data for tracking the performance of programs or projects may not be established;
- Data may be inaccurate, data element definitions may vary depending on the source, and/or data may be in a format not easily analyzed;
- Agencies may not have established safety performance measures;
- Agencies may not have a tracking system, or the staff time to maintain and update it;
- Management may not be willing to allocate the necessary resources; and
- Policy board members, executive committees, and elected officials may not understand the need for continued safety improvements because evaluation data and progress updates are lacking.

### 2.7.4 Opportunities and Strategies

#### *2.7.4.1 Create a Monitoring and Evaluation Plan*

A monitoring and evaluation plan should be developed during the initial phase of a LRTP update. It should identify the safety issues and questions to be addressed, identify the available data, list the data needed, describe the available resources, identify roles and responsibilities, and outline how and when the results will be reported and used.

#### *2.7.4.2 Develop Performance Measures*

Performance measures allow DOTs and MPOs to monitor and evaluate both safety strategy and project implementation effectiveness (output measures) and safety impacts resulting from improvements (outcome measures).

Output performance measures are used for tracking implementation. Examples of output performance measures include the following:

- The number of intersections with improved pavement markings;
- The number of lane-miles with cable median barrier, rumble strips, etc.; and
- The number of pedestrian countdown signals installed.

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Related outcome performance measures would be the following:

- The number of intersection-related crashes, serious injuries, and fatalities;
- The number of lane departure crashes, serious injuries, and fatalities; and
- The number of pedestrian injuries and fatalities.

At a minimum, states and MPOs must monitor the four measures required by MAP-21—total fatalities, fatality rate, total serious injuries, and serious injury rate. With this is mind, early discussions should focus on the availability, accuracy, and completeness of fatality and serious injury numbers and rates, and the steps to take for all agencies to track these measures (e.g., should the state DOT create a fatality crash report for each MPO region?).

Although performance measures should be developed based on available data, thought can be given to what areas of transportation safety might be monitored and evaluated in the future. For example, MPOs are increasingly able to collect better exposure and crash data for bicycle and pedestrian crashes, which are important safety issues in many metropolitan regions.

#### *2.7.4.3 Identify/Develop a Tracking Tool*

Once the required data are in place and performance measures are chosen, a tracking tool will simplify the process of monitoring and evaluation. The tracking system should assess the degree to which LRTP and S/TIP safety projects and strategies are being implemented, as well as the resulting level of crashes, serious injuries, and fatalities.

State DOTs may already have a system in place and could coordinate with MPOs to afford regional planners access or linkage to the database or share information with the person(s) inputting the data. If such a database does not exist, the state DOT and MPOs could work together to develop one.

If the technology for tracking and measuring implementation data seems too difficult, Figure 2.18 shows how Microsoft Excel™ spreadsheets can be used for data entry and graphics. This format is used by the South Central Planning and Development Commission in Houma, Louisiana, to track intersection fatalities and serious injuries. The graphs show baseline data, the target, and the trend line for achieving the target. The dial represents the number of programs and projects implemented to reduce intersection crashes. Subsequent worksheets of the spreadsheet list the different intersection programs and projects being implemented, or planned for implementation, and the status of the project.

Potential Solution—State universities often have transportation-related departments. Partnering with a university and an internship program to develop a database or tool to track performance and using students to input the information is a potential place to start.

#### *2.7.4.4 Interpret the Evaluation Data*

It is essential to interpret evaluation results to make informed decisions and to draw correct conclusions about the effectiveness of the implemented strategies and actions. Transportation planners should regularly review fatality and crash trends, compare them to baseline data, identify course corrections, and program new strategies and projects when necessary.

