INSTITUTE OF TRANSPORTATION ENGINEERS

TRANSPORTATION PLANNING

HANDBOOK

FOURTH EDITION 4

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TRANSPORTATION PLANNING HANDBOOK

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FOURTH EDITION

Institute of Transportation Engineers

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Preface

The original intent of the update to the *Transportation Planning Handbook* (third edition) was to simply provide more recent references and add material on topics that had surfaced as an important planning topic since the publication of the third edition nine years ago. In updating each chapter, however, it became apparent that much has happened since the mid-2000s in transportation planning. Important changes have included a focus on performance-oriented planning, an increased emphasis on environmental and social justice, a continuing revolutionary change in transportation system and vehicle technology, a similar revolution in the technology of data collection, the expanding options for transportation finance, and a continuing trend in changing socio-demographic characteristics that will fundamentally affect how travel occurs. What had begun as a simple update evolved into a major rewrite when it became apparent that transportation planning is now facing many important challenges and opportunities that were just becoming apparent in the mid-2000s.

In addition to the updates of the chapters found in the third edition, new chapters have been added to this edition reflecting the importance of these topics to contemporary transportation planning. These chapters include transportation finance and funding, highway system planning, travel demand management, local/municipal transportation planning, and public engagement. These chapters were written by the editor.

Finally, the technology of publishing has changed dramatically since the mid-2000s such that we can now cross reference and link key concepts from one chapter to another. This handbook does not repeat concepts that are inherent to transportation planning whether focusing on state, metropolitan, or local planning contexts. For example, Chapter 1 presents an organizing framework for transportation planning that outlines the major steps inherent in any planning process. The chapters on statewide, metropolitan, and local transportation planning simply reference this framework rather than repeat the framework in each chapter. Thus, those who are using individual chapters for teaching and/or reference should be aware that each chapter might reference material in other chapters that is needed to obtain a complete picture of the substance and concepts in a targeted chapter.

The experience in updating this handbook reflects the dynamic nature of transportation planning. As noted by the editor in other publications and in previous editions of the handbook, transportation planning relates to the key policy issues and decision contexts of the day. Although transportation planners in the mid-2000s would recognize much of what planners are doing today, they would be surprised by planning interest in climate change, autonomous vehicles, 3D printing (and its impact on logistics), cloud sourcing as a tool for public engagement, and many other capabilities and issues that have been enabled by changing socio-demographic characteristics and new technologies. The planning process outlined in this handbook is one that is future-oriented, anticipating societal and technological characteristics that will affect future transportation system performance. In addition, it is one that is flexible to allow policy issues and new analysis capabilities to be included as they become important topics to planners and decision makers. In this way, transportation planning will continue to stay relevant to the decisions that decision makers today and in the future will be making to improve the vitality of our communities.

Acknowledgments

The preparation and production of the fourth edition of the Transportation Planning Handbook has been a collaborative and intensive effort. One person in particular has been instrumental in working with the editor in all aspects of the handbook preparation … from obtaining resource information to reviewing chapters for consistency and quality. This handbook could not have been prepared without the work of Adam N. Rosbury, who deserves much credit for the final product.

The fourth edition has also greatly benefited from the efforts of numerous individuals who helped create the overall outline for the handbook and who volunteered to review individual chapters and in the process greatly improved the quality of the handbook. An initial advisory panel reviewed early versions of the new handbook outline and provided feedback on some of the early chapters. Panel members included:

Thomas W. Brahms

Steven B. Gayle

Jamie Henson

Aliyah Horton

Leslie Meehan

Michael D. Meyer

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ITE staff members have also been an important contributor to handbook development. Thomas W. Brahms articulated the original vision for the handbook and provided input on the handbook outline. Courtney L. Day was instrumental in coordinating the chapter review process and in interfacing with the publisher.

Finally, the concept of this handbook was to update the chapters in the third edition of the handbook and to add several new chapters that reflected the changing professional interests since 2009. Thus, much of the material in this handbook was produced by the original authors, updated to reflect more recent references and examples. The original authors included:

Marsha Bomar Anderson

Song Bai

Sandra K. Beaupre

Greg Benz

Wayne Berman

Stephen B. Colman

Jeffrey M. Cosello

Paula Dowell

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Jerry B. Schutz

Mary S. Smith

Vukan R. Vuchic

The editor takes responsibility for changes and additions to the fourth edition of the Transportation Planning Handbook.

