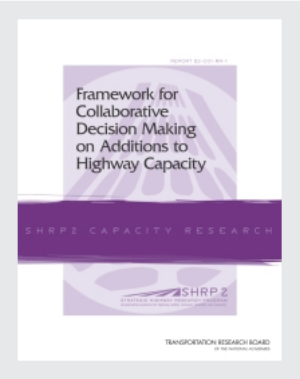

Framework for Collaborative Decision Making on Additions to Highway Capacity

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The Second
STRATEGIC HIGHWAY RESEARCH PROGRAM

SHRP 2 REPORT S2-C01-RR-1

Framework for Collaborative Decision Making on Additions to Highway Capacity

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TRANSPORTATION RESEARCH BOARD

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The Second Strategic Highway Research Program

America's highway system is critical to meeting the mobility and economic needs of local communities, regions, and the nation. Developments in research and technology—such as advanced materials, communications technology, new data collection technologies, and human factors science—offer a new opportunity to improve the safety and reliability of this important national resource. Breakthrough resolution of significant transportation problems, however, requires concentrated resources over a short time frame. Reflecting this need, the second Strategic Highway Research Program (SHRP 2) has an intense, large-scale focus, integrates multiple fields of research and technology, and is fundamentally different from the broad, mission-oriented, discipline-based research programs that have been the mainstay of the highway research industry for half a century.

The need for SHRP 2 was identified in *TRB Special Report 260: Strategic Highway Research: Saving Lives, Reducing Congestion, Improving Quality of Life,* published in 2001 and based on a study sponsored by Congress through the Transportation Equity Act for the 21st Century (TEA-21). SHRP 2, modeled after the first Strategic Highway Research Program, is a focused, time-constrained, management-driven program designed to complement existing highway research programs. SHRP 2 focuses on applied research in four areas: Safety, to prevent or reduce the severity of highway crashes by understanding driver behavior; Renewal, to address the aging infrastructure through rapid design and construction methods that cause minimal disruptions and produce lasting facilities; Reliability, to reduce congestion through incident reduction, management, response, and mitigation; and Capacity, to integrate mobility, economic, environmental, and community needs in the planning and designing of new transportation capacity.

SHRP 2 was authorized in August 2005 as part of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The program is managed by the Transportation Research Board (TRB) on behalf of the National Research Council (NRC). SHRP 2 is conducted under a memorandum of understanding among the American Association of State Highway and Transportation Officials (AASHTO), the Federal Highway Administration (FHWA), and the National Academy of Sciences, parent organization of TRB and NRC. The program provides for competitive, merit-based selection of research contractors; independent research project oversight; and dissemination of research results.

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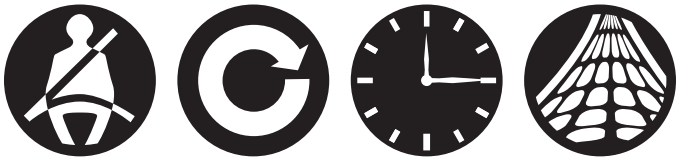

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FOREWORD

Stephen J. Andrle, *SHRP 2 Deputy Director*

"Elected officials and the public are demanding that highway projects be delivered both faster and in a more environmentally friendly manner. If we are going to meet both expectations, our profession will need to change the way we develop projects. The SHRP 2 Capacity program developed a collaborative decision-making process that is based on sound research and will serve as the new way of doing business in highway project development in the 21st century."

—Neil Pedersen, Former Administrator, Maryland State Highway Administration, and Former Co-Chair, SHRP 2 Capacity Technical Coordinating Committee

Role of Capacity Project C01 in SHRP 2

SHRP 2 was intended to address the most critical needs associated with the nation's highway system. One of the critical needs identified was being able to provide highway capacity in support of the nation's economic, environmental, and social goals, and Congress specified the Capacity focus area as one of four focus areas for SHRP 2. Projects to expand highway capacity were frequently having difficulty obtaining approvals in a timely manner. In the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) of 2005, Congress accepted TRB Special Report 260 (*1*), which specified the following goal for the Capacity focus area: "Develop approaches and tools for *systematically* integrating environmental, economic, and community requirements into the analysis, planning, and design of new highway capacity" (emphasis added).

SHRP 2 Project C01, A Framework for Collaborative Decision Making on Additions to Highway Capacity, describes foundational research for the SHRP 2 Capacity program. Its scope spans long-range transportation planning, corridor planning, project programming, and environmental review and permitting. The project provides a framework for collaborative decision making by identifying 44 decision points that are common or similar across all states and metropolitan planning organizations (MPOs). On the basis of research from 23 successful complex capacity-expansion projects, it was recognized that at each of these points, collaboration is usually required to get the sign-off of key decision makers; it was a common characteristic of the successful process followed in each of the projects. The framework that was developed is used to organize the case study information on decision making, gathered under Capacity Project C01, according to the point in the highway delivery process where it is most useful. The case study material in this report is organized by preselected topics likely to be of use to the reader. However, because of the magnitude of the number of topics to which the case study material could apply, the information is also available in a searchable, web-based form: Transportation for Communities—Advancing Projects through Partnerships (TCAPP; http://www.trb.org/Main/Blurbs/166046.aspx). The full case studies are provided in TCAPP and on the SHRP 2 website (http://www.trb.org/Strategic

HighwayResearchProgram2SHRP2/Pages/Case_Studies_in_Collaboration_373.aspx). Note that TCAPP has since been renamed PlanWorks and will be made available under that name by the Federal Highway Administration (FHWA).

About This Report

This report describes a decision-making framework that supports collaborative business practices for reaching decisions on how to add highway capacity when it is deemed necessary. The framework consists of the key decision points in the various processes at which approvals are required to advance. This framework provides structure for all the insights from the 23 case studies in which collaborative methods were successful in achieving consensus and delivering needed highway capacity expansions. The report summarizes the findings from these case studies, discusses barriers and how they were overcome, and describes how technologies were used to assist in reaching decisions. The report concludes with a description of the web tool, now called PlanWorks, which helps practitioners diagnose their business practices that either require or would benefit from collaboration. The collaborative entities include state and local transportation agencies; FHWA, including division offices and resource centers; the public; nongovernmental organizations; state resource agencies; and federal environmental regulatory agencies.

Reaching Decisions That Deliver Capacity

The demographic, social, and economic forecasts through the middle of the 21st century indicate that additional highway capacity will be needed, and experience indicates that collaboration and compromise will be needed to achieve it. Over the next four decades, the U.S. population is expected to grow by 40% to 420 million in 2050 (*2*). Between 1985 and 2005, vehicle miles traveled increased 80%, but lane miles increased only 4% (*2*), thus consuming much of the highway capacity built during the Interstate construction period. It is estimated that an 80% expansion—an additional 173,000 Interstate lane miles—will be needed to meet the demand for car and freight travel through the middle of the century (*3*). In addition, the population is not expected to grow evenly but to cluster in megaregions (*2*). The demands on highway capacity in these regions will be particularly great.