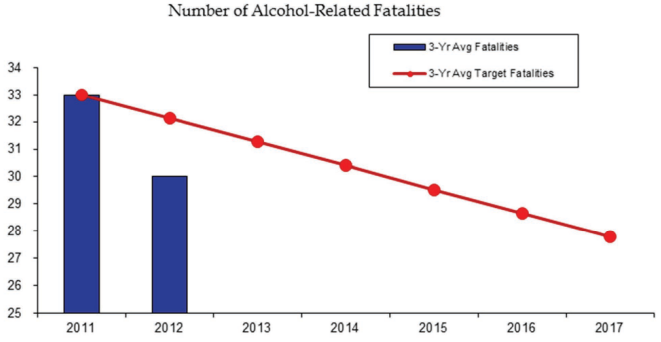
#### *2.7.4.5 Apply/Share Evaluation Results*

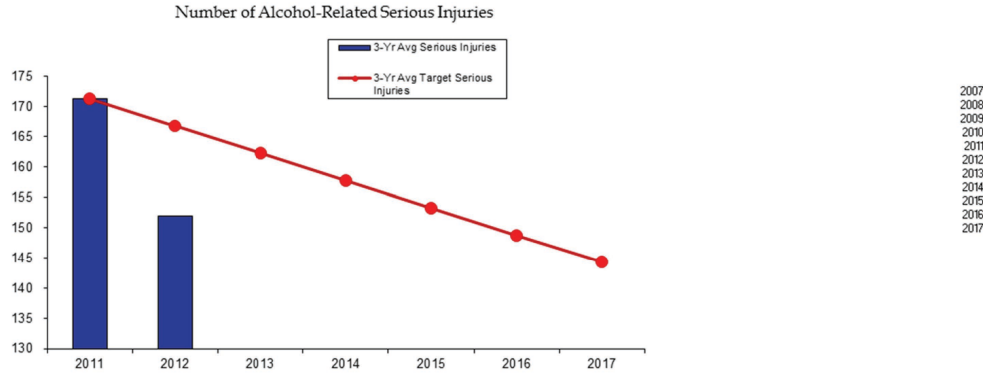
Sharing evaluation results with managers and stakeholders enables them to make informed decisions. Diagrams, graphics, charts, and tables can be used to regularly demonstrate fatality and serious injury trends (by mode or performance category), high-crash locations, corridor

Fatality Objective: Reduce the number of alchol-related fatalities from a 3-year average of 33 to 30 in Year 2015, and down to 17 by Year 2030.

Serious Injury Objective: Reduce the number of alcohol-related serious injuries from a 3-year average of 171 to 153 in Year 2015, down to 86 by Year 2030.

Performance Measures: Number of fatalities, Number of serious injuries.



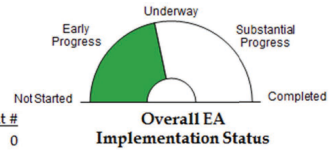




| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| 3-Yr Avg Fatalities | 33 | 30 | | | | | |
| 3-Yr Avg Target Fata | 33 | 32 | 31 | 30 | 30 | 29 | 28 |

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| 3-Yr Avg Serious | 171 | 152 | | | | | |
| 3-Yr Avg Target S | 171 | 167 | 162 | 158 | 153 | 149 | 144 |

*Action Implementation Summary*

| | Total | Strat 1.1 | Strat 2.1 | Strat 3.1 | Strat 3.2 | Strat 3.3 | Strat # |
|---|---|---|---|---|---|---|---|
| Not Started | 3 | 3 | 0 | 0 | 0 | 0 | 0 |
| Early Progress | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| Underway | 8 | 2 | 4 | 1 | 0 | 1 | 0 |
| Substantial Progress | 3 | 0 | 2 | 0 | 1 | 0 | 0 |
| Completed | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total # of Actions** | 15 | 5 | 6 | 1 | 2 | 1 | 0 |




Source: South Central Planning and Development Commission (Louisiana).

