

Framework for Institutionalizing Safety in the Transportation Planning Process

Phase 1 final report

prepared for

National Cooperative Highway Research Program

prepared by

Cambridge Systematics, Inc.

final report

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date

June 2012

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1.0 Introduction

To address the human and economic losses associated with traffic crashes, transportation agencies at all levels of government are expected to consider and implement projects, strategies, and services that increase the safety of the transportation system for motorized and nonmotorized users. An important aspect of this safety consideration is for statewide and metropolitan planners to identify and plan for transportation safety needs through the transportation planning process. The purpose of the National Cooperative Highway Research Program (NCHRP) 08-76, *Institutionalizing Safety in the Transportation Planning Process*, was to prepare a guide or “how-to” manual for integrating and institutionalizing safety into the traditional transportation planning process.

Previous research, specifically NCHRP 546, *Incorporating Safety into Long-Range Transportation Planning*; practitioner surveys and interviews; and the expertise of the research panel and consultant team, defined institutionalization as a series of seven principles or steps that would lead to a coordinated and comprehensive approach to safety. To effectively establish safety as a convention or norm in a Metropolitan Planning Organization (MPO) or Department of Transportation (DOT) planning culture, transportation planners should:

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

The study team found some state and regional planning agencies have utilized tools and strategies to excel in one or more of these steps, but no one agency has implemented all of them.

The study team developed a *Framework for Institutionalizing Safety* in the transportation planning process. Instead of preparing a “how to” manual based on successful safety institutionalization practices, the framework provides recommendations and actions that MPO and DOT planners can implement to consider safety more comprehensively. Funding concerns, competing priorities, and staff limitations may hinder the implementation of the steps, but the framework provides a useful starting point.

1.1 PROJECT OBJECTIVE

The objective of NCHRP 08-76 was to identify and document institutionalized methods for addressing safety in the traditional transportation planning process. This research built upon NCHRP Report 546 (*Incorporating Safety into Long-Range Transportation Planning*), published in 2006. Report 546 was a first step in providing transportation planners with tools and strategies to consider safety in the planning process. The intent of 08-76 was to create a framework demonstrating how planners have been utilizing these tools and strategies, as well as other methods, to institutionalize safety as a decision factor in the planning process. The first step was to define “institutionalization” and the second step aimed to identify successful practices to illustrate how safety integration could be achieved.

1.2 AUDIENCE

The intended audience for the framework is primarily DOT and MPO transportation planners. These professionals are expected to implement legislative requirements, which guide the transportation planning process and formally connect the process to safety.

1.3 METHODOLOGY

The research team designed and implemented an approach for identifying tactics, techniques, and strategies for institutionalizing safety in the traditional transportation planning process and testing a proposed framework. The process consisted of a literature review, practitioner outreach surveys and interviews, review by an expert panel, a beta test involving students in a transportation safety planning course, a series of workshops with the Nevada Department of Transportation and the four Nevada MPOs, and a three-and-a-half-hour workshop at the Transportation Research Board sponsored *Making Progress: Transportation Planners and Programmers Turn Ideas Into Reality* conference. See Appendix A.1 (on page A-2) for a full description of the research methodology and Appendix A.5 (page A-26) for the materials and findings from the workshops.

2.0 Safety and the Transportation Planning Process

Transportation planning is a continuing, comprehensive, and cooperative (3C) process. DOT and metropolitan agencies use the transportation planning processes to bring together system users to identify the scope and nature of future changes to the system, develop strategies to address these issues, and better orient their organizations to deliver the program.

The following steps illustrate a traditional approach to transportation planning and are captured in Figure 2.1: The Traditional Transportation Planning Process:

1. Develop an inventory of existing transportation systems and patterns of travel;
2. Establish goals, objectives, performance measures, and needs;
3. Formulate alternative plans;
4. Predict outcomes, identify benefits, and forecast the physical effects of alternative plans on local travel patterns to evaluate and prioritize projects and strategies;
5. Choose course(s) of action;
6. Use prioritization to develop programs, projects, priorities for Long-Range Transportation Plans (LRTP), and Statewide and Regional Transportation Improvement Programs (S/TIP); and
7. Implement and monitor the results to prepare for subsequent planning processes.

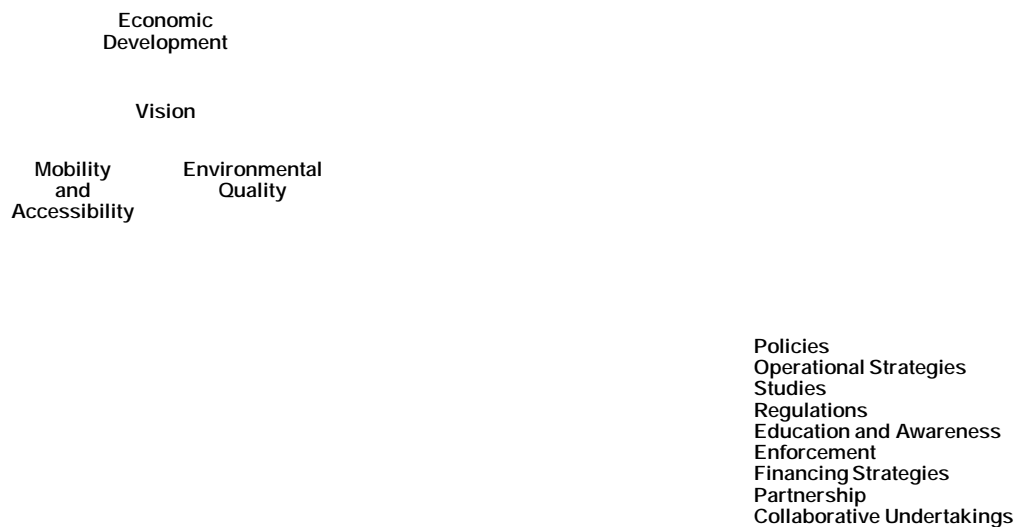
As part of this process, planners are required to consider an array of complex needs or planning factors in the state or region. MPOs and DOTs must consider and implement projects, strategies, and services that address the following factors:

1. Support the **economic vitality** of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency;
2. Increase the **safety** of the transportation system for motorized and nonmotorized users;
3. Increase the **security** of the transportation system for motorized and nonmotorized users;
4. Increase the **accessibility and mobility** of people and for freight;
5. Protect and **enhance the environment**, promote energy conservation, improve the quality of life, and promote consistency between transportation

- improvements and state and local planned growth and economic development patterns;
6. Enhance the **integration and connectivity** of the transportation system, across and between modes, for people and freight;
 7. Promote efficient system **management and operations**; and
 8. Emphasize the **preservation** of the existing transportation system.¹

A number of priorities need to be balanced throughout the transportation planning processes. Transportation legislation requires safety to be considered in the planning process, but the degree to which statewide and metropolitan planners consider it is subject to the magnitude of the problem, competing priorities, staff time, and financial considerations.

Figure 2.1 The Traditional Transportation Planning Process²



¹ *Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU).*

² NCHRP Report 546, *Incorporating Safety into Long Range Transportation Planning*, Graphic adapted from Meyer and Miller, 2001.

3.0 Integrating Safety into Transportation Planning

Despite competing interests, the safe movement of freight, automobiles, motorcycles, pedestrians, and bicyclists should be a priority in every state and region considering the large economic costs of crashes incurred both by those involved and by other travelers affected by traffic delay, etc. Although barriers to safety integration and institutionalization exist in the transportation planning process, legislation has provided a general direction for moving forward. Agencies are responsible for developing specific goals, strategies, and safety planning elements to reduce fatalities and serious injuries.

3.1 LEGISLATION AND REQUIREMENTS

Legislation paved the way for safety considerations in the transportation planning process. In 1998, TEA-21 provided a focus on safety by establishing “safety and security” as a transportation planning requirement. This legislation marked the first time safety was mentioned as a transportation planning factor. Prior to this legislation, explicit safety improvement strategies were seldom included in statewide and metropolitan planning processes or documents.

In 2005, SAFETEA-LU enhanced the transportation safety planning requirement by separating safety and security into distinct planning factors; hence, increasing the impact of both. The importance of safety was further heightened with the creation of Section 148, the Highway Safety Improvement Program (HSIP), as a new core funding program. HSIP nearly doubled the funds for infrastructure safety, allowed increased flexibility in program funding, and required the states to develop and implement a multidisciplinary, collaborative, data driven, results-oriented Strategic Highway Safety Program (SHSP).

In 2007, an update to the Statewide and Metropolitan Transportation Planning Final Rule (23 CFR 450) was issued. It encouraged a safety element in the long-range transportation plan consistent with the SHSP, and the statewide and regional transportation improvement programs (S/TIP) are expected to reflect SHSP programs and projects. The Rule is designed to strengthen the link between safety and the transportation planning process.

3.2 DEFINING SAFETY

Transportation legislation provides the basic framework for including safety in the transportation planning process, but defining what it means and identifying

how to provide safe facilities for all users, is at the discretion of the planning agency and interested stakeholders. Defining safety is usually accomplished through a collaborative process in conjunction with the goal and objective setting stages for a state or region. In most cases, two (or more) definitions may exist. The first definition may be broad and portray the big picture, e.g., *improving safety for all modes is critical to improving quality of life and improving access for all the citizens of the state and region*. A second definition may be narrower and rely upon data or stakeholder knowledge to specifically address what the state or region hopes to achieve, e.g., *reduce pedestrian fatalities by 25 percent or repair transit crossings at high risk locations*. Because transportation safety concerns can vary across states and regions, no single definition is followed. It is incumbent upon planners and safety stakeholders to collaborate and define what will make transportation facilities safe for all users.

For purposes of this framework, a definition often quoted by safety professionals is used: The safety of an entity (a road section, an intersection, a driver, a bus fleet, etc.) is “the number of accidents (crashes), or accident consequences, by kind and severity, expected to occur on the entity during a specified period.”³

3.3 TSP CHALLENGES

Surveys, interviews, and research have identified the challenges to comprehensive safety integration into transportation planning.

- Long-range transportation plans (LRTP) generally mention safety in the goals, objectives, or vision statement, but specific recommendations and strategies are usually lacking.
- State departments of transportation and MPOs face competing priorities; hence, they are not always directly focused on safety.
- Long-range plans often do not consider the entire range of safety factors – such as behavior, enforcement, and education.
- Elected officials often champion programs and projects that deal with congestion or economic competitiveness because their constituents are focused on those issues.
- In the past, safety practices operated in a reactive mode and were addressed in the project design phase; whereas, planners think proactively and work toward the future condition.

³ Hauer, E. (1997). *Observational before-after studies in road safety*. Pergamon, Oxford, United Kingdom.

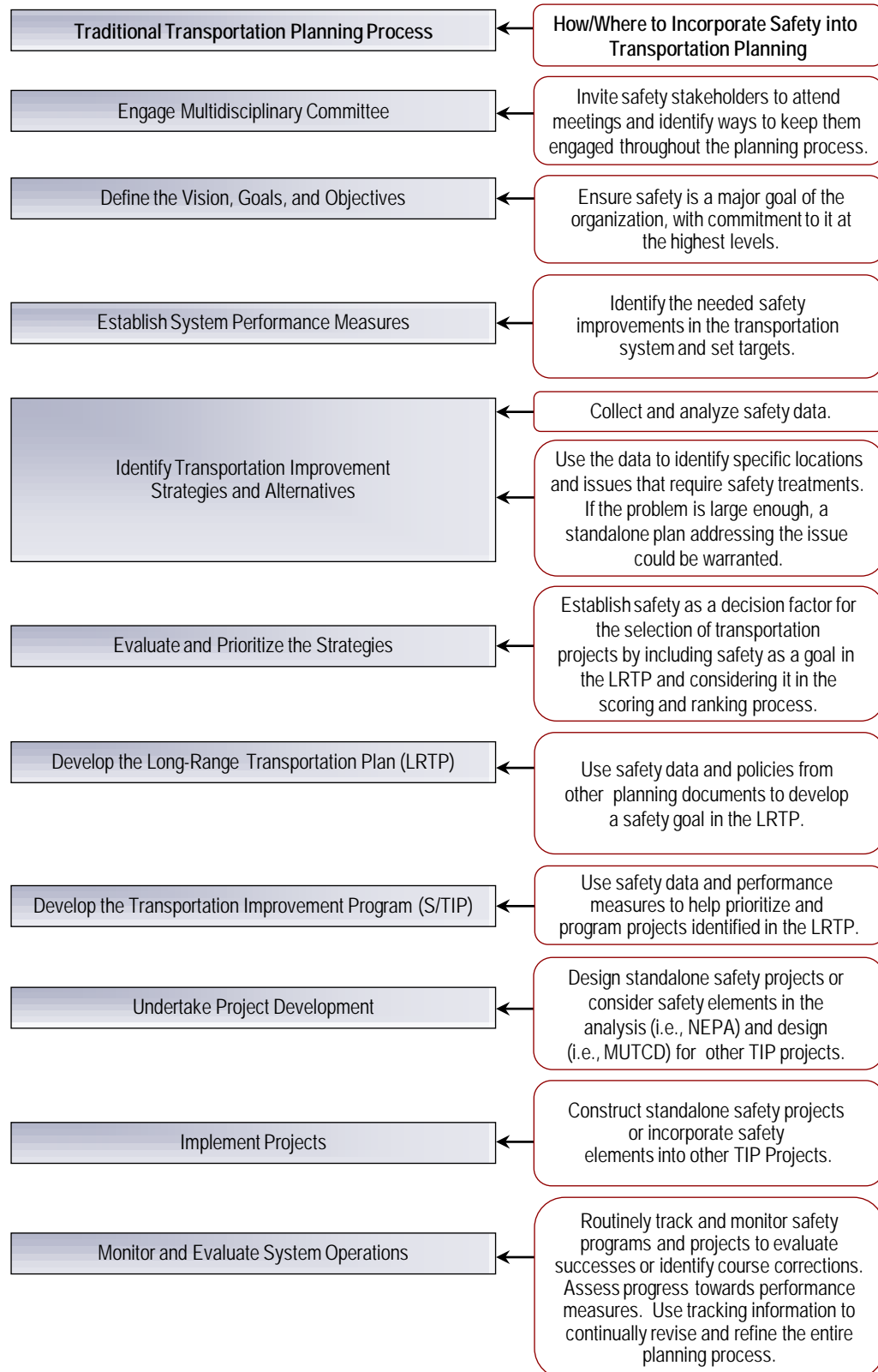
- The HSIP, Highway Safety Plan (HSP), the SHSP, and the Commercial Vehicle Safety Plan (CVSP) address safety issues; hence, transportation planners may believe safety is managed by other planning processes.
- The transportation planning process requires DOTs and MPOs to “consider” projects, strategies, and services that address the planning factors (e.g., safety), but does not specify to what extent.
- Transportation planners lack robust tools for forecasting transportation safety issues; therefore, long-range safety planning efforts are limited.
- Accurate and available data may not always be easily accessible. If data are available, staff expertise for analyzing and utilizing the data may be unavailable.
- Generally, planners believe safety is addressed in all projects and programs; therefore, a standalone safety section in planning documents is unnecessary.

These challenges can be addressed by institutionalizing the framework documented in Section 4.0.

3.4 SAFETY INTEGRATION

Despite the challenges, some agencies have found success incorporating safety into one or more elements of the transportation planning process. Figure 3.1 depicts a high-level view of how to integrate safety throughout the process and Section 4.0, *A TSP Framework*, describes a seven step process for effectively implementing safety at every point in the transportation planning process.

Figure 3.1 Institutionalizing Safety in the Transportation Planning Process



4.0 A Transportation Safety Planning Framework

This section lists the seven steps which can be implemented and institutionalized to ensure safety is explicitly recognized as a factor in the transportation planning process. The framework provides both basic and more advanced methods for weaving safety into the transportation planning process and describes why, amongst a number of competing interests, it is critical to consider safety in all transportation programs and projects. The intent of the framework is to provide MPO and DOT transportation planners with ideas, strategies, and techniques for addressing safety or considering it in a more comprehensive and explicit manner.

1. Include Safety Experts on Planning Committees

The transportation planning process brings together agencies, elected officials, municipalities, system users, and citizens to provide input and suggestions for transportation projects. At the DOT level, committees are usually formed to specifically advise the long-range planning process. In 2010, for example, the Florida DOT created a statewide planning steering committee comprised of a diverse group of transportation providers (e.g., Federal, state, regional, and local public agencies), economic developers, businesses, the military, community representatives, environmental interest groups, and members of the public.

At the MPO level, the committee structure is usually better defined and larger, and includes one or all of the following committees:

- **A Policy Board** comprised of local elected officials, state officials, and officials from agencies that operate major modes of transportation in the region. They are responsible for discussing and approving transportation projects in a region.
- **A Technical Advisory Committee (TAC)** comprised of technical staff, primarily planners and engineers, representing regional interests. This includes, but is not limited to; local governments, state DOTs, transit agencies, Federal agencies, environmental interests, and freight interests. They are responsible for keeping the policy board informed of the transportation planning process and assisting in the dissemination and clarification of decisions.
- **A Citizen Advisory Committee** to provide local perspective and encourage public participation.
- **Committees formed around specific modes or topic areas (e.g., safety)** to provide technical insight into program and project planning.

The purpose of these committees and forums is to bring together a diverse group of stakeholders to reach consensus on Federally funded transportation investments, despite their varied interests. Each of these committees plays a role in informing, implementing, and adopting the LRTP and TIP.