Michael D. Meyer, Ph.D., P.E., M.ITE,
and F.ASCE, Editor

About the Editor

Dr. Michael D. Meyer is a senior advisor to WSP/Parsons Brinckerhoff, Inc., Co-founding Principal of Transport Studio, LLC, and president of Modern Transport Solutions, LLC. He was the Frederick R. Dickerson Professor of Civil Engineering and Director of the Georgia Transportation Institute at the Georgia Institute of Technology until 2012 when he retired. From 1983 to 1988, Dr. Meyer was Director of Transportation Planning and Development for Massachusetts where he was responsible for statewide planning, project development, traffic engineering and operations, and transportation research. As Director, Dr. Meyer spent considerable time with the state's transportation planners developing statewide, metropolitan, and corridor-level transportation plans. In addition, he worked closely with local officials in developing institutional collaborations for compatible land-use and development strategies. Prior to this, he was a professor in the Department of Civil & Engineering at M.I.T. He is currently an adjunct professor at Denver University's Transportation Institute.

Dr. Meyer has written over 200 technical articles and has authored or co-authored 28 books or book chapters, many on transportation planning and policy, including a major college textbook on transportation planning. Dr. Meyer has given over 300 speeches or keynote conference addresses over the past 20 years and testified to Congressional committees on a variety of topics relating to transportation policy and planning, including most recently the importance of incorporating sustainability into transportation decision making. He was one of the first researchers in the United States to examine the role of performance measures in transportation planning and decision making, and more recently he has been one of the first transportation professionals to write extensively on the relationship between climate change and transportation system performance. He has received numerous professional awards, and was chair of the Transportation Research Board Executive Committee in 2006.

Introduction to Transportation Planning[1]

I. INTRODUCTION

The economic health and quality of life of a nation's communities depend on a well-functioning and safe transportation system. For example, following housing costs, transportation is one of the biggest expenses faced by an average household in the United States and in many other countries. This is usually measured by the actual out-of-pocket costs associated with owning and operating vehicles or paying for transit fares. When one considers the value of time it takes to travel from one location to another, often in congested conditions, this cost increases significantly. The cost of freight and goods movement is also an economic cost passed on to consumers that will vary depending on the price of transportation.

The accessibility and mobility provided by transportation systems can influence land use patterns and, thus, over time affect how we live. The best example of this relationship is the large-scale suburbanization of U.S. metropolitan areas and of those in many other countries after World War II when massive investment was made in suburban freeways. Today, transportation investment is often an integral part of economic and development plans, usually including transit, pedestrian, bicyclist facilities, and actions to manage transportation demand. The importance of transportation investment in transforming communities raises questions of who is benefiting and who is carrying additional burdens after the system has changed. These are questions that are part of many transportation planning studies.

The public is also concerned about the environmental impacts linked to transportation systems and their operation. This has been manifested in many environmental laws and regulations that affect how transportation planning is conducted and the types of data and tools that must be used.

These, along with many other reasons, suggest that the transportation system is a critical component of a successful modern community and economy. Thus, anticipating the challenges and opportunities relating to transportation system performance is critical not only to future transportation system effectiveness, but also to the economic and social well-being of our communities.

This handbook examines many facets of transportation planning. Transportation planning can be a highly technical process, which often relies on computer models and other sophisticated tools to simulate the complex interactions of transportation system performance. It is a public relationship-oriented process in that transportation planners often interact with a wide range of stakeholders and members of the public. Transportation planning can also become intertwined with the politics of any given decision.

Some transportation planners and engineers focus on transportation supply—the facilities and services needed to handle expected demands and characteristics of the infrastructure to provide such service. Others are more interested in influencing travel behavior to promote more cost-effective and environmentally sustainable options for travelers.

Given the breadth of topics and issues that transportation planners can become involved in, transportation planning necessarily includes a wide range of interests, skills, and expertise. Perhaps the most important characteristic of any transportation planning process is to remain flexible given the dynamic nature of community planning and decision making, and the importance of transportation planning providing input into this process. This need for flexibility will be particularly important as the types of investment decisions for transportation systems evolve over the next several decades in response to changing demographic and technology factors.

[1] The original chapter in Volume 3 of this Handbook was written by Michael D. Meyer, WSP/Parsons Brinckerhoff. Changes made to this updated chapter are solely the responsibility of the editor.

II. ORGANIZATION OF THIS HANDBOOK

This handbook is organized to reflect different levels of user familiarity with transportation planning. Not only do transportation planners need to know about the defining characteristics of the transportation system itself, but given a variety of transportation planning contexts, they must also understand the specific application contexts they are working in. In addition, transportation planning can be applied at a multimodal level, for example, statewide or metropolitan transportation planning efforts where all modes of transportation are considered, or it may target a very specific transportation strategy or element, such as freight planning.

The handbook is organized to answer six major questions:

What is transportation planning?

Chapter 1: Introduction to Transportation Planning

What are the basic concepts for understanding transportation systems and their relationship to the community?