***Figure 2.18. Tracking table from the South Central Planning and Development Commission (Houma, Louisiana).***

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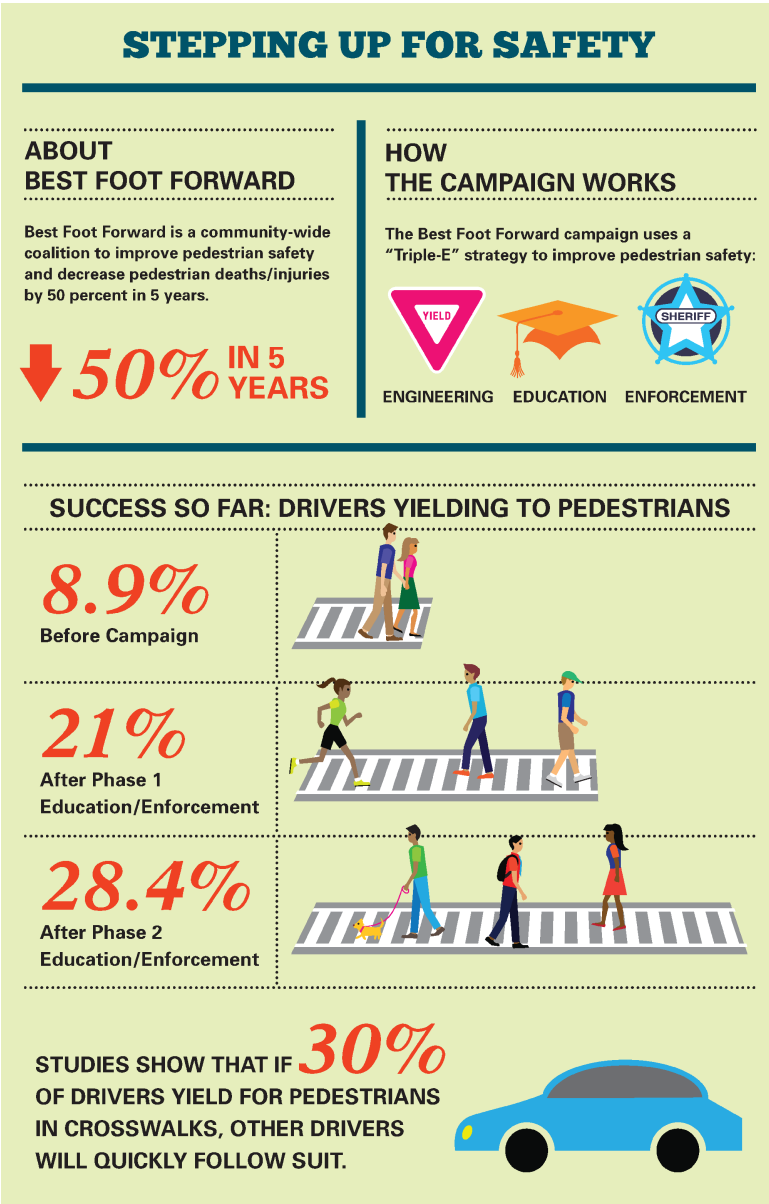
concerns, or other data to policy or executive boards. At a minimum, the information should be provided prior to an LRTP update, but ideally, evaluation results are shared more frequently. This keeps safety a part of the conversation and promotes support for continued transportation safety improvements and funding.

Sharing transportation safety performance information with the public is an opportunity to show how programs or projects improve multimodal safety and make the case for additional investments. Some agencies publish an annual comprehensive "state of the safety system" report. Usually annual reports and scorecards depict high-level measures, but sometimes agencies publish reports on individual programs, such as the brochure excerpt in Figure 2.19 from MetroPlan Orlando. This simple brochure informs the public, policymakers, and safety stakeholders about a program to reduce pedestrian deaths and injuries.




Source: MetroPlan Orlando (2012).

***Figure 2.19. Pedestrian program infographic from MetroPlan Orlando (Florida).***

Basic Solution—Highway safety offices are required to publish annual reports on behavioral safety measures. These plans may be used as a starting point for ideas or templates for developing a state or regional annual report.