Although much of the projected expansion of highways involves only widenings and upgrades, the public demands that we get the most out of our existing highways through better operations and management before they will consider supporting expansion. There is also an expectation to do more than just mitigate impacts. Transportation agencies are expected to be stewards of the environment with respect to natural habitats, wetlands, air quality, and greenhouse gas emissions. In addition, the agencies are expected to enhance communities, delivering transportation capacity that people want and that makes their communities more desirable places to live. Because many interests are represented, finding the most appropriate solutions only gets harder. The price for failure to work together is endless redo loops in the planning and design processes, lawsuits, delays, and cost escalation.

Many of the strategies involved are familiar: consultation, ecological approaches to mitigation, practical or context-sensitive design, broad-based performance measurement, environmental justice, integrated corridor management, rightsizing, integrating planning and the requirements of the National Environmental Policy Act (NEPA), commitment tracking,

and others. "Systematically" is emphasized because these strategies are often not woven into the planning and programming processes.

Transportation agencies today are charged with faster delivery of the right transportation solutions. To speed project delivery and have the flexibility to consider nontraditional solutions, the entire organization needs a systematic approach to collaboration, ensuring that the right people are engaged at the right time with the right information. The collaborative decision-making framework provides this systematic approach. It is delivered as a web-based resource that can be used as a troubleshooting guide or a road map to changing a business process.

How do we translate the most successful of these practices into business as usual? How can 50 states and more than 350 MPOs, at least six federal agencies and their many regional offices, and hundreds of state environmental organizations do this efficiently and repeatedly? And should they? What is the business case for this approach from all perspectives? Will a transportation or environmental agency be better off if these strategies are adopted? The case studies on which the framework is based and eight subsequent pilot tests of PlanWorks indicate that agencies would be better off.

PlanWorks

The framework is made accessible as an integrated web-based resource designed primarily for practitioners. As noted above, it identifies key decision points in four phases of transportation decision making: long-range transportation planning, corridor planning, programming, and environmental review and permitting. Key decisions are those that require review and approval from higher levels of authority or a consensus among diverse decision makers before the project can advance. They effectively link the many steps of planning and project development. Many key decision points are common to most transportation agencies. Some are defined by law; others follow established practice.

The framework offers detailed information for each key decision point, such as the following:

- The outcomes of each key decision point;
- The decisions made at each key decision point;
- The roles and responsibilities of the formal decision makers;
- Stakeholders or project champion roles and relationships;
- Supporting data, tools, and technology;
- Planning processes other than transportation;
- Primary products of the step; and
- Associated case studies of effective practices.

Integrating the Research

The decision-point structure underpinning PlanWorks serves a larger purpose as well. The results from 10 other SHRP 2 studies were integrated into PlanWorks over a four-year period as each was completed. The decision points provide the organizational structure for these SHRP 2 products by calling the user's attention to them at the point or points in the highway delivery process where the information is needed and by making it all accessible through a general search.

The products and outcomes of other SHRP 2 research are integrated into the framework to strengthen the basis for decisions about when, where, and how much capacity is needed; what the economic impacts will be; and how to build capacity in ways that enhance communities and the environment. These products include the following:

- A customizable performance measurement framework with links to key decision points and case studies of expedited decision making.
- Guides for integrating freight demand, greenhouse gas emissions, land-use issues, and travel time reliability performance measures into transportation planning and programming.
- Tools for estimating the economic impact of new capacity; for implementing an ecosystem approach to environmental review and permitting; for determining driver responses to congestion and pricing; and for analyzing the effect of operations, technology, and design on highway capacity.
- Strategies for linking community vision to transportation decision making; for minimizing disruption by managing construction at corridor and network levels; and for improving freight demand models and data.
- Major advances in travel demand modeling that will be sensitive to policies such as pricing, telecommuting, time and route choices, and mode selection.

Along with the collaboration tools, the research outcomes of these other SHRP 2 projects collectively map a route to decisions that deliver highway capacity.

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CONTENTS

Executive Summary

"Effective and efficient delivery of transportation improvements" has become a mantra in the transportation profession. This desire has been supported by legislative mandate to become more inclusive of broader interests and needs at the earliest possible time. Successful plans and projects have demonstrated that if everyone is brought into the discussion of how to support transportation system needs, the right solutions will be found. This means the right solution the first time.

The implementation of transportation improvements has a profound impact on quality of life. Although there is universal recognition of the value of a robust transportation system, the agencies responsible for delivering the transportation system often meet with resistance because of environmental, social, or financial impacts. Transportation decision making must combine an interest in the efficiency and effectiveness of the transportation system with an interest in quality of life. The perceived interest in one at the expense of the other by individuals or groups has often resulted in stalled or eliminated improvement projects that are actually needed by all.

The research conducted for this project indicates that at least part of the answer to delivering the necessary capacity with increased environmental and community integration lies in systematically institutionalizing collaborative decision making. It is essential to have the right people at the table at the right time with the right information to make good choices that will stand up to scrutiny. Collaboration among decision-making partners, as well as stakeholders, has one essential commonality: involvement is based on what matters to them. It is not necessary that the interests are common to all, but rather that the importance of individual interests are acknowledged, respected, and included in the process. This report describes a flexible and adaptable Collaborative Decision-Making Framework (CDMF or Framework) that provides specific information on how to support collaborative decision making within existing laws and regulations.

Contribution of Case Studies

From a real-world perspective, 23 case studies provide examples of and data about successful collaborative decision making. The selected case studies represent a diverse group of highway planning and projects ranging from a simple bridge reconstruction to a full corridorwide planning program. Eight case studies focused specifically on solution screening—possibly the most complex and difficult component of transportation decision making.

In addition to identifying successful examples of collaborative decision making, the case studies provide:

- Key findings regarding the transportation decision-making process;
- Barriers that agencies frequently face; and
- Factors that significantly contribute to a project's success.

In the case study examples, decision making varied considerably when it came to timing—some processes took considerably longer and several required a redo. Environmental and community impacts and the general lack of integration of transportation decision making with other processes, such as land-use planning, stood out as significant barriers. Other barriers included lack of collaboration across the phases (i.e., long-range planning through environmental review) of transportation decision making, turnover and loss of key leaders, funding constraints, challenges in solution screening, and insufficient involvement of both partner agencies and the public.