Chapter 2: Travel Characteristics and Data

Chapter 3: Land Use and Urban Design

Chapter 4: Environmental Considerations

Chapter 5: Transportation Finance and Funding

What are the types of tools and analysis methods used in transportation planning?

Chapter 6: Travel Demand and Network Modeling

Chapter 7: Evaluation and Prioritization Methods

Chapter 8: Asset Management

How does one plan for mode-specific transportation networks?

Chapter 9: Road and Highway Planning

Chapter 10: Transportation System Management and Operations

Chapter 11: Planning for Parking

Chapter 12: Transit Planning

Chapter 13: Planning for Pedestrians and Bicyclists

Chapter 14: Travel Demand Management

How does one plan for multimodal transportation networks?

Chapter 15: Statewide Transportation Planning

Chapter 16: Metropolitan Transportation Planning

Chapter 17: Corridor Planning

Chapter 18: Local and Activity Center Planning

Chapter 19: Site Planning and Impact Analysis

Chapter 20: Rural Community and Tribal Nation Planning

Chapter 21: Recreational Areas

What are some special planning applications transportation planners should know about?

Chapter 22: Integrating Freight into the Transportation Planning Process

Chapter 23: Playing it Safe—Safety Considerations in the Transportation Planning Process

Chapter 24: Public Participation and Engagement

Individual chapters provide linkages to relevant information in other chapters of the handbook. For example, transportation professionals interested primarily in chapter 12 on transit planning, will find references to other chapters on travel demand models and data collection that provide more in-depth coverage of a transit-related application. Thus, in some cases, chapters that in other texts would have spent considerable time discussing some aspect of a particular topic (such as transit demand modeling), the reader is directed to other parts of the handbook. Given the breadth of many transportation planning studies, it should not be surprising that, in some instances, almost every chapter in the handbook could be relevant to a particular study.

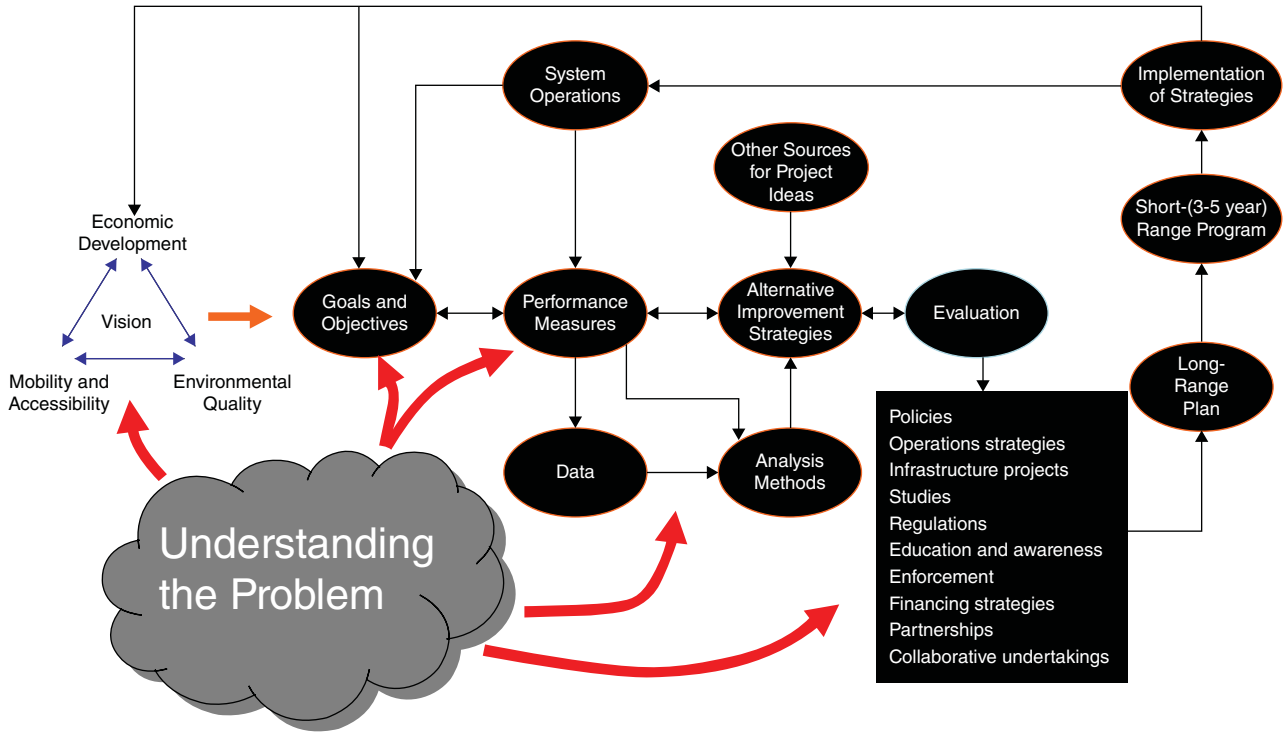
In addition, given the importance of performance measures in today's transportation planning, instead of discussing their definition and role in one chapter, the discussion of performance measures is found in each chapter where appropriate. In this way, performance measures can be discussed with specific reference to how they can be used for different modes and planning efforts.