#### *2.7.4.6 Utilize Before and After Studies*

Once projects are implemented, it is tempting to move on to the next project. However, conducting a before and after study can help evaluate projects, determine the effectiveness of implemented strategies, and decide whether similar investments should be made in the future. Due to the costs, it likely is impossible to study the results of every project, but conducting before and after studies on large capital improvements, such as a road widening or a new intersection, provides valuable insights into the safety impacts of the improvements. The results often can be extrapolated to other similar roadways or intersections.

Before and after studies can be conducted on systemic safety improvements (e.g., rumble strips, guardrail, safety edge). Systemic improvements are usually low cost and can be implemented across a transportation network. Understanding the benefits can lead to greater implementation. Some MPOs are now programming funds into the Unified Planning Work Program for before and after studies, so they can better evaluate and target investments.

### 2.7.5 Strategy Ranking and Prioritization Worksheet

Rate your organization's progress/status on the strategies on a scale of 1 to 5 using the criteria in Figure 2.20 and prioritize the strategies by the preferred order of implementation.

| Score Key | | | | | |
|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **N/A** |
| Not started | Early initial stages | Some elements complete | Substantial portion complete | Complete | Not applicable |

| **Strategy** | **Score** | **Priority Ranking** |
|---|---|---|
| Create a monitoring and evaluation plan | | |
| Develop performance measures | | |
| Identify/develop a tracking tool | | |
| Interpret the evaluation data | | |
| Apply/share evaluation results | | |
| Utilize before and after studies | | |

| **Other Potential Priority Strategies** |
|---|
| 1) |
| 2) |

***Figure 2.20. Strategy ranking and prioritization worksheet for Principle 7.***

CHAPTER 3

# Core Concepts and Implementation

## 3.1 Core Concepts

The seven principles for integrating safety in the transportation planning process represents a framework DOT and MPO planners can use to guide transportation safety decisions for future multimodal systems. The strategies listed in the guidebook were generated from practitioner input during Phase I research and during the five state workshops and two peer exchanges as part of Phase II. During the Phase II research, over 100 state and regional planners tested the practicality of the seven principles (all agreed the approach works), but implementation methods depend on the unique planning issues within a state or region and the institutional arrangements at each agency. The strategies presented for each principle showcase a broad range of opportunities to consider safety based on the practitioners' current actions and future ideas. This framework does not present a one-size-fits-all approach to transportation safety planning and includes a number of different strategies, but a few core concepts illustrated in the document can help transportation planners begin to move in the right direction:

- **Communication**—Transportation safety planning cannot take place without external input from stakeholders and the public or internal communications with partnering agencies on items such as crash data and performance measurement. At the start of any planning process, it is important to bring transportation safety stakeholders together from multiple disciplines (e.g., highway, transit, bicycle/pedestrian, enforcement, educators, emergency response) to identify the key safety issues. It is equally important to talk to the public to ask them what they perceive to be unsafe and why. Concurrently, ongoing internal communication will ensure state and regional planners are coordinating on multimodal crash and roadway data collection, sharing the outputs of data analysis, and jointly identifying performance measures and investments that will have the most success in reducing fatalities.
- **Address Safety in all Plans**—The SHSP, HSP, and HSIP are the three primary safety plans in a state. They address the near-term statewide safety issues and identify programs, projects, and funding levels to address the issues. These documents should be reviewed and applicable strategies/objectives incorporated into LRTPs and S/TIPs. However, improving safety is a multimodal and long-term endeavor. The LRTP differs from the SHSP as it identifies future programs, projects, and policies to improve safety, rather than immediate solutions. In addition, the LRTP and other planning documents address a variety of modes and topics, such as freight, transit, bicycles, pedestrians, and complete streets, which may not be found in the SHSP, HSP, or HSIP. To ensure safety is incorporated into all modes and topics over the long term, it should be considered in all planning documents, in addition to the primary safety plans.
- **Data-Driven Approach**—Data are key to lead planners to specific issues and solutions to address safety concerns. Safety data play an important role in identifying performance measures and targets to improve investment decisions. Qualitative data, obtained through public and stakeholder input, can be important for shaping and prioritizing the key safety issues.