The success of many projects is traced to a number of contributing factors. They include the following:

- Responding well to a proactive approach or a sense of urgency, especially when delays were beyond agency control;
- Making an effort to link long-range transportation planning and project development;
- Using corridor planning to bridge the scale difference between long-range and project planning;
- Following a structured decision process;
- Having effective project management skills, specifically identifying and managing risk;
- Having leaders and project champions, within the political arena or business structures;
- Developing and using context-sensitive solutions; and
- Having technology support, performance measures, and evaluation criteria.

The case studies also reinforced the perception that available funding and political support can either propel a project forward or significantly hold it back. A strong environmental ethic was commonplace—whether that happened through early coordination with resource agencies or by taking an ecoregional approach to project delivery.

Collaboration was a consistent theme throughout the case studies. State departments of transportation (DOTs) and their project stakeholders collaborated in a variety of ways. Emphasis was placed on compromising to reach consensus, employing skilled facilitators, and thinking creatively about how best to engage others. Collaborative processes were often well-organized and structured. Collaboration was encouraged by showing flexibility and responsiveness, working early with advocacy groups, and taking advantage of opportunities that otherwise might have been overlooked.

To systematize the successful practices embodied by the cases, the fundamentals of each approach needed to be extracted and incorporated into a widely applicable framework built around key decision points. Practitioners are eager for examples of successful practices that they can use to enhance their own decision making. However, case studies have their individual contexts, and even the most carefully documented case does not provide sufficient insights on how to collaborate successfully in other situations. A further difficulty for individual practitioners is finding the time and resources to extract useful and applicable information from this vast case study literature and hone it to support the unique process in which they work. These problems are addressed in the CDMF by delivering the case study and supportive material in a searchable, web-based format organized around decision points in the planning, programming, environmental review, and permitting processes. Table ES.1 identifies how the Framework addresses the major barriers identified in the case studies and incorporates the success factors. A description of the actual design of the Framework follows the table.

Framework Design

The Framework is a set of 44 key decision points common to all states. This structure is useful for organizing the insights found in the case studies, as well as for practitioners to perform a gap analysis by comparison with their existing process. The Framework was designed by groups of professionals working together as peers, bringing knowledge from different processes and perspectives. Their charge was to imagine how it could work. The final design of the Framework is the result of their collaboration.

Table ES.1. How Framework Addresses Major Barriers and Incorporates Success Factors

Barrier Identified in Case Studies	Applicable Solutions from Case Studies
Cross-phase issues	• Link phases of transportation decision making • Structure the decision-making process
Lack of integration with external processes	• Use a context-sensitive approach • Integrate transportation, land-use, and environmental issues
Insufficient engagement of the public and agencies	• Collaborate with agency partners and the public
Turnover and loss of key leaders	• Structure the decision-making process
Funding constraints	• Manage risks
Challenges in solution screening	• Use performance measures and evaluation criteria • Link phases of transportation decision making
Data availability	• Link phases of transportation decision making • Integrate transportation, land-use, and environmental issues • Structure the decision making • Collaborate with agency partners and the public

To make the Framework applicable to the entire universe of transportation participants, the structure had to be somewhat generalized. Individual agency procedures must fit under the collaborative umbrella without requiring wholesale upheaval of the current process. For this reason the Framework is organized to support collaboration leading up to key decision points that require approval from a higher level or external authority, need consensus among decision makers, or are required by law or regulation. The philosophical basis of the Collaborative Decision-Making Framework is that by institutionalizing collaboration at key decision points, collaboration in the supporting technical process will follow. Exactly how collaboration is implemented will vary from state to state or region to region.

The Framework is a structure of key decisions beginning with the initiation of a long-range plan (LRP) and concluding at a Record of Decision (ROD) in the environmental review process. Between these two milestones are many key decisions that can be grouped into individual areas, or phases, of transportation decision making: long-range planning, corridor or subarea planning, programming, and environmental review merged with permitting. The Framework is built on the foundation of decision processes in the case studies, addresses the major barriers, and incorporates the success factors identified in the case studies; it was refined and vetted through practitioners' workshops. Each key decision contains extensive information for practitioner use. The basic information captured at each key decision answers three main questions:

- Who are the collaborative decision-making partners?
- What information do the decision makers need?
- How does the technical process support making the decision?

Engaging with the Framework in its entirety is not necessary or even advisable. It is possible to select a series of individual key decisions, either within a phase or across phases, to address a particular challenge or need. Examples of these applications include linking long-range planning and the National Environmental Policy Act (NEPA), project streamlining, and stakeholder collaboration. In addition, the web tool offers a collaboration assessment that both practitioners and stakeholders can use to evaluate their transportation decision-making processes and find strategies for improvement. As practitioners become more familiar with the tool, new applications can be designed to support any individual process or need, providing professionals support tailored to their individual process.

Because the Framework is an organizing structure for data that supports collaboration, more data will be added over the life of the second Strategic Highway Research Program (SHRP 2) and perhaps beyond. Other SHRP 2 Capacity research projects provide support and enhancement of the Framework. Research topics that will be integrated into the Framework include performance measurement, economic impacts, visioning, greenhouse gas emissions, freight mobility, and system reliability, among others.

The Framework has the ability to transform individual business processes in transportation agencies by driving collaboration back into the small steps of making decisions. A change in business process will result from voluntary organizational evolution as more experience and success are achieved. What may begin as an interest in the selection of alternatives during environmental review may migrate back into the planning phase to the collection of scenario information. This can only happen when the full transportation decision-making partnership is engaged with the necessary support to make the right decisions.

CHAPTER 1

Introduction

> Things were not going well. The report being delivered on progress made was accurate and supportive, but no one was buying it. Sixty or seventy public involvement sessions, and he had never seen the people in this room before. The policy makers were obviously anxious, feeling unprepared for what was going to happen next. A year and a half of study activity was about to go up in flames.

Although the details may be different, almost everyone in the transportation profession can recall a situation in which they felt just like this. Interestingly, this specific incident ultimately resulted in a strong example of a collaborative corridor study. It happened in Los Angeles, California, and the result of this effort created an agreement among the primary partners to jointly fund the environmental review necessary to keep the project moving—as long as it was conducted the way the project leadership had learned would work.

This particular corridor study to identify needed improvements along I-710 into the Port of Los Angeles initially progressed in a way that would be familiar to most practitioners. The correct steps were in place, the technical analysis was led by a major consulting firm with strong expertise, the public involvement plan was robust and the outreach inclusive; however, as the study progressed, the stakeholders did not feel heard. They could not perceive that the decision makers were representing their interests. The staff had provided all the necessary information to make a sound, defendable decision, but the concern of most interest to the stakeholders was not captured. That interest was the toxic effect of diesel emissions and its impact on the quality of life in the region.