The committees organized to guide the MPO and DOT planning processes may not include representatives of the safety community, such as safety engineers, law enforcement, emergency responders, safety educators, or other safety practitioners. Some committee representatives may have an interest and level of expertise in safety, but it is unlikely they perceive their roles as representing safety interests because they were assigned to the committee for different reasons. Transportation and safety stakeholders may perceive the SHSP development process as the vehicle to manage transportation safety issues, rather than the LRTP and S/TIP. However, the LRTP and S/TIP are important vehicles for incorporating elements of safety into all transportation projects.

Adding safety professionals to existing MPO and DOT multidisciplinary committees would be helpful and provide safety expertise to transportation planners who tend to be “generalists” with a broad understanding across all the planning factors. Crashes generally are associated with multiple contributing factors; therefore, considering safety from only a transportation planning or engineering perspective may result in overlooking other effective measures. Ongoing access to safety expertise in the decision-making process is necessary to ensure safety receives equal consideration with other planning factors.

Multidisciplinary collaboration provides planners with the resources for considering transportation system safety. Strategies for starting and growing these relationships include:

- Invite safety representatives to join existing committees or develop a new committee or coalition to represent safety interests. In some cases, adding a new committee to the decision-making structure is difficult because of MPO requirements. However, the other committees represent a variety of interests and disciplines, and adding safety professionals to those committees is advisable. The Washington DOT includes safety professionals in decision-making when safety projects and programs are under consideration. However, a fully institutionalized safety integration approach would include representatives of the safety community in all decision-making exercises. Another option is to form a safety task force or coalition outside the institutionalized decision-making structure that influences decisions made by the standing committees. The Mid-America Regional Council (MARC), the MPO for Kansas City, adopted this approach.
- Attend an SHSP steering committee meeting or a safety summit. This forum presents an opportunity to make connections with state safety professionals and identify their regional equivalents. It also is an opportunity to identify safety champions and leaders. Regular attendance at safety meetings enables

planners to learn from example and observe firsthand how the SHSP 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 all the safety disciplines; hence, the recommendations will move beyond transportation planning and engineering and include other nontraditional partners, such as persons who address road user behavior issues. This segment of the safety community may be missing at the planning table because the funding streams and requirements are outside the traditional DOT and MPO structures. However, their input, as well as their resources, can make an important contribution.
- Invite local law enforcement, emergency personnel, businesses with an interest in safety, such as trucking and insurance companies, and other safety experts to state and regional TAC meetings where planning staff can explain the transportation planning process and the mutual benefits gained from collaboration. Ask for their ideas and insights into the most pressing safety issues.
- Engage the DOT District/Division/Regional Engineers and FHWA Division Staff in safety issues. They already may attend MPO TACs. Charging them with responsibility for safety planning will encourage them to provide insight into the statewide safety concerns, funding sources, and information on other resources, such as data and analysis tools.
- Establish safety as a regular agenda item for MPO TAC meetings. Inserting safety into the discussion encourages participation, giving safety professionals a role to play and a voice in the decision-making process.
- Focus the effort and identify how project planners and safety professionals can work together to demonstrate the importance and benefits of safety for all transportation projects. For example, corridor studies are usually a multimodal undertaking and could involve elements of bicycle, pedestrian, bridge, parking, and road safety.
- As relationships and trust grow between planners and the safety community, identify additional agencies, partners, and stakeholders to provide expertise on critical areas. For example, if pedestrian crashes near schools are an issue in a community, engage the principal and teachers in specific planning efforts.

2. Incorporate Safety into the Vision, Goals, and Objectives

SAFETEA-LU requires the transportation planning process to provide for consideration of projects and strategies that accomplish the eight (see page 2-1) planning factors. Safety is listed as a planning factor, but it is not always given equal consideration in the vision, mission, and goals of the LRTP, which eventually affects the objectives and performance measures.

The long-range planning process combines technical analysis with community and agency participation to envision a transportation future. Information from the travel demand model is widely used in stakeholder or public meetings to demonstrate the benefits of capital projects in terms of mobility, air quality, accessibility, and transit. However, the model is not capable of explaining the safety benefits of these same projects. Although safety specific models and tools are becoming available, particularly at the state level, they are not yet widely used by planners, which makes it difficult to quantify the safety benefits of a transportation project or elevate it as a primary goal.

To develop or refine safety goals and objectives, safety must be portrayed as a priority to the public, stakeholders, and decision-makers. Examining the data and asking the multidisciplinary committee to comment on the most pressing safety issues could result in creating a snapshot of the safety challenges facing a community at any point in time. This information can be presented to stakeholders, decision-makers, and members of the public to create a vision, goals, and objectives for the Plan. For example, the Miami-Dade MPO used this approach to draft the language in Figure 4.1 for the LRTP.

Figure 4.1 Miami-Dade MPO Goal and Objectives

Goal: Increase the safety of the transportation system for motorized and nonmotorized users.

Objectives:

- *Improve safety on facilities and in operations;*
- *Reduce roadway and multimodal crashes;*
- *Increase safety at transit stops and intermodal stations and connections; and*
- *Implement the Safe Routes to School Program.*

The goals and objectives not only convey to the community a sense of what the transportation planning process and products are striving to achieve, but also provide important direction to the development of the performance measures, which help planners design and implement strategies and projects to support community values.

To effectively incorporate safety into the vision, goals, and objectives of the LRTP, it is important to identify methods (e.g., forecasting tools, public outreach) for setting a meaningful safety goal. Some include:

- Develop a regional safety report on general crash statistics to serve as a resource document that, continually updates stakeholders and the public about the importance of safety. The Maricopa County Association of Governments (MAG), the MPO for the Phoenix region, publishes an annual “state of the region” report; while MARC presents the data to stakeholders on a quarterly basis.

- Use the regional safety report during stakeholder and public visioning sessions and set the stage for adopting safety as a key transportation goal.
- Create maps to depict intersections, road segments, and corridors in the transportation network with the greatest promise for improving safety in the same way the travel demand model depicts the most congested roadways. Use the maps at meetings with the public and stakeholders to solicit objectives and strategies for enhancing safety.
- Consider adopting the “National Strategy” on highway safety.⁴

3. Identify Safety Issues

The majority of state DOTs and MPOs have incorporated some aspects of safety into their long- and short-range plans. The issues typically center on the highway, but, in some cases, other issues are addressed as well, such as bicycle and pedestrian safety, motorcyclists, older drivers, younger drivers, etc.⁵ These issues are far more likely to be identified in the SHSP; however, the SHSP safety issues often are not aligned with the LRTP, nor are they explicitly considered in the development of the S/TIP. For example, since the Highway Safety Improvement Program (HSIP) became a core funding program, the projects are included in the S/TIP, but often they are the only projects focused on and defined as safety-related.

The SHSP is not intended to identify all of the state’s safety issues because it is intended to be a “strategic” plan where emphasis is placed on targeted strategies with the greatest promise of reducing fatalities and injuries. Therefore, one would expect other safety issues to be incorporated into the LRTP. Many of the interviewees from both Tier 2 and Tier 3 claim safety is a consideration in everything, whether it be asset management, air quality, congestion management, land use decisions, etc. However, the emphasis on safety is generally implied rather than explicitly stated. This practice makes it difficult to measure the degree to which safety issues are truly incorporated.

Agencies use various methods and programs to address safety issues, but these projects and programs are typically siloed by the funding agency, e.g., DOT projects are centered on highway safety issues and enhancements; MPOs and local agency programs typically address land use impacts and transit, bicycle, and pedestrian safety issues; law enforcement focuses on road user behavior; and state highway safety agencies (SHSA) implement strategies focused on beha-

⁴ FHWA, AASHTO, NCHRP, and others are developing a “National Strategy” to guide SHSP implementation and evaluation.

⁵ The U.S. Secretary of Transportation has identified five priority goals for the current administration – safety, livability, sustainability, economic competitiveness, and state of good repair. The increased emphasis on livability is resulting in some states considering the addition of a “multimodal” element (e.g., transit) to their SHSP teams.

vioral change. As noted earlier, examples of state or regional planning agencies addressing safety issues from a multidisciplinary, comprehensive perspective were not identified.

To effectively incorporate safety issues into all modes of transportation addressed in the LRTP, planners can:

- Coordinate with transportation and safety stakeholders to consider how to incorporate safety into highway, bicycle and pedestrian, freight, and transit projects.
- Prioritize safety elements, in addition to other factors such as mobility, accessibility, sustainability, etc. when developing goals, objectives, strategies, and actions in planning documents.

4. Establish Safety Performance Measures

States and urbanized areas use the transportation planning process to identify needed improvements in the transportation system. Integrating safety considerations represents a significant opportunity for transportation officials to enhance safety performance. Integration also provides decision-makers with current information on the safety characteristics of the transportation system, such as the number and rate of serious injury crashes.

Safety information is particularly important for quantifying safety needs, identifying goals to guide transportation planning efforts, and focusing attention and resources on safety-related challenges. Over the past 15 years, the transportation profession has increasingly used performance measures as the primary mechanism for providing this information. Performance measures are used to set targets, prioritize investments, demonstrate progress toward goals in statewide and metropolitan LRTPs, implement S/TIPs, and monitor system performance.

Numerous methods are used to identify and set targets. For example, in 2008, the Governors Highway Safety Association (GHSA) and the National Highway Traffic Safety Administration used a panel of experienced professionals to develop performance measures which all states are required to report annually.

Setting road safety targets and establishing performance measures are widely advocated practices, particularly in Europe and Australia. The Organization for Economic Cooperation and Development (OECD) points out targets may improve road safety by encouraging more realistic and efficient road safety programs, communicating the importance of road safety to people who can affect it, giving direction to policy-makers,

States will set goals for and report progress on each of the 11 core outcome and behavior measures annually beginning with their 2010 Highway Safety Plans and Annual Reports.

Traffic Safety Performance Measures for States and Federal Agencies (NHTSA, 2008)

motivating stakeholders to act, and holding road transport system managers accountable.⁶ The effectiveness of setting road safety targets has been evaluated in only a few studies; however, the available evidence shows reductions in fatalities and fatality rates are associated with target setting.⁷

Safety often is measured by the number, frequency, severity, and cost of crashes and is affected by road user behavior, vehicle operations, roadway conditions, and other factors, some of which may be outside the control of the state DOT. The data used to estimate safety outcomes are derived from police reports and aggregated at the state or regional level. The National Highway Traffic Safety Administration (NHTSA) maintains a census of detailed crash reports for all fatal crashes as part of the Fatality Analysis Reporting System (FARS). FARS establishes detailed standards in reporting and requirements for the type of information provided. These data are available to all states, and state LRTPs generally use one or more of the following measures:

- Number of fatalities;
- Fatality rate (by VMT);
- Number of serious injuries; and
- Rate of serious injuries (by VMT).

States also often track behavioral measures, such as observed seat belt use, and activity measures that track the number of safety belt citations, number of impaired driving arrests, and number of speeding citations issued during grant-funded enforcement activities.

Although most DOT planning divisions and some MPOs have access to the data necessary to establish realistic measures, some may not. Where data are not available, an initial solution is to use the performance measures required for all state highway safety offices by NHTSA in partnership with the GHSA. The outcome and behavioral measures provide a useful starting point. The required performance measures are listed in Figure 4.2.

⁶ OECD and International Transport Forum. (2008). *Towards zero: Ambitious road safety targets and the safe system approach*, Paris, OECD.

⁷ Gargett, S., Connelly, L.G., and Nghiem, S. (2011). *Are we there yet? Australian road safety targets and road traffic crash fatalities*, BMC Public Health, 11:270, 2011.

Figure 4.2 Performance Measures Required by NHTSA and GHSA

- *Number of traffic fatalities (three- or five-year moving averages);*
- *Number of serious injuries in traffic crashes;*
- *Fatalities/VMT (Including rural, urban, and total fatalities);*
- *Number of unrestrained passenger vehicle occupant fatalities, all seat positions;*
- *Number of fatalities in crashes involving a driver or motorcycle operator with a blood alcohol concentration of .08 g/dL or higher;*
- *Number of speeding-related fatalities;*
- *Number of motorcyclist fatalities;*
- *Number of unhelmeted motorcyclist fatalities;*
- *Number of drivers 20 or younger involved in fatal crashes;*
- *Number of pedestrian fatalities; and*
- *Observed seat belt use for passenger vehicles, front seat outboard occupants.*

DOTs and MPOs should work with safety professionals on multidisciplinary committees to identify additional performance measures and data sources. For example, if the planning documents include an objective to reduce speeding at the state or community level, the program might include traffic calming, automated speed enforcement, and other tactics. Additional performance measures could include average speed reductions, reductions in pedestrian and bicycle injuries related to speeding, etc. If an objective is to shift more road users to transit, walking, and biking, a performance measure could be added to track progress.

Ideally, safety performance measures can and should be tied to other important community issues, such as crime, land use, and mobility. Planners can use mapping techniques to overlay safety and crime or congestion data.⁸

The following action steps lead to the establishment of safety performance measures:

- Reach agreement on the issues that need to be measured.
- Identify candidate performance measures.
- Determine if the data exist to support the candidate performance measure.

⁸ Data-Driven Approaches to Crime and Traffic Safety (DDACTS) is a method for mapping crime and safety data. Training and technical assistance are available through NHTSA and some SHSOs.

- If the data are not available, determine whether to invest in data collection and identify the resources, or consider alternative performance measures.
- Collect and analyze the data for developing achievable safety performance measures.
- Ensure a strategic data collection plan is in place with appropriate quality assurance/quality control procedures.
- Assign responsibility for data collection, analysis, and tracking.⁹

5. Collect and Analyze Safety Data

Data are important to planners for many reasons, including fostering and building relationships and demonstrating the importance of safety projects and programs. Planners can use the data to identify safety problems, evaluate alternative strategies, justify proposed projects, and establish performance measures. Without data, agencies risk identifying perceived, rather than actual dangers. Common data issues involve not only collection and management, but also analysis.

Data Collection and Management

States and MPOs generally examine three types of data – crash, roadway, and travel data. Other considerations might include demographic and land use data, as well as the characteristics of the built environment. Data and data management systems differ from state to state. Data may be managed by DOTs, Departments of Motor Vehicles (DMV), State Highway Safety Offices (SHSO), or other state agencies. In some cases, enforcement agencies and emergency responders collect crash data and keep internal systems. In some states, the crash information is centralized; but in others, it may not be, especially in the case of data on local roads. Some states have data on the local road system, while others focus on the state system. Planners may work with the multidisciplinary committee and use these relationships to identify state and regional data needs and gaps. Once planners have the data, which can be very basic or more sophisticated, they usually have the ability to:

- Identify high-crash corridors, intersections, and/or facility types (ideally via GIS mapping);
- Determine crashes types (e.g., rear-end collisions, lane departures);
- Identify roadway facility types where crashes are likely to occur;

⁹ Information on the development of performance measures is based on *A Primer on Safety Performance Measures and the Transportation Planning Process*. The *Primer* was developed with support from FHWA on behalf of the Transportation Safety Planning Working Group.

- Identify contributing factors (e.g., failure to yield at a stop sign, excessive speed, distraction);
- Identify roadway characteristics associated with crashes, such as lane width, pavement markings, signage, etc.;
- Determine 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.);
- Determine crash risk inequities across jurisdictional boundaries by using travel data to establish crash rates; and
- Conduct road safety audits to further understand the safety needs.

This information can then be presented to stakeholders, the public, and decision-makers to shape or refine the goals, objectives, and measures in a LRTP or S/TIP. It also emphasizes problem areas to address in a standalone planning document, such as a pedestrian safety plan. Finally, presenting the information emphasizes to decision-makers the importance of collecting and analyzing data to support science-based decision-making.

Lack of access to quality data does not prevent transportation planners from conveying the importance of safety. Members of the public, stakeholders, and agencies in the multidisciplinary committee may have a working knowledge of the safety problems in a state or region. They may not be able to offer raw data, but an enforcement officer generally has a good sense of the behaviors associated with crashes in the community, or members of the public may use practical knowledge and experience to discuss difficult to navigate intersections. Planners are accustomed to working with diverse groups to help them understand an issue and develop solutions. Simply bringing people together to talk and collaborate on their safety concerns can provide a starting point for addressing safety in the planning process.

States are required by NHTSA to establish a Traffic Records Coordinating Committee (TRCC). The 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 strategies. Planners can participate in TRCC deliberations and establish relationships with the members for better access to safety data.

Data are critical for understanding a safety problem and working with stakeholders, decision-makers, and the public to identify solutions. To access and utilize the data, planners should:

- Identify a point of contact within the planning agency to work with the TRCC and other safety stakeholders groups.
- Work with a multidisciplinary committee to identify the available data in the state and the region and develop a data collection and reporting strategy.

- Collaborate with other units within the planning agency, such as GIS or data analysts, to analyze and prepare data for meetings with the public, stakeholders, and decision-makers.
- Use the data analysis to identify the top three or four emphasis areas in the state or MPO region; shape the goals and objectives in the LRTP accordingly; and identify appropriate strategies and countermeasures.