The remainder of this chapter describes the transportation planning process and the legal/regulatory foundation in the United States for much of what occurs in transportation planning today.

III. THE TRANSPORTATION PLANNING PROCESS

Transportation planning is often portrayed as an orderly and rational process of steps that logically follow one another. In reality, planning and project development are much more complex, often with many different activities occurring concurrently. Shown in Figure 1-1, the planning process starts with understanding the problems facing a community and ending with a solution to identified problems (projects programmed and designed). In a typical planning context,

Figure 1-1. Conceptual Framework for Transportation Planning



Source: Adapted from Meyer and Miller, 2014, Reproduced with permission of M. Meyer.

many of these steps may have already occurred and therefore are not relevant to a particular planning effort. For example, metropolitan planning organizations (MPOs) in the United States have been developing transportation plans for decades, and as a result, a typical planning effort might simply be updating an existing transportation plan. In the context of Figure 1-1, the development of goals, objectives and performance measures might consist of validating those that were developed for the prior version of the plan. Even with these caveats, the planning process shown in Figure 1-1 helps identify important components of the planning process and how they relate to one another. The planning process in Figure 1-1 will be referenced throughout this handbook.

A. Major Steps in Transportation Planning

The planning process begins with an *understanding of the socio-demographic, land-use, and economic context* within which a transportation system operates. This is followed by becoming aware of the problems, challenges, opportunities, and deficiencies of transportation system performance within this context, be it a state, province, region, or community. This usually entails some form of analysis and assessment of the changing context of transportation system performance and an examination of both the existing and expected challenges facing the transportation system. This initial step is important because a planning agency usually begins a planning study based on the planning and analysis that has preceded it. More often, a transportation plan is being updated, or some specific problems have been identified that require a planning effort to be undertaken. Understanding the nature of the challenges facing a community thus becomes an important starting point for the planning steps that follow.

The next step is *developing a community or study area vision*. The dimensions of the vision portrayed in Figure 1-1 reflect the interaction among desired states of economic prosperity, environmental quality, and social equity/ community quality of life. These three factors have been chosen purposely as defining a vision because they are often considered to be the three major elements of sustainable development; a concept well-developed and accepted in recent years (see chapter 3). The vision can consist of general statements of desired end states or can be as specific as a defined land-use scenario. The visioning process often relies on extensive public outreach and is considered one of the most community-interactive steps of the planning process.

Once a vision has been defined, the next step is to *acquire more specific information* about what the vision means. What is the desired performance of the transportation system? What characteristics of community life can be most positively affected by transportation improvements? This more specific definition of a community's future is usually accomplished by *defining goals and objectives* that provide overall direction to the planning process. These goals and objectives not only help define the purposes of the planning process for the public, but can also help identify criteria to evaluate different transportation system options and alternatives.

Goals and objectives can also lead to the identification of *system performance measures*. Using measures to monitor the performance of the transportation system and the progress of transportation plans and programs is relatively new to the transportation field (see, for example, the performance management requirements of the 2012 U.S. federal transportation law—Moving Ahead for Progress in the 21st Century (MAP-21)). The primary purpose of collecting data on key system performance characteristics is to provide information to decision makers on the aspects of performance that are most important to them. Performance measures can be used to monitor whether congestion, average speeds, system reliability, and mobility options have changed over time. Many planning programs have also developed performance measures relating to such things as environmental quality, economic development, and quality of life. In these cases, transportation is just one factor that contributes to achieving overall community goals.

Collecting and analyzing data, the next step of the planning process, is key to understanding the problems and potential challenges facing the transportation system and the surrounding community. This analysis process primarily focuses on understanding how a transportation system and its components work and how changes to the system will alter its performance. A large part of the analysis step is identifying the current status of system performance. Analysis also includes identifying alternative strategies or projects that meet the objectives of the study. Analysis tools, ranging from simple data analysis to more complex simulation models, are used to produce the information that feeds the next step of the process, which is evaluation.

Evaluation is the process of synthesizing the information produced during the analysis step (for example, the benefits, costs, and impacts of different alternatives) so that judgments can be made concerning the relative

merits of different actions. As noted by Meyer and Miller [2014], evaluation should incorporate the following characteristics:

- Focus on the decisions being faced by decision makers.
- Relate the consequences of alternatives to goals and objectives.
- Determine how different groups are affected by transportation proposals.
- Be sensitive to the time period in which project impacts are likely to occur.
- In the case of regional transportation planning, aggregate information in a way that allows planners to assess the likely effects of alternatives at varying levels.
- Analyze the implementation requirements of each alternative.
- Assess the financial feasibility of plan recommendations.
- Provide information on the value of alternatives in a readily understandable form and timely fashion for decision makers.