A pivotal moment came at one particular meeting, when everyone recognized that a major change needed to occur to save a much needed corridor study. The project direction and decision-making structure had to change dramatically, and that change needed to be communicated to the stakeholders immediately. In that meeting, the decision makers crafted the guiding principles that led the project forward: the creation of two stakeholder committees, new consultant support, and a new process for collecting public input. The recommended improvements along the corridor were universally supported and moved quickly into the environmental review process. The decision-making partnership that led the study committed $5 million to support environmental review, carrying through the outreach and involvement efforts that had supported the corridor study to that point.

This example and many others make clear that "redo loops" are all too common in transportation decision making. However, with growing needs and shrinking funding, the redo loop is simply too expensive. "Effective and efficient delivery of transportation improvements" has become a mantra in the profession. At the highest level, this desire has been supported by legislative mandate to become more inclusive of broader interests and needs at the earliest possible time.

The redo loop is only one example of the risk associated with failure to fully collaborate with partners and stakeholders. A lack of collaboration with decision-making partners can make it more difficult to obtain the supporting actions needed to fully implement the project alternative. This is most often an issue with the resource agency partners that provide the regulatory approval necessary for implementation. However, it may be just as meaningful if local land-use agencies fail to adopt a land-use policy or plan in support of the transportation improvement. Stakeholders in the general public often find the transportation decision-making process confusing and frustrating, which leads to mistrust of the transportation agency. This lack of public trust may not be apparent until late in the process; if decisions must be revisited at that point, inefficiencies and delays in project delivery may result.

The goal of this research is to take successful practices in collaboration, like the new direction taken in the I-710 case, and pair them with the ideas and experience of stakeholders and partners of the transportation decision-making process to build a systems-based, transparent, well-defined framework

for consistently reaching collaborative decisions on transportation capacity enhancements. This involves bringing the right people into the transportation decision-making process at the right points, to find the right solution the first time. The Collaborative Decision-Making Framework (Framework or CDMF) is the outcome of this vision.

The Framework was developed from 23 in-depth, detailed case studies of innovative practices in collaborative transportation decision making, six workshops bringing together partners and stakeholders of the transportation decision-making process, and an extensive process of review and refinement. The case studies were used to identify barriers and success factors to collaborative transportation decision making, as well as the specific elements of a project or plan that support collaboration. Chapter 2 provides brief descriptions of the case studies along with a summary of the overall approach to developing the Framework. The barriers and success factors that were the most prevalent in the case studies or the most widely applicable to the Framework are discussed in Chapter 3 and Chapter 4, respectively. Chapter 5 is a description of the Framework and a demonstration of how the barriers and success factors were used as foundational material for the Framework design; the chapter also contains a database of key decisions from the case studies and input from practitioner workshops. The Framework, as well as the tools and applications developed to support its use, will be available in a publicly accessible web tool to be completed in 2010. The structure and expectations for the tool are described in Chapter 6.

CHAPTER 2

Approach

Most transportation professionals would say they are interested in collaboration. They often cite two reasons: (1) an interest in the efficiency and effectiveness of the transportation system, and (2) an interest in quality of life. There are good examples in practice of how collaborative approaches benefit the transportation decision-making process by supporting both of these interests. In fact, case study examples contribute to the belief that collaboration is a key ingredient in successful transportation projects. But what makes these situations successful when so many others are not?

The Framework is meant to be a useful tool that advances the state of the practice in transportation decision making. One way of achieving that goal was to use actual case studies and input from practitioners to identify the barriers, success factors, and structure of successful collaborative decision making in practice. By using case studies and input from practitioners to build the Framework, the Framework speaks to real needs and helps implement collaborative practices on a broad scale.

Contribution of Case Studies

The development of the Framework began with the collection of case study examples of collaboration in all phases of transportation decision making. The initial list of cases to consider represented several hundred examples. Ultimately, 23 case studies were selected, providing geographic diversity, a balance between planning and project development examples, and special focus on solution screening.

To capture detailed information that would help in developing the Framework, the case studies were categorized as comprehensive cases, phase cases (planning and project development), and solution screening cases.

- *Comprehensive case studies* examine the entire transportation decision-making process, starting with concept development in a planning study (long-range, corridor, or subarea) through project planning, design, and permitting.
- *Phase case studies* focus on just one phase of the overall process, to better extract detailed information on key decision points. Specifically, planning phase case studies focus on long-range planning, corridor planning, or visioning processes. Project development/permitting case studies focus on the National Environmental Policy Act (NEPA) process, design, and permitting. Phase case studies were intended to help gather in-depth information about the data, analyses, processes, and tools that support technical and policy decisions, and to yield detailed information for each decision point.
- *Solution screening case studies* focus on one of the most difficult aspects of transportation decision making—the selection of a preferred option from all those considered. These case studies span all phases of transportation decision making (including visioning) but focus solely on the solution screening process within each phase. The innovative use of technology for solution screening was a key factor in the selection of these cases.

A brief summary of each case study is provided below. The case studies, in their entirety, are available online at http://www.trb.org/StrategicHighwayResearchProgram2SHRP2/Pages/Case_Studies_in_Collaboration_373.aspx.