Data Analysis Techniques

Access to quality data and analysis should enhance the integration of safety in the planning process. Safety can be integrated into the planning process without complete or comprehensive data and analysis capabilities available to transportation planners as long as they collaborate with the multidisciplinary committee, the public, and decision-makers to extract practical safety information. Analysis can be simple and look at crash trends, types, and contributing factors or it can be sophisticated and utilize tools such as those included in the Highway Safety Manual (HSM), e.g., network screening methods and crash prediction models. Depending on the level of detail included in the planning documents, the HSM can be used to identify specific projects and priorities and/or its use can be adopted as a matter of policy. Data analyses help planners accomplish the following tasks:

- **Identify Systemic Safety Issues as Well as High-Risk Corridors, Road Segments, and Intersections** - By describing safety problems quantitatively, an agency knows the magnitude of the problem and can focus its efforts and rally support for areas with the greatest potential to improve safety.
- **Identify Crash Types** - Data analysis is used to discern trends in the frequency of crash types (e.g., rear-end collisions, lane departures, impaired driving, etc.) to identify possible effective safety countermeasures. Crash type data are used to identify SHSP emphasis areas and develop action plans.
- **Track Performance** - Safety data analysis allows managers to determine the extent to which the LRTP and S/TIP are achieving the stated goals and objectives.
- **Select and Prioritize Projects** - Analysis of safety data guides managers to select and implement appropriate systemic improvements to the transportation network and identify projects to improve safety at high-risk locations. It identifies high-risk groups such as younger and older road users, and impaired drivers, motorcyclists, and pedestrians. Managers use these data to select and prioritize countermeasures with the greatest potential for reducing death and injury.
- **Utilize Low-Cost Safety Improvements** - Systematic identification of safety deficiencies may assist in identifying and implementing low-cost safety improvements which spread safety funds more widely.

State agencies generally have access to analysis tools, and MPO planners should coordinate with DOT staff and ask them to provide a regional analysis or staff training on the tools. These partnerships eventually result in shared data and analysis and stronger partnerships between the DOTs and the MPO. Figure 4.3 shows an example of states sharing data and analysis tools with an MPO.

Figure 4.3 Example of States Sharing Data and Analysis Tools

The MPO for the greater Philadelphia region, the Delaware Valley Regional Planning Commission (DVRPC), uses crash data analysis tools available from the New Jersey DOT (Plan4Safety) to select safety projects and Pennsylvania DOT's Crash Data Analysis and Retrieval Tool (CDART). Plan4Safety is a comprehensive tool that includes a countermeasure generator and a predictive modeling resource. CDART allows users to query data into maps and reports.

In its simplest form, data analysis can be helpful for updating the planning goals and objectives; while more robust analysis can be used to develop performance measures and prioritize projects.

To identify current and future analysis capabilities, it is important to:

- Collaborate with the multidisciplinary committee to identify analysis tools.
- Collaborate with tool developers and current users to learn whether they can provide analysis, training, and/or staff assistance.
- Discuss and demonstrate how DOT and MPO planning agencies can mutually benefit from sharing data and analysis.
- Develop methods and protocols for sharing data and analysis tools.

6. Utilize Safety as a Decision Factor

LRTPs and S/TIPs are the two major planning documents required of the transportation planning process. Development of the state and metropolitan LRTPs depend upon the collaborative participation of relevant transportation-related agencies and organizations; open, timely, and meaningful public involvement; and technical approaches (data analysis and travel model results). These inputs establish the critical goals, strategies, and policies that guide the long-term transportation vision and the near-term transportation investment decisions. Planners prioritize programs and projects for funding in the S/TIP based on a number of unique factors, but central to this is the consideration of how well the proposed projects meet the goals laid out in the LRTP. To effectively consider safety as a key decision factor, it must be present in the LRTP as a goal and defined by supporting strategies and policies.

Establishing Safety in the LRTP

The safety goal(s), strategies, and policies established in the LRTP can be developed from a top down or bottom up approach. In a top down approach, the state or metropolitan transportation agency has the tools (e.g., data, collaborative partnerships, forecasting tools) to develop a goal and data driven strategies and policies. These serve as the overarching principles to guide the development of safety-specific strategies and policies in other, standalone modal or policy plans. In a bottom up approach, the safety strategies and policies from other planning documents, such as the Congestion Management Process (CMP), the SHSP, and Bicycle and Pedestrian Plans guide the development of the goal(s), strategies, and policies in the LRTP or are adopted as is, into the LRTP.

The SHSP update process is a data driven, collaborative effort. It brings safety, transportation, health, enforcement, and education professionals together to identify the safety problems in the state and develop creative solutions. Coordinating with SHSP stakeholders to identify the emphasis areas, strategies, and action items from the SHSP that bear relevance to future transportation system safety is a point of departure for updating the safety goals and strategies in the LRTP.

Strategies for incorporating safety into the LRTP include:

- Identify the necessary resources (e.g., data, tools) or partnerships to comprehensively develop safety as a goal with supporting strategies and policies in the LRTP.
- Use the SHSP emphasis areas as a guide when developing the safety goal, policies, and strategies for the LRTP. For example, if intersection safety is identified as a priority area in the SHSP, identify relevant strategies and policies for intersections in the LRTP.
- Adopt the relevant safety goals, policies, and strategies in standalone transportation plans, such as the Bicycle and Pedestrian Plan, into the LRTP.
- Identify specific multimodal safety strategies.
- Include a safety element of safety chapter in the Plan addressing multimodal safety (i.e., Transit Safety, Highway Safety, Bike/Pedestrian Safety, Freight Safety).

Prioritizing Safety Programs and Projects in the TIP/STIP

Prioritization is the process for evaluating and selecting individual transportation projects. The goals, strategies, and policies established in the LRTP serve as one of the filters for ranking, scoring, and selecting transportation programs and projects. Other common filters include financial assumptions and political interests. However, in general, the programs and projects that best meet the transportation goals are included and prioritized in the S/TIP. Safety should be included as an element in the scoring mechanism. Sometimes, planners believe

safety is a consideration in all transportation projects and programs; hence, they do not see the need to single out safety as a ranking factor. However, many of the standards included in engineering manuals have not been evaluated for impact on safety. Therefore, it is incorrect to assume all projects will protect or enhance safety.

Because of competing interests and limited funds, it is important to refer back to the original goals and objectives of the Plan to establish the prioritization system. For example, in Wisconsin, the goals in the State LRTP are cost-effectiveness, safety, traffic flow, economic impact, and community impact. The agency created a ranking system to prioritize transportation projects, based on how well they meet each of the established goals.

An effective prioritization process relies on the original goals and objectives in the LRTP, as well as available data. For example, in Wilmington North Carolina, the MPO scores roadway congestion projects on a 100-point system, which includes 25 points for safety. Projects receive safety points if they reduce the number and severity of crashes, reduce potential conflict points, and include bicycle/pedestrian improvements. Data are used to identify high-risk locations and monitor the project's effects over time.

DOTs have developed methods for prioritizing safety-specific projects which are regularly programmed into the STIP and are implemented with HSIP funding. Planners can collaborate with the safety engineers and HSIP managers to identify appropriate programs and projects for inclusion in LRTPs and S/TIPs.

To effectively prioritize safety in the project selection process, it is important to:

- Review the safety goal in the LRTP. Ensure the established ranking or scoring system for each transportation project reflects this goal.
- Refer to the objectives based on crash data or information from safety planning partners to understand the most pressing safety issues and weight projects based on the objectives.
- Clearly state in project solicitation forms, the goals, and objectives of the plan, as well as the ranking criteria for each element (including safety).
- Explain to the community the purpose and importance of the safety rating to ensure community buy-in.

7. Monitor and Evaluate the Effectiveness of Safety Programs and Projects

The primary purposes of system performance monitoring and evaluation are to ensure programs and projects are on track and being implemented appropriately; identify opportunities for course correction to improve performance; and provide feedback to the overall process for future improvements in the planning and programming process.

Routine system monitoring (data tracking and performance measurement) provides an agency with the information necessary to evaluate both system and project-level outcomes. The evaluation process analyzes the data and compares the results to expected outcomes. For example, to reach the established safety goal, agencies monitor crash statistics for a three- to five-year period to evaluate progress.

Evaluation requires a fairly high level of data and analysis to determine the success or failure of safety programs and projects. Planners regularly see fatality trends, which enables them to evaluate the performance measures, goals, and objectives and where appropriate, program new analysis methods and projects. Figure 4.4 provides an example of system monitoring and evaluation.

Figure 4.4 Missouri's Tracker Tool

The Missouri DOT utilizes a Tracker tool to assess how well services and products are delivered to customers. The tool tracks annual trends in fatal and disabling injuries resulting from traffic crashes on all Missouri roadways.

Performance measures monitor the effectiveness of a system by comparing program and project results to benchmarks or targets. Performance measures are the most reliable method for detecting and correcting problems, but tracking progress relies on data collection, data quality, and data management systems. Planning agencies can develop performance measures based on the available data and, at the same time, plan for improved data collection and additional future performance measures. Some MPOs, such as Hampton Roads, Virginia work directly with local police departments to collect data and develop regional crash data systems.

As noted earlier, the measures developed by NHTSA and GHSA provide a starting point for agencies with little experience in safety performance monitoring. In addition, a simple set of qualitative indicators could assess the extent to which the initially specified goals are being achieved.

The SHSP is a likely place to identify basic measures and available data. For example, the Ohio DOT monitors safety-related system performance quarterly. Regional agencies can take advantage of DOTs with the resources to produce performance monitoring information. The Southeast Michigan Council of Governments (SEMCOG), the MPO for the greater Detroit region, tracks the same performance measures and related goals detailed in the Michigan SHSP. The information is readily available, and it provides a starting point for system monitoring.

No matter how simple or sophisticated a monitoring system, the ultimate goal is to utilize the information to influence and refine the original performance measures, vision, goals, and objectives. The feedback is used in subsequent planning cycles to highlight deficiencies or successes and incorporate appropriate changes.

Effective monitoring and evaluation systems ensure critical safety programs and projects are selected, implemented, and evaluated. When monitoring, it is important to:

- Track and monitor the data or leverage existing tracking mechanisms to measure performance.
- Monitor the data, at least once a year, to analyze trends; measure project effectiveness; and modify the goals, objectives, and performance measures in planning documents.
- Work through the multidisciplinary committee. A variety of agencies may monitor operations and system performance. Considering the performance measures developed by other agencies may save time and generate additional ideas, discussion, and consensus.
- Create a comprehensive evaluation plan early in the planning process. The plan should document the desired achievements and performance measures, identify the data for monitoring progress and methods for tracking and analyzing the information, and establish a feedback mechanism for updating future plans.
- Set aside resources to support evaluation.
- Assign evaluation responsibilities to a person or agency.
- Analyze data at least annually to ensure projects and programs are on target to meet expected long-term performance. If not, determine whether changes in policies, programs, or project prioritization methods are appropriate.
- Engage the multidisciplinary committee in the evaluation process since it is a potential source for information, and the members will provide input into future goals, objectives, and projects.

Regularly (at least annually) report on program and project effectiveness to the decision-makers, stakeholders, and partner agencies.

5.0 Potential Next Steps

This document presents a prototype framework for integrating and institutionalizing an explicit consideration of safety into the traditional transportation planning process. When the framework was presented in Nevada and Denver, the feedback on the conceptual framework was useful, but also many of the participants seemed energized to return to their agencies and think about how to incorporate safety into the planning process in a more systematic way. The next phase in the research process should build on this success and conduct additional tests to improve and enhance the recommendations and suggestions included in the framework.

- Provide ongoing technical assistance to DOT and MPO transportation planners interested in developing procedures and processes for enhanced attention to safety in the planning process. The Nevada workshops demonstrated the efficacy of this approach. Locations might be chosen where safety has not been widely considered in planning to assess the level of interest in doing so and to test the framework in challenging situations.
- Host webinars to present the findings from this research and continue to vet the seven steps with DOTs and MPOs unfamiliar with the framework. Their insights would provide additional information on the feasibility of institutionalizing safety in the transportation planning process, as well as examples, techniques, strategies, and tools to enhance the clarity of each step.
- Develop new content gleaned from the webinars and host a series of regional workshops on the framework. The workshops should be highly interactive, using tabletop exercises and real planning scenarios, to illustrate methods that could be used within the agencies.
- Conduct before and after evaluations to identify and document effective strategies for changing the planning culture to increase emphasis on safety integration. This effort would use the framework developed in this research as a catalyst for bringing about change.
- Identify and develop training and education materials for relevant college and university courses to ensure the next generation of transportation planners and engineers are exposed to safety planning methods and tools during the educational experience.

A. Appendix

The appendix includes:

- A.1 Research Methodology;
- A.2 Literature Review;
- A.3 The Transportation Planning Process;
- A.4 Sources for Funding and Other Resources; and
- A.5 Materials from Nevada and Denver Workshops.

A.1 RESEARCH METHODOLOGY

The research team designed and implemented an approach for identifying tactics, techniques, and strategies for institutionalizing safety in the traditional transportation planning process and testing a proposed framework. The following describes the different research methods used to develop and refine the framework.

Literature Review

The first step reviewed the state of current practice (Appendix A.2 contains an annotated bibliography). The literature review organized the research into several relevant topics:

- Basic concepts, key characteristics, and processes associated with integrating safety into the transportation planning process;
- The extent to which DOT and MPO transportation planners address safety in the traditional planning process and documents;
- Documented attempts to integrate safety into the transportation planning process; i.e., case studies;
- Studies concerning the linkage between transportation safety planning (TSP) and other planning considerations, such as operations, the National Environmental Policy Act (NEPA), and land use;
- Practical guidance on essential safety planning activities and characteristics;
- Guidance for implementing Strategic Highway Safety Plans (SHSP);
- White papers and presentations addressing the relationship between transportation planning and programming and SHSPs; and
- Relevant literature from the international community.

Outreach

The literature review was followed by a three-tiered practitioner contact plan.

- The first tier focused on a broad set of constituencies with the goal of identifying agencies and individuals who had integrated safety as an *explicit* consideration in the transportation planning process. A web-based survey was distributed to state DOT officials, such as planning directors and state safety engineers, MPOs and regional planning agencies, and the Governors' Highway Safety Representatives (GR) or Section 402 coordinators. The research team worked with professional organizations, such as the American Association of State Highway and Transportation Officials (AASHTO), Association of MPOs (AMPO), National Association of Regional Councils (NARC), National Association of Development Organizations (NADO), and

Governors Highway Safety Association (GHSA) to develop a list of potential participants and a contact strategy to motivate responses to the survey.

- The second tier survey involved approximately 45 structured telephone interviews with practitioners identified from the Tier 1 outreach. The interviews delved deeper into some of the answers given during Tier 1. The telephone surveys lasted approximately 30 to 45 minutes and focused on more detailed questions relating to specific agencies and processes for institutionalizing safety into transportation planning processes.
- The third tier involved more detailed information collection and in-person interviews in three states (Minnesota, Oregon, and Washington) considered at the forefront of safety and planning integration. The research team sought information on strategies, tools, and techniques for institutionalizing safety concerns into transportation planning processes and linkages with SHSPs.

Expert Panel

The literature review, survey results, interview summaries, and input from the research panel were combined to produce a conceptual framework for integrating and institutionalizing safety in the planning process. An expert panel was convened for a two-day meeting to review the framework and recommend improvements. The objectives for the expert panel meeting were to:

- Review the framework;
- Address feasibility issues;
- Identify and/or create examples and case studies;
- Suggest revisions to the framework; and
- Identify research and resource needs.

Members of the expert panel were tasked with addressing each of the principles or steps in the framework according to the following questions:

- What is the current practice?
- Which of the strategies under each principle are beneficial and feasible?
- What revisions would the participants make to the framework?
- What resources are needed (e.g., political permission, funding, administrative support, time, etc.) to integrate safety into the transportation planning process?
- What additional research is needed to achieve safety integration?

Beta Test

Students in the Transportation Safety Planning (TSP) course offered by the National Highway Institute (NHI) and supported by FHWA provided an opportunity to Beta Test the framework. They served as focus groups to test the

feasibility of the principals and suggest tools, methods, and practices to supplement the framework.

Workshops

A final step in the research process involved conducting two workshops to determine the framework's efficacy in a "real world" setting.

The first series of workshops were held in Nevada with the MPOs and the DOT. The consultant team met with the Regional Transportation Commission (RTC) in Reno on January 10, 2012; the Regional Transportation Commission (RTC) in Las Vegas on January 11, 2012; and the Nevada DOT on January 13, 2012. The Carson City RTC attended the DOT workshop and a meeting also was held with the Tahoe RTC.

The second workshop was held during Transportation Research Board sponsored *Making Progress: Transportation Planners and Programmers Turn Ideas Into Reality* conference in Denver, Colorado on May 23, 2012. Thirty-six DOT and MPO transportation planners attended the workshop from a number of different states – see Table A.3 in Appendix A.5 for a complete list of attendees.

Nevada Workshops

The workshop format was a two to three-hour informal guided discussion. It began with a brief presentation on the research findings and framework development process. This was followed by a conversation with the participants on each step of the framework to determine the extent to which the entity already performs the step, as well as opportunities for enhancing their approaches to accomplishing the objective.

The matrix in Table A.2 shows the findings and results from the workshops. In summary, the workshops served to raise safety issues, offer technical assistance, and point out how an explicit consideration of safety could be achieved in the transportation planning process.

Denver Workshop

The workshop was three and a half hours and was designed to provide participants with background information on transportation safety and introduce them to the seven principles for incorporating safety in the transportation planning process. The end goal was to have participants fill in a matrix with transportation safety actions they could implement at their own agencies. The agenda and presentation from the workshop can be found in Appendix A.5, Table A.4 and Figure A.2. The matrix, also found in Appendix A.5, Table A.5, shows the key findings and results from breakout group discussions. The purpose of the discussion was to:

Share opportunities and best practices. The participants were asked to share information about how they are applying one or more of the seven principles in their agencies.