Crash, road, and exposure data provide planners with specific information about where and why crashes are occurring and with what frequency and severity levels. In addition to the statewide priorities laid out in the HSP, SHSP, and HSIP, data provide regions and localities with information on the safety issues unique to their planning areas. MPO and DOT coordination and communication on crash data and analysis can lead to safety improvements that fit the needs of different transportation networks.

- **Prioritize Safety**—A common perception is all transportation projects are designed safely, but most current design standards are not optimized for safety. For instance, the AASHTO Green Book develops standards for design so roadways are consistent and users know what to expect. Most of the recommended design aspects have not been empirically tested for safety outcomes in terms of which designs result in reduced fatalities and injuries. Planners and other practitioners should move beyond broad statements, such as "safety is part of every project because it meets design standards" to identifying and prioritizing transportation safety programs and projects with proven safety benefits.
- **Leadership—**One person, whether it be a staff planner, a DOT or MPO director, or an elected official, can play a leadership role and advocate for transportation safety improvements. The key is to frame safety conversations using public perception, crash data, and other available tools to engage stakeholders on the topic and promote transportation safety investments.

At a minimum, these core concepts will help planners initiate or enhance a process for integrating safety into planning documents. More specific results can be identified using the Strategy Ranking and Prioritization Worksheet at the end of each section in Chapter 2. For planners who are motivated to develop specific actions to advance to the next step in transportation safety planning, the TSP Action Plan will serve as a guide.

## 3.2 TSP Action Plan

The TSP Framework provides a range of opportunities for weaving safety into the transportation planning process. At the end of each section in Chapter 2, readers were provided a worksheet to understand the status of suggested strategies, identify other strategies, and rate implementation priorities. The template in this section provides a guide to developing a TSP Action Plan to be used to enhance TSP at the state, MPO, or local level.

Use the assessment conducted for each principle to guide the development of the action plan. For each strategy identified as a priority for the organization, create a list of action steps to accomplish the strategy. Table 3.1 describes the information requested on the action plan. Figure 3.1 provides a blank action plan template to assist in the creation of action steps for each priority strategy.

**Table 3.1. Terms used on the TSP Action Plan.**

| Term | Description/Definition |
|---|---|
| Principle | Enter one of the seven TSP principles to be addressed (i.e., Include Safety Experts on Planning Committees or Discuss Safety at Committee Meetings; Collect and Analyze Transportation Safety Data; Incorporate Safety into the Vision, Goals, and Objectives; Integrate Safety Performance Measures into the Performance Management System; Incorporate Safety in Planning Programs and Documents; Establish Safety as a Decision Factor; or Implement a Monitoring System and Regularly Evaluate Performance). |
| Priority Strategy | List at least one priority strategy identified in the Strategy Ranking Prioritization Worksheet. |
| Action Step | Outline the steps you will take to achieve each strategy. Arrange steps chronologically. Place each action step in a separate row. |
| Target Date | Denote a time period for each action step to be accomplished (number of months, years, etc.). |
| Lead Person/Organization | Identify the key person who will initiate the activity, provide direction for the work, and monitor progress. |
| Anticipated Result | Describe the results of the activity. |
| Progress Notes | Track the progress of activities. |

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**Date Created:** **Date Reviewed/Updated:**