Comprehensive Case Studies

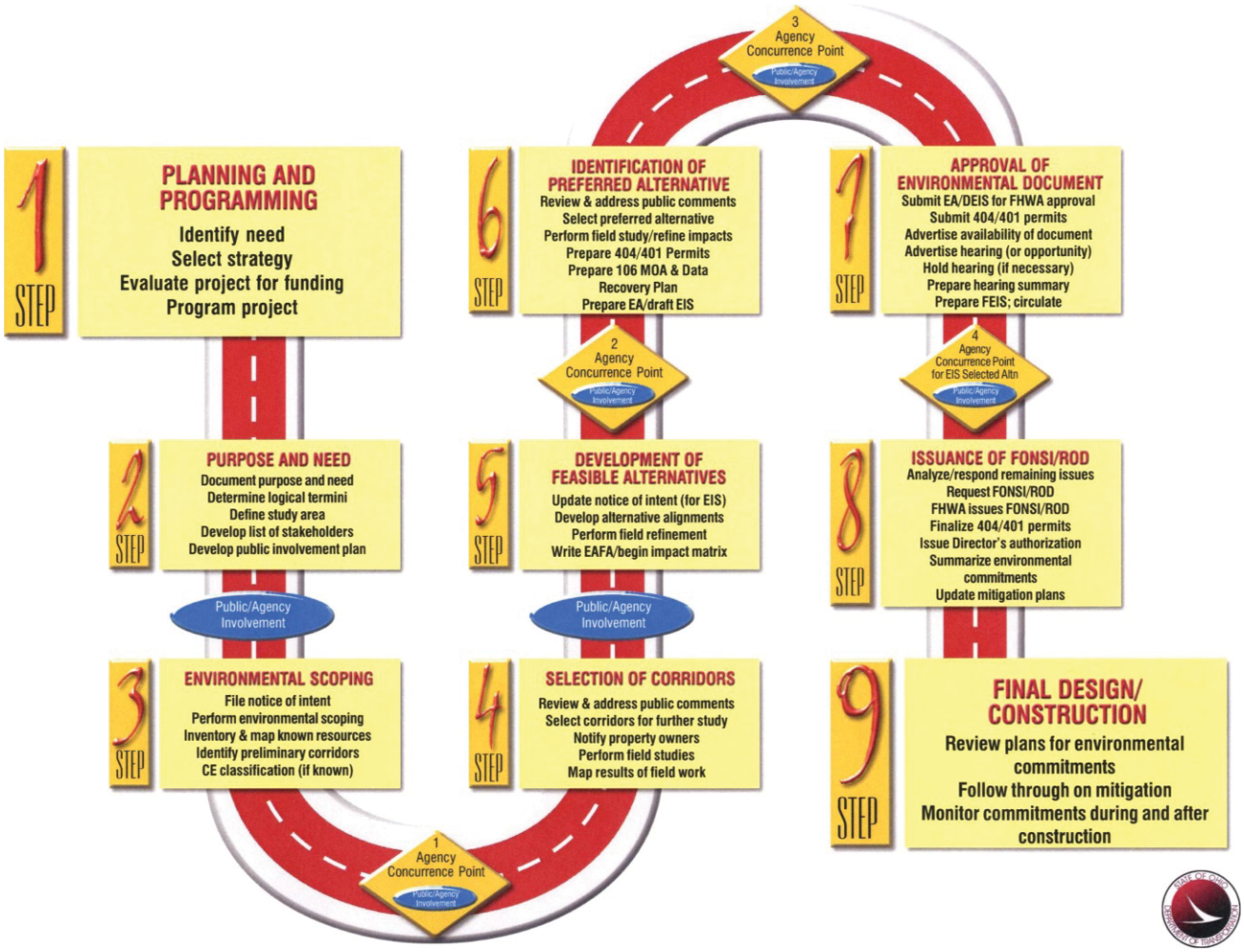
- *Utah I-15 NOW.* Utah DOT's primary objective for the Interstate 15 New Ogden Weber (I-15 NOW) improvements was the fast and effective delivery of upgrades. Accelerated Construction Technology Transfer (ACTT) workshops and a design-build approach along with supplemental legislative funding streamlined the project development process.
- *US-24 New Haven, Indiana, to Defiance, Ohio, Environmental Impact Statement (EIS) Transportation Development Process.* The US-24 corridor runs between Ft. Wayne, Indiana, and Toledo, Ohio, as a largely rural facility, providing a crucial link to the Port of Toledo. Ohio DOT followed a

nine-step collaborative process to streamline environmental review, as depicted in Figure 2.1.

- *Colorado US-285 Corridor.* This project is a highly successful example of planning and development of additional highway capacity in an area with significant environmental issues. The project planning process combined project development, environmental review, and solution screening into a single interactive and highly collaborative process.
- *Texas Kelly Parkway.* This corridor study aimed at developing a new highway in San Antonio in response to the closing of the Kelly Air Force Base. The project highlights the relationship between economic redevelopment initiatives and local participation. It catalyzed the community through direct involvement in developing project criteria and in screening design alternatives.

Planning Phase Case Studies

- *Washington I-405 Corridor Study.* Washington State DOT (WSDOT), Federal Highway Administration (FHWA), Federal Transit Administration (FTA), Sound Transit, King County, and local governments joined to assess improvements needed in the I-405 corridor in Seattle. As a pilot study for improved transportation decision making, Reinventing NEPA developed solutions through a programmatic EIS.
- *New Jersey Route 31 Integrated Land Use and Transportation Plan.* New Jersey DOT (NJDOT) embarked on one of its first efforts to respond to the state's smart growth principles within the project EIS through collaboration with Flemington Borough and Raritan Township.
- *Colorado STEP UP.* The North Front Range Metropolitan Planning Organization (NFRMPO) partnered with Colorado DOT and FHWA to pilot an integrated planning project called STEP UP, which was aimed at getting early involvement of resource agencies. This effort was supported by interactive web-based geographic information system (GIS) technology. Colorado DOT is pursuing statewide availability of this type of technology interface.
- *Binghamton Transportation Plan.* The Binghamton Metropolitan Transportation Study (BMTS) in New York State



Source: *US-24 New Haven to Defiance Draft Environmental Impact Statement,* Ohio Department of Transportation, July 2003.

Figure 2.1. US-24's nine-step transportation development process.

used scenario planning to engage business leaders, economic development professionals, health-care organizations, arts advocates, and others. Transportation investments focus on the region's urban centers during a time of population loss.
- *California I-710 Corridor Study.* Improvements to a congested freeway in Los Angeles were almost abandoned due to public mistrust. The study was redirected to arrive at a solution supported by all stakeholders by adopting collaborative guiding principles.
- *Maricopa Regional Transportation Plan (RTP).* In Arizona, the Maricopa metropolitan planning organization (MPO) included members of the business community on the policy board in an effort to gain support from both the public and the legislature for the new RTP and the funding it required. The result was broad acceptance for identified transportation system improvements supported by sales tax revenue for implementation.
- *Idaho's Transportation Vision 2033.* This project was investigated as both a planning phase case study and a solution screening case study. The Idaho Transportation Department (ITD) initiated an extensive dialogue and strategy process to create Idaho's transportation vision through 2033. In this visioning exercise, MetroQuest, interactive regional scenario analysis software, was used to create and evaluate alternative scenarios in real-time based on input from stakeholders.

Project Development/Permitting Phase Case Studies

- *Oregon I-5 Beltline Interchange.* Interstate 5 divides the cities of Eugene and Springfield in west-central Oregon. Oregon DOT used a community-based decision-making process to get buy-in from diverse stakeholders to complete an environmental assessment (EA).
- *North Carolina US-64 Bypass.* North Carolina DOT (NCDOT) followed a merged NEPA and Section 404 permit application process to conduct the environmental review process for the bypass, meeting the needs of the North Carolina Zoo and a Hispanic community along the corridor.
- *Michigan US-131 S-Curve.* US-131 faced serious structural damage due to settlement of a bridge pier in downtown Grand Rapids. Michigan DOT, through collaboration with the MPO, local leaders, and business community, successfully replaced the bridge and 1.2 miles of associated roadway in less than 3 years without detrimentally affecting the downtown economy.
- *Woodrow Wilson Bridge Project.* Carrying traffic between Maryland and Virginia as part of the I-95 system, the Woodrow Wilson Bridge routinely experienced heavy congestion and major traffic delays. FHWA developed a collaborative approach which resulted in consensus on a high-quality design for the bridge.