Discuss challenges. Participants may not include safety throughout the transportation planning process because of barriers along the way. The participants were asked to discuss their challenges, and brainstorm ideas for overcoming them and moving closer to institutionalizing safety in the transportation planning process.

The agencies attending all of the workshops appeared to be addressing safety at the project level; however, consideration of safety in the planning process and documents can be enhanced in all the areas. In several cases, the planning agencies stated that the workshop provided a useful foundation for considering safety more explicitly in their transportation planning process.

A.2 LITERATURE REVIEW

Title	Notes
AAA and Cambridge Systematics (2008). <i>Crashes vs. Congestion – What’s the Cost to Society?</i>	The AAA study compared the costs of safety to the costs of congestion by calculating a per-person cost for safety and multiplying by the population figures in the same 85 urban areas used by the Texas Transportation Institute in the annual Urban Mobility Report.
American Association of State Highway and Transportation Officials (1998). <i>AASHTO Strategic Highway Safety Plan</i> . Washington, D.C., http://www.transportation.safety.org .	The AASHTO plan follows a well-defined planning and implementation process. Its publication was followed by a major NCHRP project (17-18), to develop a series of countermeasure guidebooks and an integrated management process.
Anderson, Rosemarie; Hacker, Joseph (2006). <i>Planning For Safety In The Philadelphia Region. ITE 2006 Technical Conference and Exhibit Compendium of Technical Papers</i> . Institute of Transportation Engineers.	This paper addresses the steps the Delaware Valley Regional Planning Commission, a bi-state Metropolitan Planning Organization for the Greater Philadelphia, Camden, Trenton area, has initiated to integrate safety into the planning process and the first phases in the creation of a Regional Safety Action Plan.
AECOM Consulting Transportation Group; Federal Highway Administration; Federal Transit Administration (2002). <i>Considering Safety in the Transportation Planning Process</i> .	The focus of this report is on incorporating safety into the transportation planning process for the multimodal transportation system and on providing planners with information and techniques to better understand the role of safety within this process.
Australian Transport Council (2008). <i>National Road Safety Action Plan 2009 and 2010</i> . http://www.atcouncil.gov.au/documents/pubs/ATC_actionplan0910.pdf .	This Action Plan identifies the main issues expected to affect road-trauma levels in the foreseeable future and sets out the priority areas for action in 2009 and 2010. This Action Plan was developed jointly by all Australian jurisdictions, with input from the National Road Safety Strategy Panel, which represents a broad range of organizations involved in road safety.
Bax, C. (2005). <i>Cooperation and Organization in Decision Making: A More Decisive Road Safety Policy? Results from a Multiple Case Study in the Netherlands</i> . <i>Canadian Journal of Administrative Sciences</i> , 22:1.	The article discusses how the decision-making process should be organized so that the interests and the negotiations contribute to a good “decisive” road safety policy.
Baxter, John (2006). <i>Strategic Highway Safety Plans: Lessons Learned and Next Steps. ITE 2006 Technical Conference and Exhibit Compendium of Technical Papers</i> . Institute of Transportation Engineers.	Many common elements of successful SHSP implementation are discussed in this paper, including key foundational aspects of effective programs.
Berkovitz, A. (2001). <i>The Marriage of Safety and Land-Use Planning: A Fresh Look at Local Roadways</i> . Public Roads, FHWA, Washington, D.C. http://www.tfhr.gov/pubrds/septoct01/marriage.htm .	The article presents information on safety, roadway, and community design, and relationships. It argues land use and community design strategies hold promise for improving safety.
Bowman, B.L., and Vecellio, R.L. (1994). <i>Effect of Urban and Suburban Median Types on Both Vehicular and Pedestrian Safety</i> . Transportation Research Record 1445, Washington, D.C.: National Academy Press.	The study includes the analysis of 32,894 vehicular and 1,012 pedestrian accidents occurring in three cities on arterials with three different median types.

Title	Notes
Bruff, J Thomas (2006). <i>Safety and the Planning Process: The Southeast Michigan Experience</i> . Institute of Transportation Engineers 2006 Technical Conference and Exhibit Compendium of Technical Papers.	This paper describes the Southeast Michigan Council of Government's (SEMCOG) experience of integrating safety into the transportation planning process.
Campbell, S., D. Leach, K. Valentive, M. Coogan, M. Meyer, and C. Casgar (2005). <i>From Handshake to Compact: Guidance to Foster Collaborative, Multimodal Decision Making</i> . TCRP Report 105, Washington, D.C.: National Academy Press.	The report provides examples of collaboration in multimodal decision-making. The report is designed to provide practical advice to transportation professionals interested in identifying, implementing, and sustaining collaborative activities.
Chatterjee, Arun (2006). <i>Safety Conscious Planning for Small and Medium Size Urban Areas</i> . 10 th National Conference on Transportation Planning for Small and Medium Sized Communities. TRB, Washington, D.C.	This paper presents a practical and comprehensive framework for proactive safety planning by MPOs in small and medium size communities. The paper examines each step of the long-range planning process, and identifies for each step how planners can integrate safety-related activities.
Chatterjee, A., Wegman, F.J. Fortey, N.J. and Everett, J.D. (2000). <i>Incorporating Safety and Security Issues in Urban Planning</i> . Center for Transportation Research, The University of Tennessee.	This report contains information on a sample of MPO efforts to incorporate safety into the planning process.
Cheung, Carl; Shalaby, Amer S; Persaud, Bhagwant N; Hedayeghi, Alireza (2008). <i>Models for Safety Analysis of Road Surface Transit</i> . Transportation Research Record: Journal of the Transportation Research Board, Issue Number: 2063.	This study explores the development of zonal- and arterial-level collision prediction models that incorporate characteristics applicable to urban transit planning. These models can be used as a tool to predict future levels of transit involved collisions for existing and new transportation networks or arterial routes.
Depue, L. (2003). <i>Safety Management Systems: A Synthesis of Highway Practice</i> . NCHRP Synthesis 322, TRB, Washington, D.C. http://www.trb.org/trb/onlinepubs.nsf .	The synthesis reports on the state-of-the-practice of highway safety management systems, a systematic process designed to assist decision-makers in selecting effective strategies to improve the efficiency and safety of the transportation system.
Federal Highway Administration (2004). <i>Traffic Congestion and Reliability: Linking Solutions to Problems</i> . FHWA, Washington, D.C.	This report is designed to provide a snapshot of congestion in the United States by summarizing recent trends in congestion, highlighting the role of unreliable travel times in the effects of congestion, and describing efforts to curb congestion.
Federal Highway Administration (2005). <i>Safety Conscious Planning Peer Exchange</i> . http://www.planning.dot.gov/peer.asp#ss .	The peer exchange addressed Challenges and Opportunities; Data Collection, Management, and Analysis; Integrating Safety into the Planning Process; Safety Initiatives; Implementation Strategies; and Safety Perspectives.
Federal Highway Administration (2006). <i>Strategic Highway Safety Plans: A Champion's Guide to Saving Lives</i> . FHWA, Washington, D.C.	This document promotes best practices and serve as guidance to state DOTs and their safety partners for the development and implementation of the state SHSP; assists state DOTs in creating an SHSP that meets the requirements of SAFETEA-LU, and assists states in understanding the relationship between the SHSP and existing transportation planning and programming processes.
Federal Highway Administration (2002) "National Review of the Highway Safety Improvement Program." http://www.tfhr.gov/pubrds/02mar/04.htm .	This review found numerous noteworthy activities related to the HSIP and safety in general. The review notes that each state has tailored its program to its unique needs and effective safety programs must take into account existing strengths and weaknesses.

Title	Notes
Federal Highway Administration (2007). <i>Transportation Planners Safety Desk Reference</i> . Washington, D.C.: U.S. Department of Transportation.	This reference document describes an overview of transportation safety, the potential roles that transportation planners can play to advance it, a framework for incorporating safety into the transportation planning process, available sources that may be accessed to fund safety programs, and a menu of possible safety strategies.
Federal Highway Administration (2008). <i>Making the Case for Transportation Safety – Ideas for Decision Makers</i> . http://tsp.trb.org/assets/Briefingpercent20Bookpercent20hi-res.pdf .	This report includes case studies of transportation safety practices throughout the United States involving stakeholders at all levels of transportation safety. The report also examines the potential value of integrating safety into the transportation planning process and lists transportation safety resources.
Federal Highway Administration. <i>Strategic Highway Safety Plans (SHSP) Implementation Process Model (IPM) and Pilot</i> . (in draft)	To assist states with the task of implementing SHSPs across the nation, this study researched noteworthy practices and incorporated them into an SHSP Implementation Process Model (IPM). The IPM is an implementation guide primarily based on research and the experiences of several “model” states as well as the knowledge and experiences of subject experts.
Federal Highway Administration. <i>Highway Safety Improvement Program (HSIP) User’s Manual and Workshop Update</i> . (under development)	FHWA updated the Highway Safety Improvement Program (HSIP) manual and workshop according to the requirements in SAFETEA-LU.
Federal Highway Administration and Federal Transit Administration (2007). <i>The Transportation Planning Process Key Issues: A Briefing Book for Transportation Decision Makers, Officials, and Staff. Transportation Planning Capacity Building Program</i> . FHWA, Washington, D.C. http://www.planning.dot.gov/documents/briefingbook/bbook_07.pdf .	The publication provides an overview of transportation planning and contains a summary of key concepts in statewide and metropolitan transportation planning, along with references for additional information.
Federal Transit Administration (2002). <i>Handbook for Transit Safety and Security Certification</i> . FHWA, Washington, D.C. http://transit-safety.volpe.dot.gov/Publications/order/singledoc.asp?docid=21 .	The Handbook provides a guide for establishing a certification program to address safety and security. It identifies the key activities, incorporates safety and security more fully into transit projects, highlights resources necessary to develop and implement a certification program for safety and security, and provides tools and sample forms to promote implementation.
Federal Transit Administration. <i>Transit at the Table: A Guide to Participation in Metropolitan Decision Making</i> . Washington, D.C.: U.S. Department of Transportation. http://www.planning.dot.gov/Documents/tat.htm .	This report presents the observations, perspectives, and recommendations of a cross-section of transit agencies from large metropolitan areas on how to secure strategic positions in the metropolitan planning process. The report can be used as a guide to how to use strategic positions to win policy and program support for priority transit services.
Gaines, Danena Lewis; Meyer, Michael D. (2008). <i>Safety Conscious Planning in Midsized Metropolitan Areas: Technical and Institutional Challenges</i> . Transportation Research Board: Washington, D.C.	Midsized MPOs were surveyed for this study and three case studies of midsized metropolitan areas were prepared to understand better the technical and institutional challenges and opportunities facing safety conscious planning.
Goins, Kimberly (2009). <i>What Planners Should Understand about Rail System Safety</i> . Transportation Safety Planning Working Group, June 2009 Newsletter.	This article discusses safety regulations and stakeholders that govern rail transit agencies, minimum safety and security requirements the state must enforce, and implications for transportation planners.

Title	Notes
Goldman, Lois M; Herbel, Susan B; Suhrbier, John H; Davies, Gary; Papayannoulis, Vassillos (2006). <i>Safety Conscious Planning in Practice: Development of Regional Safety Planning and Policy Priorities</i> . Transportation Research Record: Journal of the Transportation Research Board No. 1969.	This study incorporates principles of safety conscious planning, including data analysis, interdisciplinary professional perspectives, and public input.
Governors Highway Safety Association (2005). <i>Countermeasures That Work</i> . http://www.ghsa.org/html/publications/pdf/GHSA_Countermeasures.pdf .	This guide is a basic reference to assist State Highway Safety Offices (SHSO) in selecting effective, science-based traffic safety countermeasures for major highway safety problem areas. The guide describes major strategies and countermeasures relevant to SHSOs; summarizes their use, effectiveness, costs, and implementation time; and provides references to the most important research summaries and individual studies.
Hadayeghi, Alireza; Shalaby, Amer S; Persaud, Bhagwant N. (2007). <i>Safety Prediction Models: Proactive Tool for Safety Evaluation in Urban Transportation Planning Applications</i> . Transportation Research Record: Journal of the Transportation Research Board No. 2019, Washington, D.C.	The objective of this research study was to develop a series of zonal-level collision prediction models consistent with conventional models commonly used for urban transportation planning.
Hampton Roads Planning District Commission (2004). <i>Hampton Roads Regional Safety Study, Part 3 – Crash Analysis and Countermeasures</i> . Chesapeake, Virginia.	This regional safety study identifies and analyzes the top 10 regional interstate high-crash locations by estimated property damage only (EPDO) crash rate in detail, including location maps, roadway geometry diagrams, collision diagrams, crash data summaries, and proposed countermeasures. The study also identifies, analyzes, and prioritizes the top intersections by EPDO crash rate and by number of crashes in each jurisdiction.
Harkey, D., R. Srinivasan, C. Zegeer, B. Persaud, C. Lyon, K. Eccles, F. Council, and H. McGee (November 2005). <i>Crash Reduction Factors for Traffic Engineering and Intelligent Transportation System (ITS) Improvements: State-of-Knowledge Report</i> . Research Results Digest 299, NCHRP Project 17-25 (interim deliverable), Transportation Research Board of the National Academies.	This digest summarizes the current status of crash reduction factors for a variety of treatments, provides a summary of the “best available” crash reduction factors, and discusses the relationship between this study and other ongoing research studies either documenting or developing additional factors.
Hauer, E. (2002). <i>Observational Before-After Studies in Road Safety</i> . New York: Pergamon Press Inc.	This three part monograph aims to enable road safety researchers and professionals to interpret correctly the results of one of the main sources of knowledge about the effect of road safety engineering measures, the “observational before-after study.”
Herbel, S.B. (2001). <i>Safety Conscious Planning. Transportation Research E-Circular</i> , Number E-C025, Transportation Research Board: Washington, D.C. http://nationalacademies.org/trb/publications/circulars/ec025.pdf .	This circular considers the goal relating to safety: Promote the public health and safety by working toward the elimination of transportation-related deaths, injuries, and property damage. Following a general discussion of safety planning, attention is focused on a safety workshop convened in 2000.

Title	Notes
Herbel, S.B. (2002-2007). <i>Supporting the Establishment of Safe Transportation Networks. Part I: Safety conscious planning Forums; Part II: Facilitator's Toolkit</i> . Transportation Research Circular E-C041, Transportation Research Board: Washington, D.C.	This circular is the outgrowth of a presentation to the Committee on Transportation Safety Management during the 1999 Transportation Research Board Annual Meeting. The circular reports on the process and outcomes from those forums in Part I. The forums suggested this type of activity produced useful outcomes and benefits for the states. Part II is a toolkit for use by states to organize and conduct safety conscious planning forums statewide or within regions/districts of a state.
Herbel, S.B. (2005). <i>Massachusetts Safety Conscious Planning Forum</i> . Boston, Massachusetts, (unpublished conference proceedings).	This collection of papers summarizes discussions and findings from the safety conscious planning forum held in Boston, Massachusetts in 2005.
Herbel, S.B. (2005). <i>Integrating Safety into Transportation Planning</i> . (unpublished New York Forum proceedings). Poughkeepsie, New York.	The forum provided an opportunity for transportation planners from New York State to learn how they can contribute to improved safety outcomes by integrating a safety perspective into their transportation plans.
Herbel, S.B. (2005). <i>Safety Conscious Planning in Small and Medium-Sized MPOs and Rural Planning Agencies: Results of a Domestic Scan</i> . Journal of Safety Research – Traffic Records Forum proceedings, Volume 36, No. 5; 473-475.	A strategy for implementing the safety planning factor focuses on starting a dialogue among engineers, transportation planners, the highway safety offices, law enforcement, motor carrier safety professionals, and other safety stakeholders in forums and other venues. The Iowa and New Mexico DOTs are identified by scan, as agencies aimed at removing barriers and providing technical and financial assistance and expertise to metropolitan planning organizations (MPO) and rural agencies.
Herbel, S.B. (2006). <i>Strategic Highway Safety Plans: A Peer Exchange</i> . (Unpublished report). National Cooperative Highway Research Program, Washington, D.C.	This report reviews lessons learned from previous SHSP implementation efforts through peer exchanges.
Herbel, S.B. and Meyer, M. (2007). <i>Institutional Needs in Safety Planning</i> (NCHRP 8-36B, Task 57). National Cooperative Highway Research Program, Washington, D.C.	This webinar addresses challenges in addressing transportation safety by detailing the organizational structures and collaboration strategies that promote safety integration in the planning process.
Hoffman, K. and K. Epstein (March 2003). <i>Safety in Planning: New Developments at the Federal and State Levels</i> . 2003 Technical Conference and Exhibit, Institute of Transportation Engineers, Fort Lauderdale, Florida.	This paper describes early efforts to organize the Federal safety conscious planning initiative, its accomplishments over the past two years, the results of the first national leadership conference, a national action plan for SCP, and next steps.
Johnston, I. (2005). <i>Halving Deaths from Road Traffic Crashes: A Case Study from Victoria, Australia 1989-2004</i> . AustRoads, Monash University Accident Research Centre, FHWA, Washington, D.C.	This report grew out of a U.S. DOT report on an international scan, "Transportation Performance Measures in Australia, Canada, Japan, and New Zealand." The report goes beyond the public data and draws on interviews, as well as firsthand knowledge of how traffic safety strategies were implemented in Victoria, Australia.
Kononov, Jake; Allery, Bryan K; Znamenacek, Zane (2007). <i>Safety Planning Study of Urban Freeways: Proposed Methodology and Review of Case History</i> . Transportation Research Record: Journal of the Transportation Research Board No. 2019, Washington, D.C.	This study introduces a two phase process used to evaluate the safety impacts of multiple design alternatives. The evaluation process is based on the available safety performance functions calibrated specifically for urban freeways in concert with diagnostic investigations, pattern recognition analysis, and detailed accident diagramming. The critical importance of accident diagramming is discussed in reference to examining safety history at complex interchange locations.