One of the most common ways to ensure that the results of the evaluation process are linked closely to decision making is through the evaluation criteria used to assess the cost-effectiveness of individual alternatives or strategies and that reflect important decision-making concerns. These criteria provide important guidance to planners and engineers on the type of data and analysis tools to be used in producing the desired information.

Note in Figure 1-1 that planning can result in many different products. Studies can recommend the pursuit of specific transportation projects or services; they can recommend changes to institutional structures or funding programs that would make the management of the transportation system more effective. Some studies might recommend specific policy changes, such as how land-use and development plans should be linked to the transportation plan. In the United States, one of the most important products of the statewide and metropolitan transportation planning process is the development of a transportation plan. Much of what is covered in this handbook focuses on the steps necessary to develop such a plan. However, it is important to recognize that the ongoing planning process actually results in many different products aimed at improving the performance of the transportation system and in enhancing the economy and quality of life of the community it serves.

The actual program of action—in the United States called the transportation improvement program (TIP) for a metropolitan area or a state transportation improvement program (STIP) for a state—is connected to the plan through a process called *programming*. Programming matches the most desirable actions that have surfaced through the evaluation process with available funds. Priorities must be set when there are insufficient funds to satisfy all of the funding needs. This process can take many forms, ranging from political considerations to the use of systems analysis tools to assign priorities to different projects or alternatives.

Once a project or action has been programmed for implementation, its design and operation must be further refined, and likely impacts further explored. This process of refinement is called *project development*. Project development takes various forms, depending on the scope and magnitude of the project and the expected effects. Three major steps in project development include: developing project concepts, planning the project in finer detail than typically occurs in systems planning, and preliminary/final engineering. When significant environmental impacts are expected, the project development process will usually (depending on federal and state laws) include an environmental analysis process whose steps are well laid out in rules and regulations.

The final component of the framework is *system monitoring*. Note in Figure 1-1 that system monitoring provides feedback to the definition of goals and objectives and the use of performance measures. Poor system performance can lead to further planning analysis to better understand the dynamics of the underlying problem, or it might very well lead to the identification of new goals and objectives.

The planning process shown in Figure 1-1 is very different from more traditional constructs. First and perhaps most significantly, system planning as shown encompasses a broad set of planning steps. Many books on transportation planning have focused almost exclusively on analysis and evaluation, with the visioning process, program and/or project

implementation, and system monitoring occurring outside the planners' purview. The approach toward planning in this handbook adopts a much broader perspective to transportation planning.

Second, the use of performance measures is a relatively new addition to systems planning, and as shown in Figure 1-1, is a central concept to the overall process. Given the important linkage between planning and decision making that serves as the core concept in the definition of planning used in this handbook, performance measures should focus on the information of greatest concern to decision makers. Performance measures not only help define data requirements and influence the development of analytical methods, but also become a critical way of providing feedback to the decision-making process on the results of previous decisions.

Third, a major purpose of planning is to identify and analyze alternative improvement strategies and projects, which could include traditional infrastructure projects, but also actions to influence travel behavior and system performance. For example, travel demand management (TDM) strategies, such as variable work hours, rideshare programs, and parking pricing, have become important options in many metropolitan areas for reducing demand for transportation. Likewise, many intelligent transportation system (ITS) actions are not really projects as much as they are efforts to better improve transportation system performance through the use of technology. The planning process in Figure 1-1 provides for a much wider consideration of actions and strategies than what is usually considered part of the transportation planning process.

Figure 1-1 was presented primarily as a structure for planning in the United States. Other countries have their own requirements for transportation planning, or in the case of developing countries, they often follow the guidance of international lending institutions, such as the World Bank. However, although the goals and objectives, models and analysis tools, and strategies might be different from those found in the United States, the overall approach to planning in other countries is still similar to what is shown in Figure 1-1.

A final characteristic of planning proposed here is the periodic feedback provided to the original vision definition, goals statement, and identification of performance measures through system management and operations. System management and operations serves as a major source of information on transportation system performance and thus is an important indicator of system deficiencies or opportunities for improvement.

One of the useful aspects of the process shown in Figure 1-1 is that it provides a framework for assessing how comprehensive a planning process is for addressing specific issues. For example, Table 1-1, structured from Figure 1-1, is an example of how to assess the effectiveness of a transportation planning process with respect to safety issues. Similar constructs could be developed for almost any issue of concern to a community.