Solution Screening Case Studies

- *Caltrans's Corridor System Management Plan.* California Department of Transportation's (Caltrans's) corridor system management plans (CSMPs) focus transportation planning efforts on the use of all facilities within an urban corridor. The process is used during corridor planning to select a preferred congestion management strategy. The CSMP for I-880 in Alameda County was based on a series of performance measures in three key areas: mobility, reliability, and safety.
- *Florida's Efficient Transportation Decision-Making Process.* Florida's Efficient Transportation Decision-Making (ETDM) Process is the transportation planning process Florida uses to accomplish early agency participation, efficient environmental review, and meaningful dispute resolution. The process involves screening transportation projects during long-range planning and programming. The ETDM Process is supported by an Internet-accessible interactive database and mapping application called the environmental screening tool (EST).
- *Idaho's Transportation Vision 2033.* See above: Investigated as both a planning phase case study and a solution screening case study.
- *Puget Sound Regional Council's VISION 2020 and Regional Transportation Improvement Program Policy Framework.* The Puget Sound Regional Council (PSRC) in Washington establishes regional policy direction for both transportation and land use. The 2002 Regional Transportation Improvement Program (TIP) Policy Framework established regional policy direction and project selection criteria to ensure that transportation projects selected to receive federal funding through PSRC are consistent with the regional long-range growth management plan (VISION 2020) and the regional long-range transportation plan (Destination 2030).
- *Sacramento Area Council of Government's Blueprint Project.* The Sacramento Region Blueprint is the result of a visioning effort spearheaded by the Sacramento Area Council of Governments (SACOG) in California. The blueprint identifies the region's preferred growth strategy. I-PLACE3S, a land-use projection visualization tool, was used to help compare different growth scenarios. The blueprint is currently being used in programming to guide the selection of transportation projects for placement on the metropolitan transportation plan (MTP) 2035.
- *I-69 Trans-Texas Corridor Study.* The I-69 Trans-Texas Corridor encompasses 15 sections of independent utility (SIUs). The Texas DOT proposed a tiered environmental review of the project. The first tier of the process (Tier 1) is under way and will select a preferred corridor(s) for the various SIUs. This single NEPA study and document will be followed by subsequent alignment-level NEPA studies (Tier 2) for each SIU. The Quantm System, an alignment optimization technology, generated potential routes that

planners, environmental scientists, and engineers used to determine corridors in Tier 1.

- *Illinois Prairie Parkway Project.* The Prairie Parkway is a proposed new location highway currently under study led by the Illinois DOT (IDOT)–District 3. The project began as a Feasibility Study and progressed into a Corridor Protection Study. The environmental review phase is now under way, as the final EIS is currently being developed.
- *Wasatch Front Regional Transportation Plan: 2007–2030.* The Wasatch Front Regional Council (WFRC) is the MPO responsible for developing area-wide long-range transportation plans for Salt Lake, Davis, and Weber counties in Utah. Three screening processes were used during long-range planning to develop the Wasatch Front Regional Transportation Plan 2007–2030 (2030 RTP): (*a*) system needs assessment, (*b*) evaluation of alternatives, and (*c*) project selection and phasing.

Multiple Purposes of the Case Studies

The case studies served multiple purposes. In their entirety, they are resources for practitioners looking for detailed examples of success stories in collaboration. However, if every state and MPO tried to use examples of barriers and success factors from case studies to design their own approach to collaboration, it is extremely unlikely this disparate guidance would result in a cohesive framework for institutionalizing collaboration into the transportation decision-making process. Examined collectively, the common barriers to project or program delivery serve as targets that an effective framework for collaborative decision making should address. Common success factors become the tools or approaches that the framework should emulate.

In addition to the barriers and success factors, the case studies provide examples of decision processes for every phase of transportation decision making. Case study research and interviews were conducted using a straw man framework to follow the step-by-step decision making in each examples. This universally applied structure allowed comparisons between the examples instead of approaching each case study as a representation of how collaboration might occur in a given context. The collected data from all case studies offer strong insight into both the successes and the challenges to collaboration at each individual key decision point in the transportation process.

A transportation decision-making structure was drafted on the basis of the decision structures in the case studies, as well as overall successful practice within the constraints of current law and regulation. The intent was to extract the detailed data from the case studies to populate the preliminary structure. When all the individual project context, nuances, and details are pulled away, just the data are left: who made the decision, how it was made, and what supported the decision makers. This represents the beginning of a collaborative decision-making database. The resulting combination of case study data and decision-making structure was the foundation of the Framework.

Insight from Practitioners

Twenty-three case studies divided into many individual decision points do not include everything required for collaboration. They represent a good start, but the real extensive knowledge lies with the practitioners. Transportation professionals who engage in decision making over long periods of time are the true experts. Even if their processes have not been highly collaborative, they know where to look for the land mines and what can go wrong. This knowledge goes well beyond what case study examples can provide. Take these professionals out of their day-to-day process and ask them to imagine the way it could work, and the resulting information is truly instructive. Even better, put them in a group of peers that bring knowledge from a different process or perspective, and the outcome is enlightening.

Six workshops—bringing together representatives from transportation agencies, resource agencies, and the public—were held to design key elements of the Framework:

- Designing the base Framework;
- Integrating sub- and influencing planning processes;
- Understanding solution screening and the dynamics of collaboration;
- Understanding the roles and relationships of the formal decision-making partners;
- Understanding the roles and relationships of stakeholders; and
- Determining the tools and technologies needed to support the Framework.

The data collected from the case studies served as a starting point in the workshops but were refined and elaborated on using the collective thoughts of the workshop participants.

CHAPTER 3

Barriers to Delivering a Project or Program

Certain barriers from the case studies stood out among the others due to their prevalence or broad applicability. These barriers are summarized in Table 3.1 and are explored further following the table. These barriers became the issues or targets that any collaborative decision-making framework for transportation must address.