Title	Notes
Korve, H., et al. (2001). <i>Light Rail Service: Pedestrian and Vehicular Safety</i> . Transit Cooperative Research Program Report 69, Washington, D.C.: National Academy Press.	This study documents and presents the results of a study to improve the safety of light rail in semi-exclusive rights-of-way where light rail vehicles operate at speeds greater than 35 mph through crossings with streets and pedestrian pathways. This report also presents the results of field tests conducted to improve the safety of higher speed light rail systems through grade crossing design.
Knezek, C., J. Orth, and A. Maher (2005). <i>New Jersey Congestion, Security, and Safety Initiative</i> . FHWA Report 2005-01, Washington, D.C.	The purpose of this project was to examine the relationship between effective national transportation congestion, security, and safety technology transfer applications, compare national trends and the conditions found in New Jersey, and implement the most appropriate solutions.
Levine, N. (2006). <i>The Houston Metropolitan Traffic Safety Planning Program</i> . Transportation Research Record, Transportation Research Board, Washington, D.C.: National Academy Press, March.	This report documents the metropolitan traffic safety planning program of the Houston-Galveston Area Council in Texas which monitors safety in the eight county region, identifies hazardous locations, and supports other safety efforts.
Meyer, M. (2005). <i>Linking Safety Conscious Planning and Context-Sensitive Solutions</i> . ITE Journal, 75:8, Washington, D.C.	This article examines Safety Conscious Planning and Context Sensitive Solutions from the perspective of basic concepts and principles, and identifies issues that have served as focal points for disagreements in the past between those interested in promoting the community context and those advocating safety.
Meyer, M. (2006). <i>Implementing the Strategic Highway Safety Plan: A White Paper</i> . Institute of Transportation Engineers 2006 Technical Conference and Exhibit, San Antonio, Texas, March 2006.	The primary purpose of this white paper, which was based on the FHWA guidance document Strategic Highway Safety Plans: A Champion's Guide to Saving Lives, was to identify key characteristics of the safety planning process that would result in an effective plan.
National Cooperative Highway Research Program (2004). NCHRP Report 501: <i>Integrated Safety Management Process</i> . NCHRP, Washington, D.C. NHTSA (2004). Traffic Facts 2004 – Overview. http://www.nhtsa.dot.gov .	This report presents the findings of a research project to develop an integrated safety management process. The process is a tool to assist in integrating safety-related implementation actions by proposing a method for bringing together agencies responsible for highway safety within a jurisdiction.
National Cooperative Highway Research Program (2004-2006). NCHRP Report 500: <i>Guidance for Implementation of the AASHTO Strategic Highway Safety Plan</i> . NCHRP, Washington, D.C.	This series of guidebooks provides guidance for implementation of AASHTO's Strategic Highway Safety Plan. The plan includes strategies in 22 key emphasis areas that affect highway safety and an outline of needs for implementing each strategy.
National Cooperative Highway Research Program (2007). NCHRP Report 591: <i>Factors that Support the Planning-Programming Linkage</i> . NCHRP, Washington, D.C.	This report explores the factors that influence the connection between planning and programming, and examines the steps that transportation agencies may take to strengthen the linkage between planning and programming.
National Highway Traffic Safety Administration (2008). <i>Traffic Safety Performance Measures for States and Federal Agencies</i> . Washington, D.C.: U.S. Department of Transportation.	This report provides a minimum set of performance measures to be used by states and Federal agencies in the development and implementation of behavioral highway safety plans and programs.
National Transportation Library (2005). <i>Intermodal Surface Transportation Efficiency Act of 1991 – Summary</i> . Bureau of Transportation Statistics: Washington, D.C. http://ntl.bts.gov/DOCS/ste.html .	This document provides a summary of the Intermodal Surface Transportation Efficiency Act of 1991.

Title	Notes
Petzold, R. (2003). <i>Proactive Approach to Safety Planning</i> . Public Roads, Washington, D.C., 66:6.	The article provides a comprehensive introductory overview of safety conscious planning as both a concept and an initiative.
Ravanbakht, Camelia; Belfield, Samuel S; Nichols, Keith M. (2005). <i>Integrating Safety into the Transportation Planning Process: Case Study in Hampton Roads, Virginia</i> . Transportation Research Record: Journal of the Transportation Research Board, Issue Number: 1922.	This regional safety study was designed to help local communities understand safety-related problems and issues. The study analyzes and recommends a series of safety-related countermeasures and solutions for the top 10 high-crash locations throughout the region.
Roberts, Kelvin. (2001) <i>Safety Conscious Planning: The Development of the Safer Transportation Network Planning Process</i> . Institute of Transportation Engineers, Washington, D.C. http://www.ite.org .	This document addresses considerations and activities relating to the safety conscious planning (SCP) category.
Roden, D. J. Binder, and A. Nwankwo (2003). <i>Incorporating Safety into the Transportation Planning Process: Bests Practices in Data Investments and Coordination Efforts</i> , NCHRP 8-36. Task 18 Prepared for AASHTO Standing Committee on Planning, Washington, D.C.	This report contains a review of the 2003 Safety Conscious Planning Leadership Conference and case studies focused on accident information systems, safety performance measures, and collaborative safety planning efforts.
Southeast Michigan Council of Governments (SEMCOG). (2004). <i>2030 Regional Transportation Plan for Southeast Michigan</i> . Detroit, Michigan.	This regional transportation plan serves as a guide for developing a transportation system that is accessible, safe, and reliable and contributes to a higher quality of life for the region's citizens.
Tarko, Andrew P. (2006). <i>Calibration of Safety Prediction Models for Planning Transportation Networks</i> . Transportation Research Record: Journal of the Transportation Research Board, Issue Number: 1950.	One of the major concerns in predicting crashes in transportation networks is the applicability and accuracy of crash prediction models. This paper presents two alternative formulations of the calibration problem consistent with the maximum likelihood approach.
Tarko, Andrew P; Iqbal, Muhammad Asif; Inerowicz, Mike; Liang, Hong; Panicker, Gopal. (May 2007). <i>Safety Conscious Planning in Indiana: Predicting Safety Benefits in Corridor Studies</i> , Volume 1 Research Report. Purdue University; FHWA.	This project is meant to enhance the available tools for predicting crash frequencies on future road networks to improve the quality of safety consideration in intermediate and long-term road planning in Indiana. This is the first volume of a two volume report.
Tarko, Andrew P; Inerowicz, Mike; Liang, Hong. (May 2007). <i>Safety Conscious Planning in Indiana: Predicting Safety Benefits in Corridor Studies</i> , Volumes 2 Pass and Inpass User Manual. http://rebar.ecn.purdue.edu/JTRP_Completed_Project_Documents/SPR_2875/FinalReport/spr_2875_final/2875-2_Final.pdf .	This project is meant to enhance the available tools for predicting crash frequencies in future road networks to improve the quality of safety consideration in intermediate and long-term road planning in Indiana. This is the second volume of a two volume report.
Transportation Research Board (2008). <i>Highway Safety: Planning; Young Drivers; Older Drivers; Indian Nations; Roundabouts; Traffic Law Enforcement; and Trucks and Buses</i> . Transportation Research Record: Journal of the Transportation Research Board No. 2078.	This collection consists of 18 papers focused on highway safety research. Specific topics include safety conscious planning in midsized metropolitan areas; safety and accessibility effects of pay-as-you-drive strategies; driver injury severity causes in single vehicle deer crashes; road hazards detection by novice teen and experienced drivers; effect of passenger age and gender on fatal crash risks of young drivers; actual and perceived behavior of older drivers on freeways; and older driver behavior related to fatal crashes.

Title	Notes
Transportation Research Board (2006). <i>The Metropolitan Planning Organization, Present and Future</i> . Conference Proceedings 39, August 2006.	This report contains the proceedings of an August 2006 conference that explored the organizational structure of MPOs, the current state of the practice for regional decision-making among MPOs of various sizes, and approaches to integrating a wide array of additional considerations into the MPO planning process.
Transportation Research Board (2004). <i>Safety Conscious Planning Leadership Conference: Presentation Materials and Highlights</i> , August 30-September 1, 2004. Washington, D.C.	This contains the proceedings of the 2004 Safety Conscious Planning Leadership Conference. The Leadership Conferences are designed to bring planning and safety professionals together who have exhibited leadership in addressing safety as a planning factor.
Turnbull, Katherine F. (2008). <i>Key Issues in Transportation Programming: Summary of a Conference</i> . November 2006, Seattle, Washington. Transportation Research Board Conference Proceedings Issue Number: 43.	This paper summarizes the Key Issues in Transportation Programming Conference, which highlighted successful approaches to multimodal programming and its links to planning and performance measures to support the core objectives of SAFETEA-LU and the general objective of effective use of transportation funds.
Washington, S., M. Meyer, Ivan Schalkwyk, E. Dumbaugh, S. Mitra, and M. Zoll. (2006). <i>Incorporating Safety into Long-Range Transportation Planning</i> . NCHRP Report 546. Washington, D.C.: Transportation Research Board.	This report describes the transportation planning process and discusses where and how safety can be effectively addressed and integrated into long-range planning at the state and metropolitan levels.
Williams, Allan F., and Haworth, Narelle. (2007). <i>Overcoming Barriers to Creating a Well-Functioning Safety Culture: A Comparison of Australia and the United States</i> . AAA Foundation for Traffic Safety. http://www.aaafoundation.org/pdf/WilliamsHaworth.pdf .	In this publication, the authors compare the experiences of Australia and the United State to assess how a better functioning traffic safety culture may be achieved.

A.3 THE TRANSPORTATION PLANNING PROCESS

Transportation planning plays a fundamental role in the state, region, or community's vision for its future. It includes a comprehensive consideration of possible strategies; an evaluation process that encompasses diverse viewpoints; the collaborative participation of relevant transportation-related agencies and organizations; and open, timely, and meaningful public involvement.¹⁰

Transportation planning is a cooperative process designed to foster involvement by all users of the system, such as the business community, community groups, environmental organizations, the traveling public, freight operators, and the general public, through a proactive public participation process conducted by the metropolitan planning organization (MPO), state department of transportation (DOT), and transit operators. Figure A.1 illustrates the transportation planning process.

Transportation Planning Steps

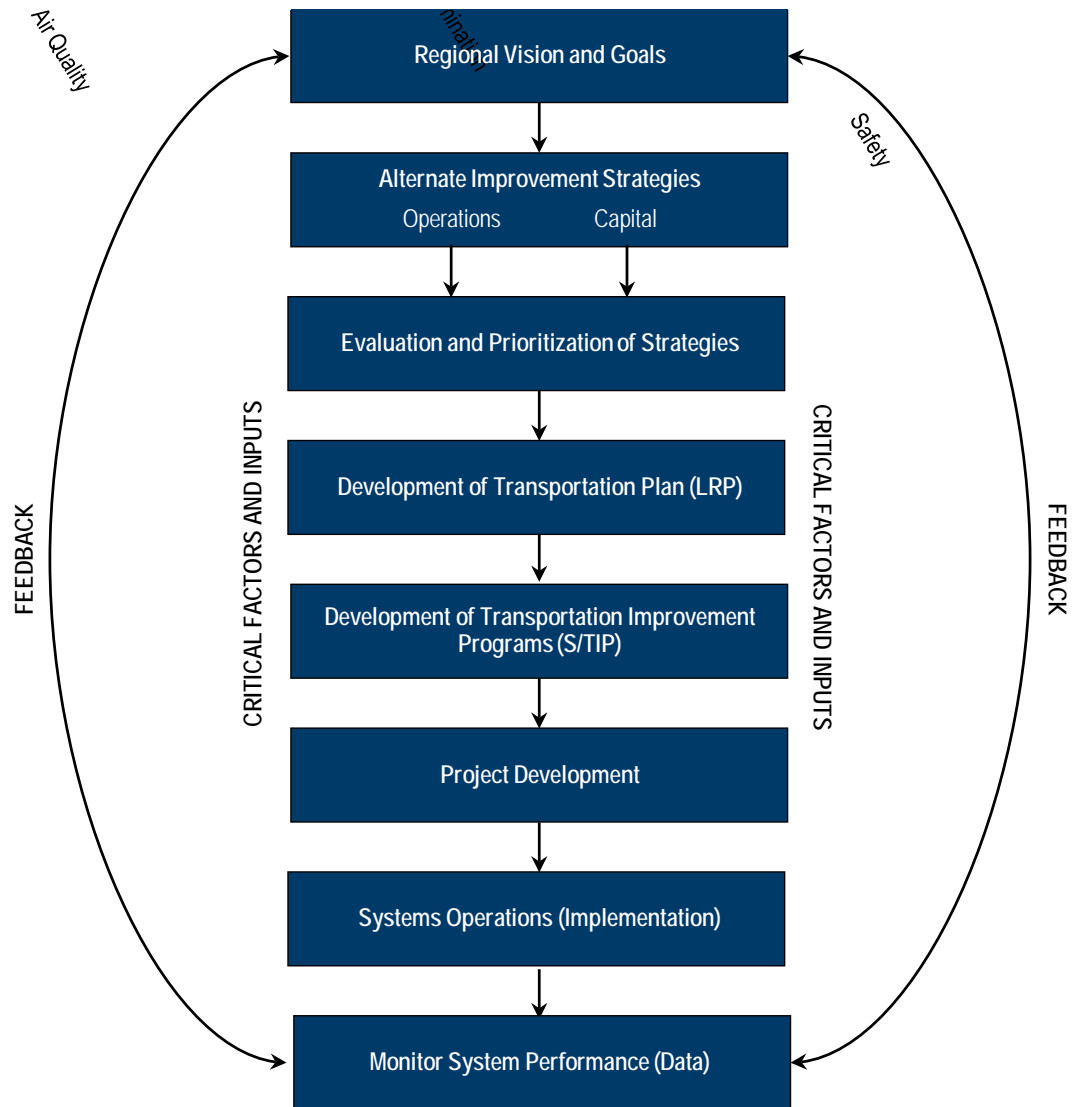
Steps in transportation planning include:

- Monitoring existing conditions;
- Forecasting future population and employment growth, including assessing projected land uses in the region and identifying major growth corridors;
- Identifying current and projected future transportation problems and needs and analyzing, through detailed planning studies, various transportation improvement strategies to address those needs;
- Developing long-range plans and short range programs of alternative capital improvement and operational strategies for moving people and goods;
- Estimating the impact of recommended future improvements to the transportation system on environmental features, including air quality; and
- Developing a financial plan for securing sufficient revenues to cover the costs of implementing strategies.

The steps are illustrated in Figure A.1.

¹⁰The information in Appendix A.2 is adapted from *The Transportation Planning Process: Key Issues. A Briefing Book for Transportation Decision Makers, Officials, and Staff*. FHWA and FTA published the document in 2007.

Figure A.1 The Transportation Planning Process (FHWA)



Key Documents

The transportation planning process produces five key documents as illustrated in Figure A.2.

Table A.1 Key Transportation Planning Products

	Who Develops?	Who Approves?	Time Horizon	Content	Update Requirements
UPWP	MPO	MPO	1 or 2 Years	Planning Studies and Tasks	Annually
MTP	MPO	MPO	20 Years	Future Goals, Strategies, and Projects	Every 5 Years (4 Years for Nonattainment and Maintenance Areas)
TIP	MPO	MPO/Governor	4 Years	Transportation Investments	Every 4 Years
LRSTP	State DOT	State DOT	20 Years	Future Goals, Strategies, and Projects	Not Specified
STIP	State DOT	U.S. DOT	4 Years	Transportation Investments	Every 4 Years

The Unified Planning Work Program (UPWP): The UPWP lists the transportation studies and tasks to be performed by the MPO staff or a member agency. Because the UPWP reflects local issues and strategic priorities, the contents of UPWPs differ from one metropolitan area to another. The UPWP covers a one to two-year period. It typically contains the following elements:

- The planning tasks (e.g., data collection and analysis, public outreach, and preparation of the plan and TIP), the supporting studies, and the products resulting from these activities;
- All Federally funded studies and all relevant state and local planning activities conducted without Federal funds;
- Funding sources identified for each project;
- A schedule of activities; and
- The agency responsible for each task or study.

The Metropolitan Transportation Plan (MTP) or Long-Range Transportation Plan (LRTP): In metropolitan areas, the transportation plan states a regions plans for investing in the transportation system. Examples of typical plan components include:

- Future policies, strategies, and projects;
- A systems-level approach by considering roadways, transit, nonmotorized transportation, and intermodal connections;
- Projected demand for transportation services over 20 years;
- Regional land use, development, housing, and employment goals and plans;

- Cost estimates and reasonably available financial sources for operation, maintenance, and capital investments; and
- Ways to preserve existing roads and facilities and make efficient use of the existing system.

The Metropolitan Transportation Plan (MTP) and the long-range statewide transportation plan must be consistent. The MTP must be updated every five years in air quality attainment areas or every four years in nonattainment or maintenance areas.