B. Linkage to Policy and Other Planning Efforts

Because much of transportation planning has developed in response to the needs of a nation, individual states or provinces and municipalities, a great deal of what a transportation professional does is defined by law. In the United States, for example, the Constitution establishes the structure of government and the powers, responsibilities, and limits of the different branches and levels of government. Those powers vested in the federal government take precedence over the actions and authority of state and local governments. Thus, although state departments of transportation (DOTs) and MPOs focus on state and metropolitan/local issues, respectively, federal law often requires that certain actions be taken. For example, federal law requires that each state and metropolitan area have its own transportation plan. Federal law, interpreted through regulations, requires that the process for developing these plans must have certain characteristics, such as an effective public participation process. In those areas that have not attained air-quality standards as set forth in federal regulations, the transportation system plan, improvement program and selected projects must be found to be in conformance to the adopted air quality plan. It is beyond the scope of this chapter to identify all of the U.S. federal requirements that influence transportation planning; however, some additional description of key laws that transportation planners in the United States will be exposed to is important (for more a more exhaustive presentation of relevant federal laws see [Gayle, 2009; Meyer and Miller, 2014]).

Federal guidance on transportation planning is justified by the importance of transportation to the nation—the economy, national security, and health and welfare of its citizens. It is this national purpose that generates the need for an informed and consistent approach to transportation investment across the nation, especially where federal funds are involved. Congress first established a federal requirement for metropolitan transportation planning in the Federal-Aid

Table 1-1. Assessing the Consideration of Safety in the Transportation Planning Process

Vision

- Is safety incorporated into the current vision statement of the jurisdiction's transportation plan? If not, why not?
- Is safety an important part of the mandates and enabling legislation of key agency participants in the planning process?
- Is safety an important concern to the general public and planning stakeholders? If not, should it be?
- How is safety defined by the community?
- What type of information is necessary and desired to educate the community on the importance of a safe transportation system?

Goals and Objectives

- Is safety incorporated into the current goals and objectives set of the jurisdiction's transportation plan? If not, why not? If so, what, if anything, needs to be changed in the way safety is represented?
- How does the safety goal relate to the community understanding of safety as discovered through the vision development process?
- Does the safety goal lead only to recommended project construction and facility operating strategies, or does it also relate to strategies for enforcement, education, and emergency service provision?
- Does the safety goal reflect the safety challenge of all modes of transportation, that is, is it defined in a multimodal way?
- Are there goal-related objectives that provide more specific directions on how the goal is going to be achieved? Are these objectives measurable?
- Do the objectives reflect the most important safety-related issues facing a jurisdiction?
- Can the desired safety-related characteristic of the transportation system be forecast or predicted? If not, is there a surrogate measure or characteristic that will permit one to determine future safety performance?
- What type of information is necessary and desired to educate the community on the importance of a safe transportation system as it relates to planning goals and objectives?
- If target values are defined in objective statements (for example, fatal crashes will be reduced by 20 percent), have these targets been vetted through a technical process that shows that the target value can be reached?

Performance Measures

- What are the most important safety-related characteristics of the transportation system that have resulted from community outreach efforts to date? If performance measures are used, are these characteristics reflected in the articulated set of performance measures?
- Will the safety performance of the transportation system (as defined in the performance measures) likely respond to the types of strategies and projects that will result from the planning process? That is, are the performance measures sensitive enough to discern changes in performance that will occur after program implementation?
- Are the number of safety performance measures sufficient to address the safety concerns identified in the planning process? Alternatively, are there too many safety measures that could possibly "confuse" one's interpretation of whether safety is improving?
- Does the capability exist to collect the data that are related to the safety performance measures? Is there a high degree of confidence that the data and the data collection techniques will produce valid indicators of safety performance? Who will be responsible for data collection and interpretation?
- Can the safety performance measures link to the evaluation criteria that will be used later in the planning process to assess the relative benefits of one project or strategy over others? If so, can the safety performance measures be forecast or predicted for future years?

(*continued*)

Table 1-1. (*Continued*)

Analysis—Data

- Given the definition of safety that resulted from the visioning and goals/objectives phases of the planning process, what types of data are needed to support the safety desires of the community?
- Are these data available currently? If not, who should collect these data? Are there ways of collecting these data, or are there surrogate data items that can be used to reduce the cost and burdens of data collection?
- Does the state (or region) have a systematic process or program for collecting safety-related data? If not, who should be responsible for developing one?
- Is there a quality assurance/quality control strategy in place to assure the validity of the data collected? If not, who should develop one?
- Are there opportunities to incorporate data collection technologies into new infrastructure projects or vehicle purchases (for example, surveillance cameras or speed sensors)?
- Does the safety database include safety data for all modes of transportation that are relevant to the planning process (for example, pedestrians, bicyclists, transit, intermodal collisions, etc.)? If not, what is the strategy for collecting such data? Who should be responsible?
- What types of database management or data analysis tools are available to best use the data (for example, a geographic information system)? Are such tools available to produce the type of information desired by transportation decision makers?
- Are there other sources of data in your state or region that might have relevant data for safety-related planning (for example, insurance records, hospital admissions, nonprofit organizations, etc.)? If yes, who should approach these groups to negotiate the sharing of data?
- Are there any liability risks associated with the collection and/or reporting of crash data? If so, how can your agency be protected against such risk?