Cross-Phase Issues

Barriers that can be categorized as cross-phase issues stem from a lack of coordination and consistency across the phases of transportation decision making. Cross-phase issues result in redo loops of duplicated and wasted effort. Examples include the failure to eliminate fatally flawed solutions early in the decision-making process, failure to transfer decisions and the reason behind those decisions from one phase to another, failure to transfer data and information from one phase to another, and failure to ensure that decisions in late phases (i.e., NEPA) reflect the goals and objectives agreed on in planning. The lapse of time between phases can exacerbate these issues as information becomes obsolete due to changes in the natural environment, changes in the human environment, and staff/management turnover.

One common cross-phase issue arises between the programming/fiscal constraint phase and the planning, environmental review, and design phases. Often, projects work their way through these other phases then hit a roadblock because of changes or limitations in the availability of programmed funds. In Arizona, the ***Maricopa Association of Governments (MAG)*** developed a plan in 1985 for a regional freeway system to be constructed by 2005, using a dedicated local revenue source. However, due to increasing construction and right-of-way costs and lower-than-expected revenues, it became clear by the early 1990s that the system could not be completed with the available funding. Voters in the region rejected two ballot measures in 1994 that would have generated additional revenue, largely because of a lack of confidence in MAG's ability to deliver on its plans, forcing projects to be scaled back or delayed.

Similarly, in 2003, NJDOT was in the process of developing an EIS for a proposed bypass of the borough of Flemington on ***New Jersey Route 31***. As work on the EIS progressed, it became clear that the project was not in keeping with the state's smart growth goals and was not likely to receive adequate funding for construction, due to its high cost. As a result, the EIS process was put on hold until a new integrated land-use and transportation plan was completed for the corridor, to realign the project with state and community goals and develop a more cost-effective solution.

There are also disconnects between long-range planning and environmental review. In the case studies examined, projects going through the NEPA process did not always come out of the metropolitan transportation planning process. In some cases projects were even added to an MTP after beginning the NEPA process. For instance, in the ***US-285 project in Colorado*** the NEPA process began in July 2002. More than a year later, in November 2003, the project was added to the 2025 RTP and TIP. For the ***I-15 New Ogden Weber project in Utah***, the EIS was initiated in April 2001, and the project was subsequently included in the 2030 Long-Range Plan (LRP) and TIP in December 2001. These examples suggest that there are sometimes disconnects between long-range transportation planning at the MPO level and transportation planning for projects at the state DOT level. The lack of an orderly flow from long-range planning through project development suggests that in some cases there may be limited information from the long-range planning process that can be used to expedite project development.

Lack of Integration with External Factors

Transportation planning is sometimes conducted in a vacuum, without adequately considering other nontransportation factors that either have impacts on transportation

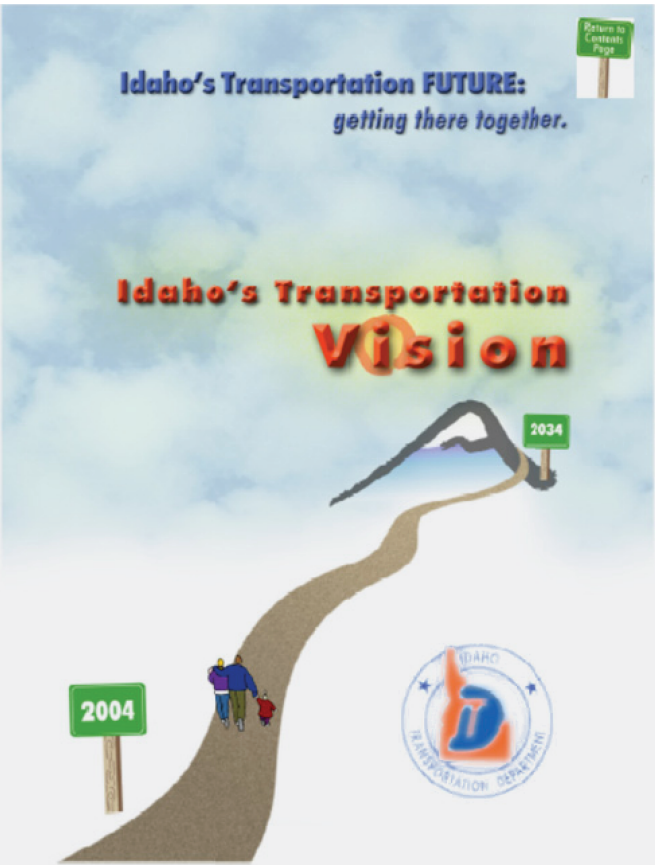
Table 3.1. Summary of Barriers from Case Studies

Cross-Phase Issues
Lack of Integration with External Factors
Insufficient Involvement of the Public
Absence of the public early in the decision-making process
Lack of public trust in the transportation agency
Insufficient Engagement of Agency Partners
Turnover and Loss of Key Leaders
Funding Constraints
Challenges in Solution Screening
Lack of adequate screening criteria
Failure to fully consider a broad range of alternatives
Data Availability

facilities or could be affected by transportation plans. This can cause problems, not only within the transportation decision-making process, but also after plans are completed.

The ***Texas Kelly Parkway*** case study points out the volatile nature of road projects driven by political and economic initiatives. The Kelly Parkway was initially meant to serve the transportation needs of a commercial industrial park and shipping hub. Planning for the road was completed, but funding never became available for implementation. Since that time, Union Pacific has announced it will build a new intermodal terminal facility well outside the Kelly Parkway corridor. Shifting development goals at the Kelly USA industrial park site, as well as the shifting location of the truck-rail intermodal terminal, have a major impact on the projected traffic on the planned Kelly Parkway. These external factors could potentially derail this project, making the planning effort unnecessary, and potentially souring the goodwill developed within the local community during the development of the plan.

In other cases, plans may be forced into a redo loop to consider external factors that were not originally considered. The ***New Jersey Route 31*** case study highlights an example in which a project advanced to the NEPA phase without adequately addressing state and local land-use plans and goals, forcing the NEPA study to be put on hold while a broader corridor plan was developed. In the case of the ***Idaho Transportation Department's (ITD) Vision 2033*** study (see Figure 3.1), an initial statewide LRP was developed in a traditional manner, but it was scrapped in favor of a new vision planning process following criticism that the original plan was the result of disjointed decision making rather than a clear departmental vision or policy and that it did not address land-use issues adequately.



Source: *Idaho's Transportation Future: Getting There Together—Idaho's Transportation Vision,* Idaho Transportation Department, 2004.

Figure 3.1. Idaho's Transportation Vision is regularly referenced during ITD's planning process.