Transportation Improvement Program (TIP): In the TIP, the MPO identifies the transportation projects and strategies from the MTP it plans to undertake over the next four years. All projects receiving Federal funding must be in the TIP. The TIP is the region's way of allocating limited transportation resources among the various capital and operating needs of the area, based on a clear set of short-term transportation priorities. Under Federal law, the TIP:

- Covers a minimum four-year period of investment;
- Is updated at least every four years;
- Is based on available funding (fiscal constraint);
- Conforms with the State Implementation Plan (SIP) for air quality in nonattainment and maintenance areas;
- Is approved by the MPO and the governor; and
- Is incorporated directly, without change, into the Statewide Transportation Improvement Program (STIP).

The State Planning and Research (SPR) Program is similar to the UPWP because it lists the transportation studies, research, and tasks to be performed by the state DOT. The SPR Program contains several elements:

- The planning tasks, studies, and research activities to be conducted over a one to two-year period;
- Funding sources for each project;
- A schedule of activities; and
- The agency responsible for each task or study.

The Long-Range Statewide Transportation Plan: State DOTs must develop a long-range statewide transportation plan. These vary from state to state, and they may be policy-oriented or may include a list of specific projects. The statewide plan also addresses:

- Policies and strategies or future projects;
- Projected demand for transportation services over 20 or more years;

- A systems-level approach by considering roadways, transit, nonmotorized transportation, and intermodal connections;
- Statewide and regional land use, development, housing, natural environmental resources, and employment goals and plans;
- Cost estimates and reasonably available financial sources for operation, maintenance, and capital investments; and
- Ways to preserve existing roads and facilities and make efficient use of the existing system.

Statewide Transportation Improvement Program (STIP): The STIP is similar to the TIP because it identifies statewide priorities for transportation projects and must be fiscally constrained. Through an established process, the state DOT solicits or identifies projects from rural, small urban, and urbanized areas of the state. Projects are selected for inclusion in the STIP based on adopted procedures and criteria. TIPs developed by MPOs must be incorporated, without change, into the STIP. It must be approved by FHWA and FTA, along with an overall determination that planning requirements are being met. STIP approval must be granted before projects can proceed from the planning stage to the implementation stage.

For more information on the transportation planning process see:

- FHWA and FTA. (2007). *The Transportation Planning Process: Key Issues A Briefing Book for Transportation Decision Makers, Officials, and Staff* at <http://www.planning.dot.gov/documents/briefingbook/bbook.htm#2BBa>.
- Litman, T. (2011). *Introduction to Multimodal Transportation Planning: Principles and Practices* at http://www.vtpi.org/multimodal_planning.pdf.

A.4 SOURCES FOR FUNDING AND OTHER RESOURCES

Safety competes with a variety of other important transportation programs, including maintenance, congestion, construction, and the environment; however, funding from all sources can be leveraged to support safety priorities and programs. To understand how safety projects are funded requires a basic understanding of surface transportation funding. Many additional funding sources may be available to individual states and MPOs. Furthermore, the funding sources change frequently; therefore, a full listing of all resources is beyond the scope of this framework.

Federal Transportation Funding Structure and Resources

Surface transportation improvements are financed from a variety of user fees, general taxes, special purpose taxes, and private charges. Funds for highway and transit improvements come from all levels of government and the private sector. Freight and rail improvements are financed largely from charges to customers although some public-private partnerships (PPP) have been established. Within each mode, differences exist in how individual projects are financed depending on characteristics of the projects and the construction location.

The Federal, state, and local governments play significant roles in financing the Nation's highway system. The Federal government established the Highway Trust Fund (HTF) in 1956 to guarantee revenue for constructing the Interstate Highway System and other Federal aid highways. Fuel taxes represent about 90 percent of total revenues to the Federal HTF. Federal fuel tax rates have remained unchanged since 1993; however, the real Federal gasoline tax rate has decreased by 40 percent (as measured by changes in the Producer Price Index for Highway and Street Construction). The other taxes supporting the Federal HTF are truck-related taxes. The largest of those taxes, the truck sales tax, increases with the sale price of trucks and truck trailers. The other Federal taxes – the tire tax and the Heavy Vehicle Use Tax (HVUT) – do not vary with either prices or costs.

The most recent transportation bill, passed by the Congress in August 2005 is the Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU). SAFETEA-LU was the largest surface transportation investment in U.S. history, with guaranteed funding for highways, highway safety, and public transportation totaling \$244.1 billion. All funding in the core programs is eligible for safety programs and projects.

The majority of funding in the overall surface transportation bill, and the vast majority of highway funding, goes to the “core” highway programs. SAFETEA-LU increased the number of core funding programs from five to six: interstate maintenance (IM); national highway system (NHS); surface transportation program (STP); highway bridge and bridge maintenance; congestion, mitigation, air quality (CMAQ); and the new highway safety improvement program (HSIP). A seventh program, the equity bonus (EB), which replaced the TEA-21

minimum guarantee program is sometimes referred to as a core program. Additional and much smaller apportioned programs that existed in TEA-21, and were continued in SAFETEA-LU include the metropolitan planning and recreational trails program.

For additional information, a complete list of Federally aided transportation programs, can be found at <http://www.fhwa.dot.gov/Federalaid/projects.cfm> and for a list of FHWA discretionary programs, see <http://www.fhwa.dot.gov/discretionary/proginfo.cfm>.

Other Federal agencies provide funding eligible for safety programs and projects, e.g., Department of Health and Human Services, Department of Justice, Centers for Disease Control, etc. These programs change frequently and readers are advised to check the web sites for up-to-date information.

The FHWA HSIP funding distribution formula equally considers fatalities on Federal aid system, VMT, and lane miles on Federal-aid highways. The legislation requires funds to be spent on “all public roads.” Once a state has developed an SHSP, SAFETEA-LU allows 10 percent of the state’s HSIP funds to be used for other safety projects listed in their SHSP, provided the state certifies its railway highway crossing and infrastructure safety needs have been met for the current year.

As part of the HSIP, states are required to:

- Submit an annual report describing not less than five percent of their highway locations exhibiting the most severe safety needs (Section 148(c)(1)(D)). (The intent of this provision is to raise the public awareness of highway safety needs and challenges.)
- Develop a Strategic Highway Safety Plan (SHSP) with a process that is data driven, comprehensive, and includes consultation with multiple safety stakeholders.
- Maintain a crash data system with the ability to perform safety problem identification and countermeasure analysis.

SAFETEA-LU also introduced a new set-aside provision known as the High risk Rural Roads Program (HRRRP). This program is a component of the HSIP and is set aside after HSIP funds have been apportioned to the states. It provides \$90 million of HSIP apportionment per year for HRRRP highway safety improvement projects. The HSIP program also includes a set aside program (\$220 million each fiscal year) for Railway-Highway Crossing Safety (Section 130).

The State and Community Highway Safety Program (Section 402) authorized nearly \$900 million for fiscal years 2006-2009 to address highway safety problems related to human factors and the roadway environment. State plans for distribution of these funds annually through the Highway Safety Performance Plans (HSPP). States must certify the funds support national highway safety goals, including national mobilizations; sustained enforcement of impaired driving,

occupant protection, and speed; annual safety belt observation surveys; and development of timely, effective statewide data systems.

State Traffic Safety Information System Improvement Grants (Section 408) established a new program of incentive grants to encourage states to improve the accuracy, accessibility, completeness, integration, timeliness, and uniformity of data needed for identifying and prioritizing highway safety problems, evaluating potential countermeasures, and evaluating the effectiveness of implemented strategies.

During the first year of the program, each state received up to \$500,000 in funding and in subsequent years, received up to \$350,000, which is not sufficient to meet all data needs, but it is a start and signals the importance of data in improving transportation safety. Grant requirements have resulted in the establishment of Traffic Records Coordinating Committees (TRCC) in every state. Getting involved with the TRCC has many advantages, such as a better understanding of safety data and the potential for accessing data improvement funds.

Other NHTSA grant programs include:

- Incentive grants to promote increased correct use of safety belts and child safety and booster seats. (Sections 405 and 406).
- Section 1906 - Grant Program to Prohibit Racial Profiling - is a new grant program to help states enact and enforce laws that prohibit racial profiling in highway law enforcement and to maintain and allow public inspection of statistical information for each motor vehicle stop on Federal aid highways regarding the race and ethnicity of the driver and any passengers. The grants can be applied to collecting and maintaining data on traffic stops, evaluating the results of such data, and developing and implementing training to reduce the occurrence of racial profiling.
- Section 410 funds the Alcohol Impaired Driving Countermeasures program and provides funds to implement eight impaired driving programmatic grant criteria, as well as costs for high-visibility enforcement; law enforcement training and equipment; advertising and educational campaign materials; impaired operation information systems; and vehicle or license plate impoundment.
- Section 2010 provides funding to improve motorcycle safety.
- Highway Sanctions/Penalty Transfer Programs - If states do not enact and enforce appropriate laws within the time period specified in TEA-21, certain Federal aid highway construction funds could be transferred into the Section 402 program for use in alcohol countermeasure programs or into Section 148 (HSIP). Funds specified for alcohol countermeasures may be used for data improvements relevant to alcohol programs only. If a state transfers funds into the HSIP, funds can be used for highway safety data activities. The laws which must be passed to prevent transfer of funds include Section 164 - Minimum Penalties for Repeat Offenders for DWI or

DUI (23USC§164) and Section 154 - Open Container Requirements (23USC§154).

- The Federal Motor Carrier Safety Administration administers multiple programs related to the safe operation of commercial motor vehicles; e.g., large trucks and buses. These include:
 - Crash Data Improvement (CDI);
 - Commercial Driver's License Information System (CDLIS) Modernization Grants - (Section 4123);
 - Safety Data Improvement Program (SaDIP) - (Section 4128);
 - Commercial Drivers License (CDL) Grant Program - (Section 4124); and
 - Commercial Vehicle Information Systems and Networks (CVISN) - (Section 4126).

The Motor Carrier Safety Assistance Program (MCSAP) authorizes states to use a portion of their MCSAP funds for data collection and analysis as well as improvements to existing systems. A portion of MCSAP funds are available for High-Priority Projects (Section 4107) that can include commercial motor vehicle (CMV) safety data improvement initiatives.

The Motor Carrier Information Systems and Motor Carrier Safety Improvement Act establishes a permanent funding source for information and analysis improvements. It includes funding for improvements to electronic vehicle based information systems, expanded data analysis capacity and programs, PRISM implementation, and improvements to driver programs.

Crash Data Improvement (CDI) provides discretionary funds intended to support efforts in states to improve the collection and analysis of commercial motor vehicle crash data and maintain a high level of quality data reported to FMCSA's Motor Carrier Management Information System (MCMIS) crash file.

State and Local Funding Sources

At the state level, a broader variety of taxes support highway construction, but fuel taxes are still the largest source of revenue. Other sources of revenue for highways at the state level include vehicle registration fees, motor carrier taxes, tolls, general fund appropriations, other taxes and fees, and the sale of bonds. Significant differences exist in the extent to which individual states rely on these various revenue sources. State revenues accounted for just over 50 percent of total funds spent on highways in 2005.

Local highway revenues come from a variety of sources, including motor fuel and motor vehicle taxes, tolls, property taxes, other special taxes, bonds, and general fund appropriations which are the largest of the local revenue sources. In total, local revenues accounted for approximately 28 percent of total funds generated for highways in 2005.

Alternative Funding Opportunities

Funding for transportation safety is not limited to Federal, state, and local revenues. Numerous other disciplines and advocacy organizations contribute to improving and funding highway safety. However, many DOTs, MPOs, and highway safety offices struggle to identify the potential partners, especially when most agencies and organizations have competing responsibilities and limited resources.

The development and implementation of SHSPs required the collaboration of multiple partners, including but not limited to representatives of law enforcement, engineering, emergency response, and education. In most states, many other advocacy groups and state agencies were identified as partners as well. Through this process, additional partners came to the table some with funding. For example, in Rhode Island, the local AAA Club provided funding to the Office of Highway Safety to implement one of the strategies in the SHSP. Insurance companies have provided funding for infrastructure improvements, as well as enforcement and education programs. Additional resources can be accessed through in-kind support such as planning; meeting support; technical assistance and training; and public service announcements.

Web sites, such as <http://www.grants.gov>, allow people to search and apply for Federal government grants on-line. These should be monitored regularly, particularly by state agencies wanting to secure additional funding. Local agencies and advocacy groups should monitor the state procurement web sites and highway safety office web sites. However, smaller grant funding opportunities may not be posted on a state-level procurement web site. Some web sites of interest include

- <http://www.cdc.gov/od/pgo/funding/FOAs.htm>; and
- State agency web sites – State Procurement, Departments of Transportation, Public Safety, and Public Health, and Highway Safety Offices.

Best Practices for Accessing and Sharing Resources

Local agencies may be able to rely on state partners to help identify sources, and state agencies can rely on FHWA, FMCSA, and NHTSA regional offices for assistance. Consider the funding sources that may be available to other stakeholders at the bargaining table. Ask partners to make requests to various funding sources for support.

Just like any business, when trying to secure funding it is necessary to present a clear picture of the problem and show why the selected countermeasure or project will be effective. Traffic safety practitioners know the importance of effective media. When writing a grant application, show how the program relates to the funding agency's objectives and how performance will be measured.

Use data to make the case for securing funding. This is particularly important for the agencies administering safety grants, because they are accountable to the Federal government to show how their investments are reducing injuries and deaths. When considering specific projects, conduct a literature review to identify support for the effectiveness of the selected program. AASHTO's 500 series guidebooks, the Transportation Planners Safety Desk Reference, and GHSA's Countermeasures that Work are helpful resources for establishing countermeasure effectiveness.

Relationships are key for accessing funding. Some grants are competitively bid, and it is imperative to establish a good working relationships and communication with potential funding partners.

It is necessary to carefully read any request for proposal or grant application to identify page limits, deadlines for submitting questions and proposals, and other requirements.

The complex nature of road safety program implementation offers a variety of opportunities to share resources and leverage funding.

- Other agencies or organizations may be conducting programs similar or related to safety priorities. For instance, a state department of health may have an injury prevention program and be interested in joining forces on a safety belt program.
- Public involvement and educational programs should be designed to target specific audiences. A drunk driving program might aim to provide bar and restaurant patrons information on alternative transportation options in the event a patron becomes intoxicated. College campus organizations, Chambers of Commerce, restaurants, bars, local businesses, and area hotels can provide access to the target group.
- Cross-jurisdictional projects/initiatives – Multiple agencies can pool funding, manpower, and infrastructure to accomplish regional initiatives. The Cheyenne Metropolitan Planning Organization (MPO) was successful in obtaining Section 402 funds from the state highway safety office to support a law enforcement safety belt summit and other programs. Law enforcement agencies from different cities and counties can pool manpower to conduct high-visibility enforcement programs throughout a region. Another example may involve sharing technical analysis tools and software. The Geographic Information Systems (GIS) Analyst for the MPO planning staff may provide GIS maps and analysis for city or local planning offices. Since data collection efforts are expensive and time consuming, consider collaborating with organizations with similar data needs and combine data requests with a partner agency to reduce the cost.

Challenges and Barriers

A variety of technical and institutional issues can discourage the implementation of strategies requiring resource leveraging. Many of these problems can be addressed by revising policies and procedures and creating concise documentation. The following situations can be barriers to resource sharing:

- Lack of knowledge of available resources;
- Inadequate communication;
- Lack of respect/trust;
- Institutional “cultural” differences;
- Different missions/priorities;
- Confidentiality/legal issues;
- Different planning cycles; and
- Rigid funding criteria.

Overcoming Barriers

These obstacles may make sharing resources difficult but they can be overcome. Identify the barriers to resource sharing. As an organization realizes the issues that hinder the development of meaningful partnerships; policy and organizational changes can be made to address the problem. As an organization’s priorities shift, these barriers may or may not remain.

- Crosstrain to ensure people understand each other’s roles enough to work together to achieve the goal. Effective collaboration requires a clear understanding of the group’s collective and individual goals. Crosstraining road safety stakeholders is an effective strategy for strengthening knowledge of safety issues. For example, transportation planners could be crosstrained with safety program managers.
- Develop strategies for sharing information with the agencies involved in safety planning. Useful communications techniques include: newsletters, listservs, web sites, annual reports/updates, monthly, bimonthly, quarterly, or annual meetings, task forces, and coalitions.
- Create clear and well documented agreements for funding arrangements. Written agreements establish precedence and guard against the dissolution of funding options in the event of leadership or staff changes.

- Ask public agencies to voluntarily adopt policies to focus human and financial resources on priorities or specific objectives. Adopting policies to focus resources on road safety priorities creates a more solid commitment to safety goals and principals.
- Think outside the box. Consider asking partners to provide resources in the form of services. Think about leveraging other resources that may benefit the safety program, such as, clerical/administrative support, planning support, equipment/supplies, meeting facilities or other space needs, marketing/advertising, sponsorships, and web space.