Analysis—Tools

- What is the scale of the safety problem being faced? Regional? Corridor? Site-specific? Are tools available that analyze safety problems at the same scale of analysis?

Source: Washington, Meyer, et al. 2006. Permission granted by the Transportation Research Board.

Highway Act of 1962. To receive federal transportation funds, this law required urbanized areas with a population greater than 50,000 to develop a *continuing, comprehensive* transportation plan that was a *cooperative* venture with state and local governments. This requirement, known as the 3C planning process, still serves as the foundation of today's transportation plans.

The 1973 Federal-Aid Highway Act and subsequent FHWA-Urban Mass Transportation Administration (UMTA) Joint Regulations on Transportation Planning had a profound impact on the institutional responsibilities for transportation planning. For the first time, federally supported urban transportation planning was funded separately: half of 1 percent of all federal-aid funds were designated for this purpose and apportioned to the states on the basis of urbanized area population. These funds were to be made available to "metropolitan planning organizations (MPOs) responsible for comprehensive transportation planning in urban areas." The Joint Planning regulations thus required that an entity called the metropolitan planning organization be established in every urbanized area with a population of more than 50,000.

A multiyear prospectus and annual unified work program had to be submitted specifying all transportation-related planning activities for an urban area as a condition for receiving federal planning funds. The urban transportation planning process was required to produce a long-range transportation plan, which had to be reviewed annually to confirm its validity. The transportation plan had to contain a long-range element and a shorter-range "transportation systems management element" (TSME) for improving the operation of existing transportation systems without new facilities. A multiyear "transportation improvement program" (TIP) also had to be developed consistent with the

transportation plan. The TIP had to include all highway and transit projects to be implemented within the coming five years. The TIP had to contain an "annual element" that would be the basis for the federal funding decisions on projects for the coming year. The consequences of these requirements were that they changed the emphasis from long-term planning to shorter range transportation system management, and provided a stronger linkage between planning and programming. [Weiner, 1992, 2008] Most of these requirements, except the TSME of the long-range transportation plan, are still operative today.

In 1991, the Intermodal Surface Transportation Efficiency Act (ISTEA) ushered in what many saw as a new era for transportation planning in the United States at both the metropolitan and statewide levels. This law fully established MPOs as the central forum for making transportation planning and investment decisions in metropolitan areas; it required a robust public involvement process, and it provided new flexibility in the use of federal capital program funds so that MPOs and states could find the best solutions to their transportation problems, rather than funding projects that fit the eligibility requirements of specific categorical funding programs. Different planning factors were to be addressed in the transportation planning process, including the need for the plan to be multimodal and intermodal, and to better understand the linkage between land use and transportation. ISTEA also required that both the plan and the TIP be fiscally constrained to only those projects that had a reasonable expectation of funding.

Prior to ISTEA, there was no federal requirement for statewide transportation planning, although many states do such planning. Along with the new requirements for metropolitan planning, ISTEA required states to create a planning process that would produce a long-range, intermodal statewide transportation plan and a short-range program of projects. While the process and content of the statewide plan did not have to be as rigorous as the MPO plan, Congress did include a list of planning factors that states were to consider.

The Moving Ahead for Progress in the 21st Century Act (MAP-21) passed in 2012 consolidated numerous categorical funding programs into a much smaller number of programs. For transportation planning, its biggest impact was in its requirement for state DOTs and MPOs to adopt performance measures. [FHWA, 2014a] The U.S. DOT was required to establish performance measures for safety, pavement conditions, bridge conditions, operational performance of the Interstate, operational performance of the non-interstates on the National Highway System (NHS), freight movements, mobile source emissions, and congestion. For transit, the U.S. DOT must "establish a national transit asset management system and performance measures for keeping transit in a state of good repair." States and MPOs were to establish targets for each performance measure, and adopt a "performance-based approach" in planning and programming transportation projects. This performance-based planning and programming approach was more than just imposing performance measures on states and MPOs; it also required MPOs to measure and report on the outcome of investments from the TIP/STIP as they affected the travelling public. [FHWA, 2014a]