**PRINCIPLE:**

| PRIORITY STRATEGY No. 1: | | | | |
|---|---|---|---|---|
| ACTION PLAN | | | | |
| Action Step | Target Date | Lead Person/Organization | Anticipated Result | Progress Notes |
| | | | | |
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| NOTES |
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| PRIORITY STRATEGY No. 2: | | | | |
|---|---|---|---|---|
| ACTION PLAN | | | | |
| Action Step | Target Date | Lead Person/Organization | Anticipated Result | Progress Notes |
| | | | | |
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| NOTES |
|---|
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| PRIORITY STRATEGY No. 3: | | | | |
|---|---|---|---|---|
| ACTION PLAN | | | | |
| Action Step | Target Date | Lead Person/Organization | Anticipated Result | Progress Notes |
| | | | | |
| | | | | |
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| | | | | |
| | | | | |

| NOTES |
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***Figure 3.1. TSP Action Plan template.***

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# Abbreviations and Acronyms

AARP – American Association of Retired Persons
AASHTO – American Association of Highway Transportation Officials
DOT – Department of Transportation
DOTD – Department of Transportation and Development
FHWA – Federal Highway Administration
FTA – Federal Transit Administration
GIS – Geographic Information System
HCL – High Crash Location
HSIP – Highway Safety Improvement Program
HSM – Highway Safety Manual
HSP – Highway Safety Plan
LOSS – Level of Service of Safety
LRTP – Long-Range Transportation Plan
LTAP – Local Technical Assistance Program
MADD – Mothers Against Drunk Driving
MAP-21 – Moving Ahead for Progress in the 21st Century
MPO – Metropolitan Planning Organization
NEPA – National Environmental Protection Act
PRR – Preservation/Rehabilitation/Replacement
RTC – Regional Transportation Commission
SHSP – Strategic Highway Safety Plan
STIP – Statewide Transportation Improvement Program
STP – Surface Transportation Program
TIP – Transportation Improvement Program
TSP – Transportation Safety Planning
TRCC – Traffic Records Coordinating Committee
VMT – Vehicle Miles Traveled

*Abbreviations and acronyms used without definitions in TRB publications:*

| | |
|---|---|
| A4A | Airlines for America |
| AAAE | American Association of Airport Executives |
| AASHO | American Association of State Highway Officials |
| AASHTO | American Association of State Highway and Transportation Officials |
| ACI–NA | Airports Council International–North America |
| ACRP | Airport Cooperative Research Program |
| ADA | Americans with Disabilities Act |
| APTA | American Public Transportation Association |
| ASCE | American Society of Civil Engineers |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society for Testing and Materials |
| ATA | American Trucking Associations |
| CTAA | Community Transportation Association of America |
| CTBSSP | Commercial Truck and Bus Safety Synthesis Program |
| DHS | Department of Homeland Security |
| DOE | Department of Energy |
| EPA | Environmental Protection Agency |
| FAA | Federal Aviation Administration |
| FHWA | Federal Highway Administration |
| FMCSA | Federal Motor Carrier Safety Administration |
| FRA | Federal Railroad Administration |
| FTA | Federal Transit Administration |
| HMCRP | Hazardous Materials Cooperative Research Program |
| IEEE | Institute of Electrical and Electronics Engineers |
| ISTEA | Intermodal Surface Transportation Efficiency Act of 1991 |
| ITE | Institute of Transportation Engineers |
| MAP-21 | Moving Ahead for Progress in the 21st Century Act (2012) |
| NASA | National Aeronautics and Space Administration |
| NASAO | National Association of State Aviation Officials |
| NCFRP | National Cooperative Freight Research Program |
| NCHRP | National Cooperative Highway Research Program |
| NHTSA | National Highway Traffic Safety Administration |
| NTSB | National Transportation Safety Board |
| PHMSA | Pipeline and Hazardous Materials Safety Administration |
| RITA | Research and Innovative Technology Administration |
| SAE | Society of Automotive Engineers |
| SAFETEA-LU | Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005) |
| TCRP | Transit Cooperative Research Program |
| TEA-21 | Transportation Equity Act for the 21st Century (1998) |
| TRB | Transportation Research Board |
| TSA | Transportation Security Administration |
| U.S.DOT | United States Department of Transportation |

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