A.5 MATERIALS FROM NEVADA AND DENVER WORKSHOPS

Table A.2 Transportation Safety Planning Nevada Workshop Results

Nevada Entity	RTC Northern Nevada	RTC Southern Nevada	DOT
<i>Framework Step</i>			
1. Safety Experts on Planning Committees	Board membership is not flexible; a member could be added to the TAC; The RTC Advisory Board is made up of a citizens working group chosen by geographical representation; the agency working group includes a representative from SRTS; Traffic Roundtable meets quarterly.	Complex committee structure; difficult to change. SRTS is involved in Complete Streets initiative. Metro PD has monthly safety meetings. If possible, they could be more involved in the LRTP update. RTC will discuss a more formalized relationship with Metro. RTC is good at bringing people together. Should be able to include safety experts.	Focus is “Connecting Nevada”; stakeholder meetings around the state and a TAC within DOT. Safety engineer will be invited to participate. Enforcement agencies are invited to participate on TAC but level of interest varies. Officials are interested in short range objectives rather than 10-year timeframe.
2. Safety Vision, Goals, and Objectives	Guiding principles includes “healthy and safe communities.”	Not currently addressed in a formal way.	LRTP is a policy document; needs updating; group looking at ways to make it more useful; mode-specific plans (highway, statewide freight, etc.) would benefit from more safety consideration.
3. Safety Issues	Has adopted SHSP and a pedestrian plan; LRTP update will include a safety chapter.	Complete Streets policy addresses pedestrian issues; could be expanded to include motor vehicle occupant safety as well. Have a pedestrian action plan. Desire to understand 402 funding process and develop human factors programs. Has a “roundabouts first” policy in intersection improvement considerations and utilizes crosswalk standards and road diets to reduce conflict points.	Need to develop a strategy to address pedestrian issues and revise Connecting Nevada policy to address safety issues. Their normal approach is to reference other plans, e.g., the SHSP. Implementing LED signals, flashing signals, and high accident reviews. Funds SRTS projects.

Nevada Entity	RTC Northern Nevada	RTC Southern Nevada	DOT
Framework Step			
4. Safety Performance Measures	Safety chapter will have critical emphasis areas and performance measures that will be incorporated into the LRTP.	None currently. They use the SHSP performance measures and report periodically to the working group.	SHSP Performance Measures can be used – very comprehensive.
5. Safety Data Collection and Analysis	RTC gets project-specific data from NDOT and the NDOT annual report; corridor data is generated by RSAs; use of FARS.	RTC does not have data or analysis tools. NDOT has “high-crash meetings,” but RTC is not invited. RTC needs access to safety data through a web-based application.	Working to centralize data and other products, e.g., RSAs, to use for planning purposes; Working on a one-stop shopping approach for data; Challenge is data on pedestrians/bikes. Need to get planners involved in RSAs.
6. Safety as a Decision Factor	Not a decision factor now; some projects are nominated by pictures sent in through a cell phone app, e.g., “put a bus stop here.” Will take work to achieve public support for safety as a decision factor.	Safety is considered at the program level, e.g., corridor studies. NDOT prioritizes projects; RTC agrees most of the time. They do not have the analysis tools to do it for themselves. It would be controversial to enhance safety as a factor in the project prioritization process.	Planners wonder if programs can <u>leverage</u> other programs, e.g., expand scope to include safety and overcome funding silos.
7. Monitoring and Evaluation	Year-to-date crash reports are submitted to the Board quarterly.	Safety monitored through NDOT reports.	SHSP tracking but not LRTP. NDOT officials meet every year with counties to discuss program. Safety often raised but the information may not reach the right person, e.g., communications problems.
Other	It will take work to achieve public support for safety as a decision factor.	It takes a champion to bring about change. Head of MPO is a potential safety champion.	NDOT has a good process, e.g., planning, outreach, etc. Needs to enhance coordination with safety.

Table A.3 Transportation Safety Planning Denver Workshop Attendees

Safety Planning Boot Camp: Turning Ideas Into Reality	
Participant	Agency
Carolyn Bednar-Wood	TxDOT
Garson Bell	Resolve Group
Jerri Bohard	OR DOT
Nat Coley	FHWA, Office of Performance Management
Kathleen Collins	CDOT

Safety Planning Boot Camp: Turning Ideas Into Reality	
Participant	Agency
Dennis Decker	LA DOTD
Stan Elmquist	North Front Range MPO
Sonna Lynn Fernandez	ID DOT
Joe Guerre	Cambridge Systematics
David Haynes	Atlanta Regional Commission
Marie Heidemann	AK DOT&PF
Mell Henderson	MARC
Chris Herrick	KDOT
Jessie Jones	AK HTD
Leslie Kemp	CDOT
Martin Kidner	WY DOT
Linda Koenig	OK DOT
Douglas McBroom	MDT
Irene Merrifield	CDOT
Kathleen Neil	FDOT
Craig Newell	MDOT
Janet Oakley	AASHTO
Scott Omer	AZ DOT
John Orr	Atlanta Regional Commission
Jeff Ottesen	AK DOT&PF
Rob Pennington	WV DOT
Scott Phinney	OH DOT
Kenneth Prather	Pikes Peak Area COG
Mark Rogers	CDOT
Michelle Scheverman	CDOT
Amy Schmaltz	CDOT
Darin Stavish	CDOT
Jack Stickel	AK DOT&PF
Lori Sundstrom	TRB/NCHRP
Cindy Van Dyke	GDOT
Ryan Wilson	MnDOT

Table A.4 Transportation Safety Planning Denver Workshop Agenda

Safety Planning Boot Camp: Turning Ideas Into Reality	
Time	Topic
7:30-8:00	<i>Sign up for the boot camp!</i> (Sign in and Registration)
8:00-8:10	<i>Suit up!</i> (Welcome to Boot Camp)
8:10-8:45	<i>What is transportation safety?</i> (Background and Introductions)
8:45-9:10	<i>How far have we come?</i> (History, Background, Challenges, and Opportunities)
9:10-9:45	<i>Where do I start?</i> (Seven Principles of Transportation Safety Planning)
9:45-10:00	Break
10:00-10:15	<i>How can I accomplish my mission?</i> (Breakout Group Instructions)
10:15-11:15	<i>Teamwork Trainee!</i> (Breakout Group Discussions/Worksheets)
11:15-11:30	<i>How can I use this experience?</i> (Participant Highlights, Recommendations, and Next Steps)
11:30	<i>Boot Camp Graduation: Just do it!!</i> (Adjourn)

Figure A.2 Transportation Safety Planning Denver Workshop PowerPoint Deck



Safety Planning Boot Camp
Turning Safety Ideas into Reality

presented to
Making Progress Conference Participants

presented by
Cambridge Systematics, Inc.

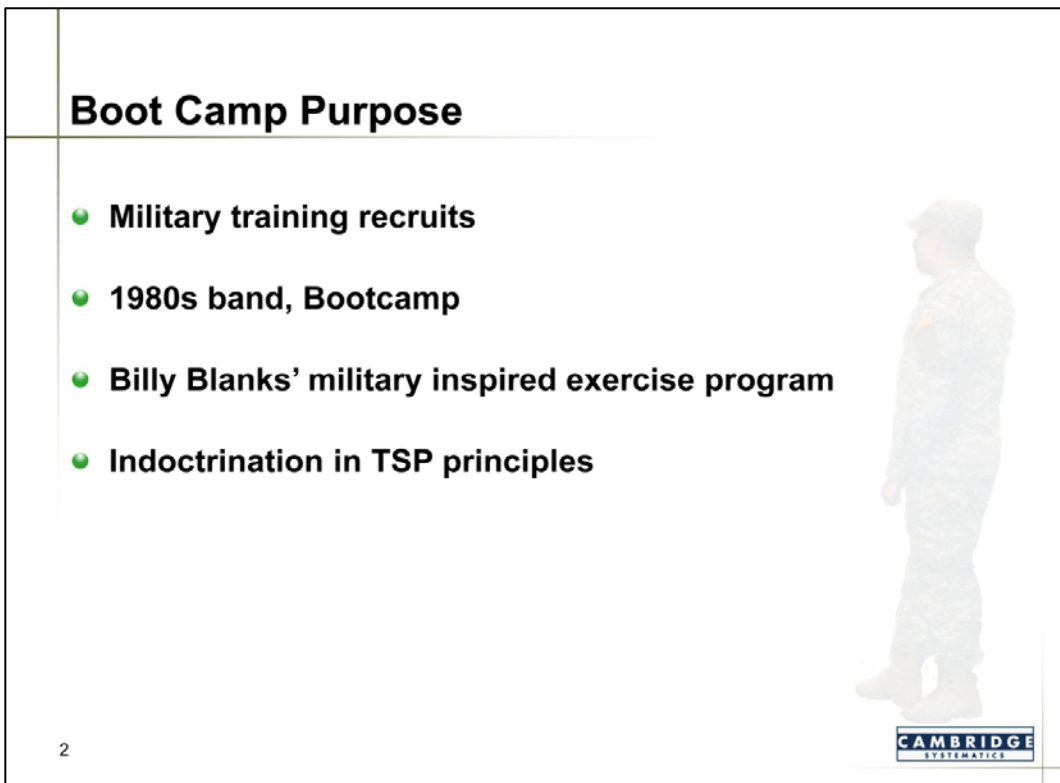
Susan Herbel, Deb Miller, Nicole Waldheim, and Mike Meyer

May 23, 2012

SAFETY PLANNING BOOT CAMP

CAMBRIDGE SYSTEMATICS

Transportation leadership you can trust.



Boot Camp Purpose

- Military training recruits
- 1980s band, Bootcamp
- Billy Blanks' military inspired exercise program
- Indoctrination in TSP principles

2

CAMBRIDGE SYSTEMATICS

Get Pumped! ***The Safety Community Wants You!!!***

A planner's role in TSP

- **Connection to decision makers**
- **Analytic skills and tools**
- **Commitment to the public good**
- **Holistic perspective of the transportation network**
- **Ability to prioritize and program regional transportation investments**

3



Your Boot Camp Schedule **Deviate and Everyone Does Pushups!**

- **Welcome and Introductions**
- **Defining Safety**
- **History, Background, and Challenges**
- **Recent Research**
- **The Seven Principles**
- **Breakout Groups**
- **Next Steps and Adjourn**

4



Welcome to Basic Training Do You Have What it Takes to Become a Soldier?

Current Thinking

Everything We
Do is Safe



End Result

Safety *Will Be* a
Priority in the
Long-Range
Transportation
Planning Process



5

CAMBRIDGE
SYSTEMATICS

State Your Name, Rank, & Serial Number, Soldier

- Name
- Agency
- Expectations



6

CAMBRIDGE
SYSTEMATICS

Safe Transportation Projects vs. Safety Projects

- **Safe Transportation Projects**

- » **Any transportation project inclusive of safety benefits**

- Implement cost effective mobility solutions (i.e., sidewalks, multi-use trails, bicycle lanes, and roadway operational upgrades) that increase transportation alternatives and improve safety.
- Include safety considerations in operations and ITS improvements.

- **Safety Projects**

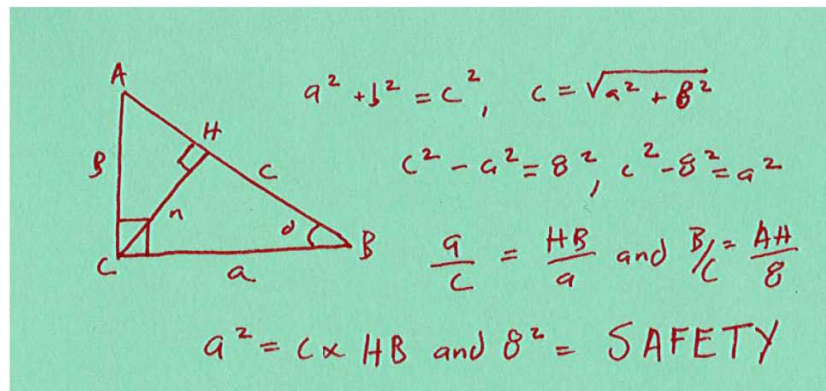
- » **A safety project that addresses a specific safety need on the transportation network**

- Implement median barriers to reduce the high number of head-on collisions.
- Add shoulders to existing rural roads.

7



How Do You Define Safety?



8



TSP History and Background

- ISTEA
- TEA-21
- TSP working group
 - » Safety conscious planning forums
 - » Conference panels and presentations
 - » Publications – E-Circulars, etc.
 - » Research – NCHRP 08-44, 08-44(2), 08-76, etc.
- SAFETEA-LU
 - » SHSP
 - » SCP → TSP



9

Challenges

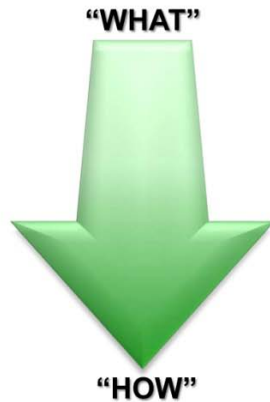


- ✓ Newer Concept
- ✓ Competing Priorities
- ✓ Safety Initiatives are Reactive
- ✓ Funding Silos
- ✓ Limited Staff and Tools
- ✓ Institutional Resources Lacking
- ✓ No Ribbon Cutting in Safety
- ✓ Other Documents Address Safety

10

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SYSTEMATICS

Recent Research



- NCHRP 546 – Incorporating Safety into Long-Range Transportation Planning
- NCHRP 08-76 – Institutionalizing Safety in the Transportation Planning Processes

11



Seven Transportation Safety Principles

- 1 Include safety expertise on transportation planning committees
- 2 Define and include safety in the vision, goals, and objectives in transportation planning documents
- 3 Include safety in the context of other transportation goals and objectives (i.e., bicycle, pedestrian, highway, transit safety)
- 4 Establish safety performance measures
- 5 Collect and analyze safety data
- 6 Establish safety as a decision factor
- 7 Monitor safety performance and evaluate safety programs and policies

12



Orders from the Drill Sergeant

Implementing the Principles



13

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SYSTEMATICS

Multidisciplinary Structures

- Identify and meet statewide and regional safety stakeholders (4 Es).
- Invite safety representatives to join existing committees or develop a new safety committee.
- Make safety a regular agenda item during meetings.
- Collaborate to identify and define the role of safety planners in the transportation planning process.

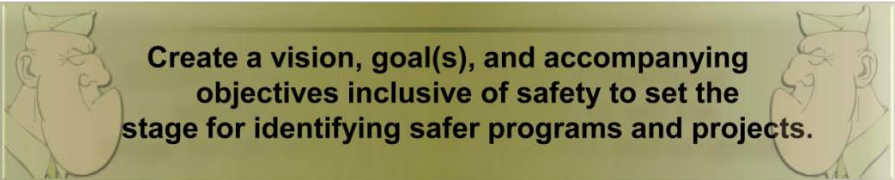
“Invite safety stakeholders to join MPO and DOT committees.”

14

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SYSTEMATICS

Vision, Goals, Objectives

- Establish safety as a priority early in the process.
- Identify the necessary resources (e.g., data, tools) and partnerships to comprehensively develop safety as a goal.
- Demonstrate key safety needs to the public, stakeholders, and decision makers (use maps, crash data, etc.).
- Use the SHSP emphasis areas as a guide.
- Review and adopt the relevant safety goals, policies, and strategies in standalone transportation plans or safety plans.



Create a vision, goal(s), and accompanying objectives inclusive of safety to set the stage for identifying safer programs and projects.

15

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Safety Issues in Planning Programs and Documents

- Coordinate with transportation and safety stakeholders to consider safety improvements on:
 - » Highways;
 - » Transit;
 - » Bicyclist and pedestrian facilities; and
 - » Freight operations.
- Consider safety elements, in addition to other factors such as mobility, accessibility, sustainability, etc, when developing goals, objectives, strategies, and actions in planning documents.



“Consider safety in the context of ALL transportation issue areas.”

16

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Performance Measures

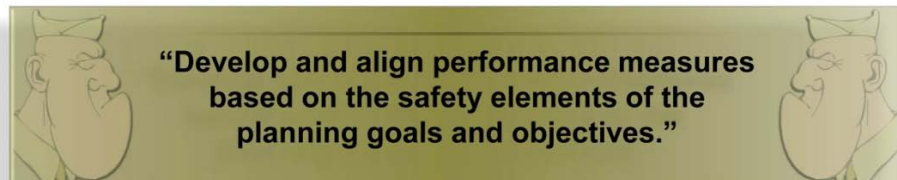
- **Reach agreement on the issues that need to be measured (refer to goals and objectives).**
- **Identify candidate performance measures.**
- **Determine if the data exist to support the candidate performance measure.**
- **Collect and analyze the data for developing achievable safety performance measures.**

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Performance Measures (continued)

- **Determine whether to invest in data collection.**
- **Ensure a strategic data collection plan is in place with appropriate quality assurance/quality control procedures.**
- **Assign responsibility for data collection, analysis, and tracking.**



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Data Collection

- Identify available data at the state, regional, and local levels.
- Identify data gaps, e.g., what are the perceived needs and are data available to support these needs?
- Develop a data collection strategy.
- Develop formats to demonstrate the data in meetings.
- Use the data to focus on the top needs to support goal and objective development.

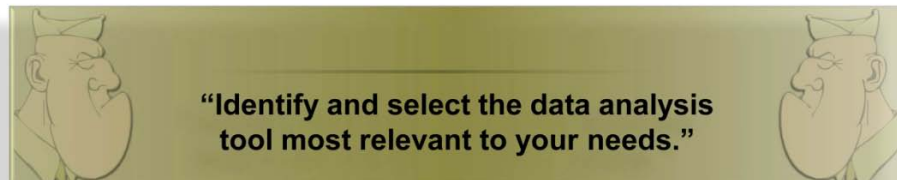


19



Data Analysis

- Determine what safety analysis tools are available and which are most appropriate for your agency.
- Leverage existing analysis capabilities within the state.
- Publish the results of the analysis annually to educate stakeholders, the public, and decision makers.