In recognition of the important role that freight plays in the national, state, and regional economies, MAP-21 required the U.S. DOT to report biennially on the conditions and performance of the "national freight network," and to develop tools for "an outcome-oriented, performance-based approach to evaluate proposed freight-related and other transportation projects." The transportation goals specified in this law for the federal highway programs included:

- "*Safety* — To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.
- *Infrastructure Condition* — To maintain the highway infrastructure asset system in a state of good repair.
- *Congestion Reduction* — To achieve a significant reduction in congestion on the National Highway System.
- *System Reliability* — To improve the efficiency of the surface transportation system.
- *Freight Movement and Economic Vitality* — To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.
- *Environmental Sustainability* — To enhance the performance of the transportation system while protecting and enhancing the natural environment.
- *Reduced Project Delivery Delays* — To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices." [FHWA, 2014b]

The most recent federal transportation legislation (as of the date of publication of this handbook) is the Fixing America's Surface Transportation (FAST) Act. This law reaffirmed the planning requirements of MAP-21 and added the following requirements to the metropolitan planning process.

- "Continue to require metropolitan transportation plans and transportation improvement programs (TIPs) to provide for facilities that enable an intermodal transportation system, including pedestrian and bicycle facilities. It adds to this list other facilities that support intercity transportation (including intercity buses, intercity bus facilities, and commuter vanpool providers).
- Expand the scope of consideration of the metropolitan planning process to include: improving transportation system resiliency and reliability; reducing (or mitigating) the stormwater impacts of surface transportation; and enhancing travel and tourism. Specifically, it required the consideration of strategies to reduce the vulnerability of existing transportation infrastructure to natural disasters. [FHWA, 2016]
- Add public ports and certain private providers of transportation, including intercity bus operators and employer-based commuting programs to the list of interested parties that an MPO must provide with reasonable opportunity to comment on the transportation plan."

Given that transportation plays such a critical role in a nation's economy and in promoting the well-being of its citizens, it should be no surprise that transportation is part of many other legislative initiatives aimed at achieving nontransportation goals such as economic development and environmental quality. Again, it is beyond the scope of this handbook to identify all such laws. In terms of impact on transportation planning and project development, the most notable are the National Environmental Policy Act (NEPA), the Clean Air Act (and its amendments), and the Americans With Disabilities Act (ADA). [Gayle, 2009] Chapter 4 on environmental considerations in the planning process discusses these and other laws and regulations relating to environmental factors; chapter 12 and chapter 13 on transit planning and pedestrian and bicycle planning, respectively, describe ADA requirements for transit and pedestrian facilities; and chapter 15 and chapter 16 discuss the laws and regulations relating specifically to statewide and metropolitan transportation, respectively.

State governments also create and enforce laws relating to transportation (where not superseded by federal law). For example, a state can pass laws regulating the licensing and operations of trucks or other vehicles moving freight, but state laws cannot impede interstate commerce, which is protected by the Constitution. State laws are important in transportation for several reasons. First, they create the institutional structure for transportation planning at the state and, in many cases, metropolitan levels. That is, state DOTs and their roles and responsibilities are defined in state statutes, as are the roles and responsibilities of MPOs. Second, local units of government such as cities and counties are created by state governments. These local governments often cannot adopt laws and policies or raise taxes without enabling legislation from the state legislature. For example, in most states, a city cannot adopt a sales tax for transportation purposes without approval from the state. Third, state governments pass laws that can have significant impact on transportation planning. In Washington state and California, for example, state environmental laws require that statewide and metropolitan transportation plans undergo an environmental review to determine potential environmental consequences of the plan's proposed investment strategy. Finally, state governments establish their own sources of funding for transportation investment, which are even more important than federal sources for supporting a state's transportation system.

Similar to federal laws that recognize transportation's influential role in achieving nontransportation goals, other types of state-mandated planning often include transportation as a means of accomplishing program goals and objectives. Some examples of the linkage between transportation planning and other planning efforts are provided below to illustrate how transportation planning influences, and is influenced by, other planning activities.

Oregon: In many states, land use planning is the responsibility of local governments with only minimal guidance from state law. In 1973, the state of Oregon established the Land Conservation and Development Commission along with fairly rigorous (at least by the standards of most states) policy requirements for local planning. Subsequent goals adopted by the commission, which by reference have the force of law, cover numerous topics including the relationship between transportation and urbanization. The adopted transportation goal spells out the required content of transportation plans, while the urbanization goal includes adopting urban growth boundaries. In Oregon, state law clearly influences the range of actions to be considered in the transportation planning process. [Abbot, 2014]

New Hampshire: Transportation plans often demonstrate the need for future travel corridors in a metropolitan area or state, whether highway or transit. However, once a corridor is designated in a plan, developers may see it as a preferred