20



Data Analysis Tools

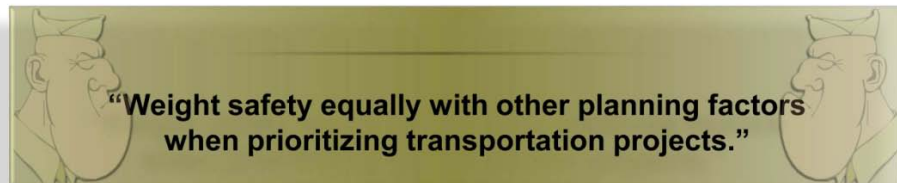
- **Highway Safety Manual**
 - » **SafetyAnalyst**
 - » **Interactive Highway Safety Design Model (IHSDM)**
 - » **Crash Modification Factor (CMF) Clearinghouse**
- **Proven Safety Countermeasures**
- **Systemic Approach**
- **PlanSafe**

21



Decision Factor

- **Ensure the established ranking or scoring system for transportation projects reflects safety.**
- **Clearly state the goals, and objectives of the plan in project solicitation forms and the ranking criteria for each element (including safety).**
- **Explain to the community the purpose and importance of the safety rating to ensure community buy-in.**



22



Decision Factor Example (Wichita MPO)

- Including safety in the decision process for transportation project selection

Exhibit A3.1: Measures of Effectiveness Used for Different Project Types

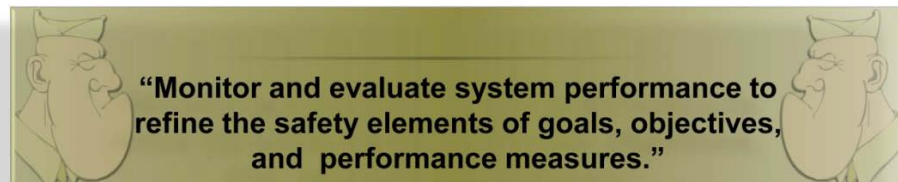
Measures of Effectiveness (MOEs)	Project Type				
	Bicycle/ Pedestrian	Bridge	Roadway	Transit	Travel Demand/ Systems Management
1. Does the project contribute to the overall improvement of the regional transportation system?	✓	✓	✓	✓	✓
2. Does the project have a positive effect on air quality?	✓	✓	✓	✓	✓
3. Does the project accommodate, connect to, or include facilities for more than one mode of transportation?	✓	✓	✓	✓	✓
4. Does the project address or help address a safety concern?	✓	✓	✓	✓	✓
5. Is the project on a route identified in the WAMPO Regional Pathway System Plan and identified as a priority missing link?	✓				
6. Does the project address congestion and is identified on the CMP Network and/or ITS Regional Architecture?					✓
7. Does the project address a regional issue that is addressed in a WAMPO Plan?		✓	✓	✓	

23



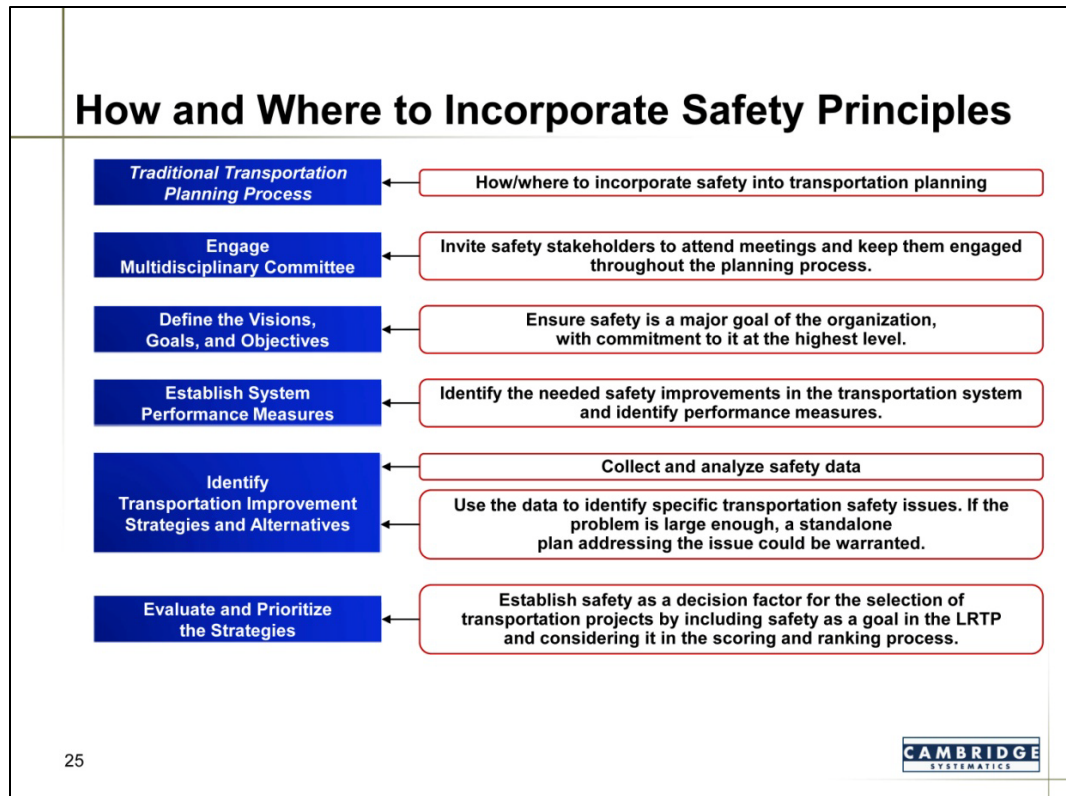
Monitoring and Evaluating System Performance

- Identify what to track –include the identified performance measures, as well as general progress on strategies and objectives by goal area.
- Create a tracking document to measure the desired achievements.
- Discuss the evaluation results often to determine whether changes in policies or programs are appropriate.
- Regularly (at least annually) report on program and project effectiveness to the decision makers, stakeholders, and partner agencies.

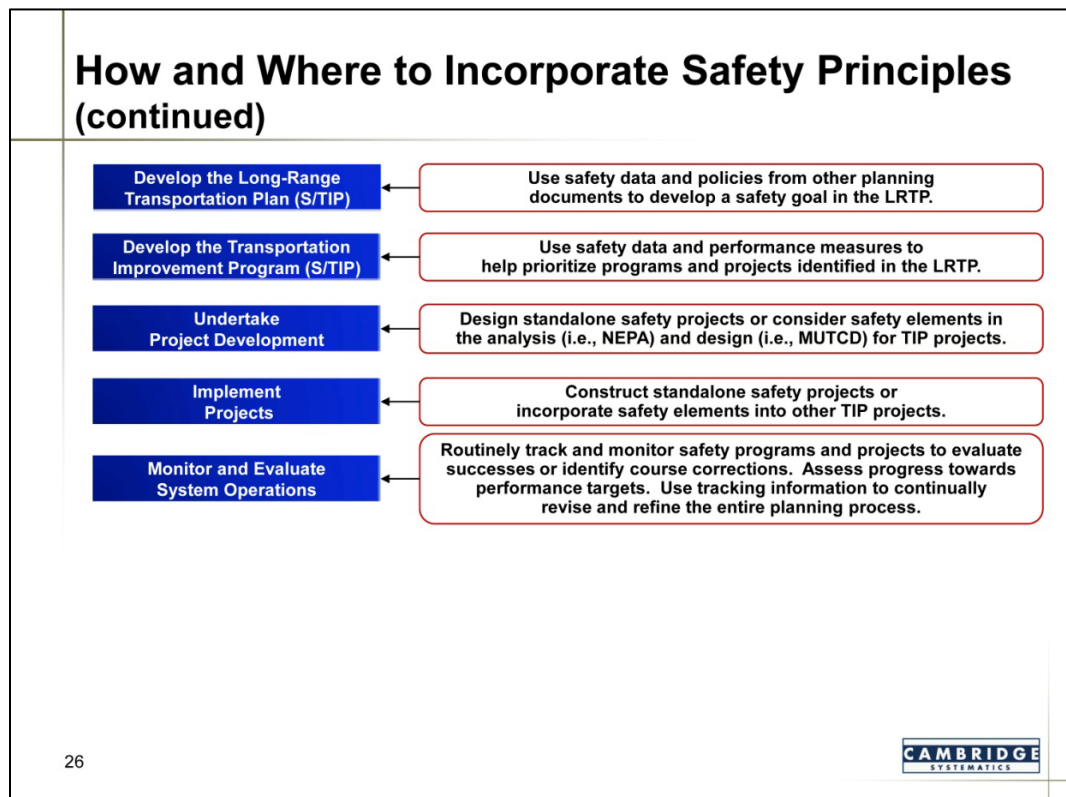


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Recruit, Complete Your Mission!

Framework Step	Agency 1 (DOT)	Agency 2 (MPO)	Agency 3 (MPO)
1) Safety Experts on Planning Committees			
2) Safety Vision, Goals, and Objectives			
3) Safety Issues			
4) Safety Performance Measures			
5) Safety Data Collection and Analysis			
6) Safety as a Decision Factor			
7) Monitoring and Evaluation			

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Teamwork, Recruits! Breakout Groups

- **The Worksheet**
 - » Think about how to incorporate safety into the planning process in a more systematic way.
- **Opportunities**
 - » Share how you are accomplishing the framework steps with the group.
- **Barriers**
 - » Discuss the challenges and brainstorm possible solutions with the group.
- **Resource Needs**
 - » Identify the need for data, technical assistance, tools, institutional change, etc. to better integrate safety into the transportation planning process

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You Made it, Recruit! - Report Out

- **Discuss the key themes from your breakout group**
 - » **Is this something you can bring back to your agency and use?**
 - » **Do you wish to highlight any opportunities?**
 - » **What are the key challenges that may be difficult to overcome?**
 - » **What one thing can you do when you return home to more explicitly and effectively consider safety in the transportation planning process?**

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Want More Boot Camp, Soldier? How to Find Us

Susan Herbel
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Nicole Waldheim
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Deb Miller
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dmiller@camsys.com
785-217-8256

Mike Meyer
Georgia Tech
mike.meyer@ce.gatech.edu
678-984-8521

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Company Dismissed!

Thanks for attending the boot camp.

Keep in touch!



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Table A.5 Transportation Safety Planning Denver Workshop Results

Framework Step	Opportunities	Challenges
1. Safety Experts on Planning Committees	<p>Ongoing collaboration between the DOT Traffic Engineering, transportation planners and Safety Offices.</p> <p>Annual meeting of behavioral and engineering safety practitioners and transportation planners in the state to build relationships.</p> <p>DOT traffic engineers regularly participate in MPO Technical Advisory Committee, and they can be encouraged to include safety advocacy and information sharing as part of their role.</p> <p>Safety practitioners and transportation planners can work together throughout the SHSP process.</p> <p>Incident management meetings can open conversations with emergency responders.</p> <p>In some states, the state patrol/police serve on the LRTP steering committee.</p> <p>LRTP advisory committees organized by objectives can all include a safety practitioner.</p> <p>Safety can be considered along with operations and asset management. Safety aspects can be considered in all areas of asset management.</p> <p>In some states, the same people already are preparing the LRTP and the SHSP.</p>	<p>The SHSP process brings safety stakeholders together, but it is difficult to change their mindsets and demonstrate the importance of coming together within the transportation planning process as well.</p> <p>Safety planners and engineers do not understand the connection with transportation planning and do not attend meetings.</p> <p>Involving more safety people in LRTP advisory panels organized by objectives can bring benefits but might also turn off safety people if the meetings don't seem relevant to them.</p> <p>In most states, the staff doing safety planning are not the same staff doing transportation planning.</p>
2. Safety Vision, Goals, and Objectives	<p>Develop multidisciplinary vision, goals, and objectives in a to ensure the overall system, including safety, is being improved.</p> <p>Every state highway (agencies? plans?) has a vision. It is developed in coordination with a number of agencies in the state and most of the corridor visions include safety.</p> <p>Goals and objectives are adopted from the SHSP, and additional safety goals are developed to meet the unique transportation safety needs.</p> <p>Establishing a safety goal is the easy part; it's motherhood and apple pie.</p> <p>Defining safety is the key. Once safety is defined, establishing performance measures follows.</p> <p>Performance measures may not always need to be quantitative.</p>	<p>States and MPOs lack the tools to estimate the impact of safety programs and projects which may cause a disconnect between performance measures and investment programs.</p> <p>The State LRTP is a policy document. Safety may be included in the goals but specific objectives are rarely developed.</p> <p>Lack of before and after studies/analyses on projects makes it difficult to develop or refine goals and objectives to include safety.</p> <p>Safety goals and objectives may change with a new administration.</p> <p>The vision, goals, and objectives in various planning documents may not be coordinated.</p> <p>States may not have processes to involve maintenance and asset managers in the planning process.</p> <p>In some states the primary safety people aren't in the transportation agency.</p> <p>Safety accountability requires the action of more than just the State DOT staff be they transportation planners, safety planners or traffic engineers.</p>

Framework Step	Opportunities	Challenges
3. Safety Issues	<p>MPO mode specific plans are likely to link to the LRTP.</p> <p>States can discuss safety issues with MPOs during discussions about performance measures.</p> <p>MPOs may have a greater focus on safety and include specific projects in their planning documents.</p> <p>Involving maintenance can lead to safety issue identification.</p> <p>There are bad pedestrians, just like bad drivers; impaired, negligent, etc.</p>	<p>Specific safety issues are rarely addressed in transportation planning and programming documents.</p> <p>The states can lead the MPOs but cannot force them to include safety in their planning and programming documents.</p> <p>Context matters and for rural states pedestrian and bike safety are not significant issues like they are in urban areas.</p> <p>Off-road fatalities are significant in Alaska but not recognized by NHTSA/FARS, etc.</p>
4. Safety Performance Measures	<p>Project sponsors select the performance measures they want to use and the DOT approves them. Sponsors are required to conduct a before and after study.</p> <p>TIGER grants require quarterly performance reporting. These measures might help establish measures for an agency.</p> <p>Most states can generate fatality and serious injury data, but other performance measures might be considered.</p> <p>The highway safety offices routinely collect 14 performance measures. These may be used as a starting point, especially if they can be broken down by region.</p> <p>Performance measures should be tied to LRTP goals.</p> <p>Performance measures can be outcome or output focused; in safety, still value in some output measures such as number of miles of cable barrier.</p>	<p>Measures do not generally evaluate project-level performance and system-level performance only shows outputs, not outcomes.</p> <p>Safety data may not be available by region or on local roads systems.</p> <p>Tends to be an over focus on vehicular safety to the detriment of other modes.</p>
5. Safety Data Collection and Analysis	<p><u>Data</u></p> <p>Crash data are used to identify the key issues across all modes and to develop safety policies and strategies in standalone modal plans (bike/ped, transit, freight).</p> <p>Data show high-crash segments, corridors, intersections.</p> <p>Data can are used to plan safety measures on similar corridors (systemic approach).</p> <p>Every state has a Traffic Records Coordinating Committee. The states and MPOs can coordinate with the TRCC members to address their data issues.</p>	<p><u>Data</u></p> <p>Due to the amount of data, it is difficult to display or create a comprehensive picture for the public and other agencies in a useful format.</p> <p>Data can deter a proactive approach to safety. It shows where the problems are “now”, which promotes a reactionary (fix it now) approach.</p> <p>Data may differ among agencies, which lowers the levels of trust and understanding of the data.</p> <p>The public may express a need for certain safety improvements, but the data do not support the need.</p> <p>A comprehensive definition of “serious injury” is lacking, so the data may differ among jurisdictions.</p>

Framework Step	Opportunities	Challenges
	<p><u>Data Analysis</u></p> <p>Develop a one-page document to convey the results of data analysis to the public and decision-makers.</p> <p>States and MPOs are required to develop ITS plans; they could tap into this source to gain more data.</p> <p>Site specific crash data exists for state roads, but not for local roads. This is a problem that will be solved soon with technology.</p>	<p><u>Data Analysis</u></p> <p>The analysis application(s) or method(s) used by a state may not fit different needs throughout the state.</p> <p>Data analysis is difficult to convey to the public.</p> <p>We collect far more data than we use.</p>
6. Safety as a Decision Factor	<p>Safety factors can be more easily included into the project ranking/selection process for projects using STP and TE funds.</p> <p>Some states and MPOs have successfully incorporated safety considerations into the decision-making process for all transportation projects.</p> <p>Asset management systems are helpful because they may be used to manage investments.</p> <p>Is possible to establish a safety element in all LRTP and TIP programs.</p> <p>Corridor planning is playing a larger role in some states which makes it easier to address safety issues.</p>	<p>Requirements governing the safety money (Highway Safety Improvement Program) are too specific for easy application to general transportation projects.</p> <p>Safety-specific projects are funded with HSIP money; therefore, they do not need to be prioritized in the context of all transportation projects.</p> <p>Many decisions are politically driven; hence, it is important to get the public involved.</p> <p>Sometimes equity issues confound the establishment of decision or ranking factors.</p> <p>Safety is often used as a tie breaker.</p>
7. Monitoring and Evaluation	<p>The State DOT manages a system-level performance tracking tool.</p> <p>Some states publish an annual performance report which includes a safety element.</p> <p>The LRTP and TIP can include a provision to ensure safety is monitored and measured.</p>	<p>Time and resources are lacking to assess the impacts of each project (before and after studies). It is easier to accomplish this at the systems level, but this analysis does not provide details on how individual projects are performing.</p> <p>Monitoring is very time and resource intensive.</p> <p>Data deficiencies may hinder the ability to collect evaluation data.</p>