Insufficient Involvement of the Public

Beyond typical not-in-my-backyard issues, there are many reasons collaboration with the public can fail. The transportation decision-making process can be difficult to understand, and subsections of the population (e.g., low-income, non-English-speaking) may feel (or actually be) excluded if it is more difficult for them to participate through traditional methods. The feedback loop is often overlooked—that is, decision makers seek information from the public but fail to provide a response regarding how that input influenced the ultimate decision. Turnover in the community can result in changing goals and visions and a change in active participants. The public often does not become involved in transportation decision making until it is apparent they may be personally affected by the decision; and frequently, there is a lack of public trust in the transportation agency.

Absence of the Public Early in the Decision-Making Process

Either through lack of opportunity or lack of interest, the public often does not become involved in transportation decisions until late in the environmental review process and, therefore, is not part of broad goal setting and prioritizing. This lack of public representation is not always apparent until late in the process and can then result in the need to revisit decisions. For instance, in the ***California I-710 Corridor*** study, the initial outreach process, though thorough, was not enough to ensure full public support. Thus, midway through the project, people started to complain about air quality impacts and the taking of residential properties; and the project team was forced to revamp its public involvement program.

Lack of Public Trust in the Transportation Agency

A lack of public trust in the transportation agency can be a key barrier to projects. This often occurs when the public feels that the DOT has already decided on a course of action and does not really wish to engage communities in the decision-making process. Several of the case studies attested to this. They showed the importance of a state DOT taking the time to instill public trust and the benefits which could be realized.

In the ***New Jersey Route 31*** case, a major issue at the outset of the integrated land-use and transportation planning process was the frustration and distrust felt by many members of the local community. Some local residents considered NJDOT's decision not to proceed with the Flemington Bypass after decades of study to be a betrayal or a broken promise. Delays in a separate intersection project along Route 31 also fueled local resentment of NJDOT and fed suspicions that the agency was not interested in hearing their opinions and working with the community to develop a locally supported solution. NJDOT and its consultants were only able to rebuild trust with the community by proving that they were truly interested in obtaining community input for the design of the substitute for the bypass. In addition to public meetings and sessions with the advisory body it created, NJDOT and its project team held many one-on-one interviews with residents. Members of the project team attended local meetings with Flemington Borough, Raritan Township, and Hunterdon County to elicit feedback. Also, near the beginning of the planning process, NJDOT completed two small improvement projects on Route 31, which helped convince residents that the agency was truly interested in helping the community with its congestion problem.

In the ***Texas Kelly Parkway*** project, the most challenging aspect was gaining the community's trust. The community had a long and difficult relationship with the Air Force base, fearing health risks associated with it. Therefore, community members were generally suspicious of any new large government project. They viewed Kelly Parkway as just an extension of ongoing base activities and directed their misgivings toward the project team. To overcome this barrier, the team had to show that its work was different from the Air Force. This proved that the proposed parkway was in the best interest of the community and would not simply serve the base. Thus, community trust was slowly rebuilt. Following this breakthrough, the team was able to focus on the more substantive elements of the project.

Insufficient Engagement of Agency Partners

A common barrier to successful transportation decision making, and clearly a key aspect of any collaborative decision-making framework, is effective collaboration with decision-making partners. Engaging the right players, getting them involved early and at key points in the decision-making process, and sustaining their involvement can be challenging for many reasons. These often relate to failure to reach out to agencies, lack of trust, conflicting missions and cultures, resistance to change, and, quite often, limited staff time and funding. Resource agencies have a limited ability to participate in the decision-making process, particularly in planning activities that go beyond the core statutory requirements of the resource agency. For example, the lack of available time to participate was a barrier to resource agency involvement in the ***Colorado STEP UP*** process.

Failure to involve agencies (or the appropriate authority within agencies) in decisions contributes to redo loops, delays, and revisited decisions. Failure to engage agencies early in the process can make it more difficult to obtain regulatory approval later on and also results in a waste of time, effort, and money. In addition, the institutional obstacles that plague transportation agencies similarly affect regulatory agencies. These internal issues—such as staff turnover, changes in leadership, lack of coordination, and resistance to change—can negatively affect agencies' participation in the transportation decision-making process.

Turnover and Loss of Key Leaders

Staff turnover and a loss of key leaders were barriers on some projects. For instance, in the ***US-64 Asheboro Bypass project in North Carolina***, staff turnover led to delays in overall project planning and the EIS document production schedule. Three different project planning engineers took helm of the

EIS and its associated merger process at different points along the way. The original project manager retired. A subsequent internal reorganization resulted in department reassignments. The consulting firm assisting the state DOT in preparing the EIS also had turnover of key staff. Although these changes set the project back, the excellent documentation associated with the merger process helped keep the process going and avoided revisiting past decisions.

In developing ***Idaho's Transportation Vision 2033***, there was concern that a change in leadership might be a stumbling block. Although the departure of the ITD's director at the beginning of the visioning process did appear to slow the implementation process initially, the project manager carried it forward with the approval of the new director.

Funding Constraints

The ***US-24 EIS project in Indiana and Ohio*** is a good example of a project that was adversely affected by lack of funding despite recognized transportation needs. US-24 in Ohio and Indiana needed improvement back in the early 1960s when the Ohio Department of Highways (later Ohio DOT) Bureau of Location and Design first proposed a new 31-mi alignment between the towns of Maumee and Napoleon, Ohio. However, funding limitations and resistance from property owners opposed to the taking of their farmland for right-of-way held this project back for more than 30 years (see Figure 3.2). In the 1980s, the project reemerged due to a grassroots movement of local government, business, and citizen groups; and in 1991, the project received federal funds to initiate the necessary planning studies. In 1994, Indiana DOT, Ohio DOT, and FHWA published the *U.S. Route 24 Improvement Feasibility Study* that recommended a four-lane divided highway to provide long-term capacity and safety improvements. Ohio DOT and Indiana DOT initiated an EIS in January 1999, which concluded with a Record of Decision (ROD) in December 2005 for a new alignment south of and parallel to the existing US-24 roadway. Once again, funding shortfalls delayed the project, but in the spring of 2007, construction began in Ohio. In Indiana, construction has begun and is expected to be complete by 2011.

Source: *US-24 New Haven to Defiance Draft Environmental Impact Statement,* Ohio Department of Transportation, July 2003.

Figure 3.2. Road along US-24 project.

The ***I-405 corridor study*** in Washington, officially named the Interstate 405 Congestion Relief and Bus Rapid Transit Projects, is a $10.9 billion long-range master plan of coordinated multimodal transportation projects that can be implemented as funding becomes available. While the integrated planning effort to address corridorwide highway and transit improvements provides a strong example of a well-managed and structured collaborative process, the program is currently funded at $1.5 billion and additional sources of funding have yet to be identified. In November 2007, voters rejected a multibillion dollar measure to fund regional roads and transit projects, leaving WSDOT and political leaders struggling to come up with a new plan for funding major transportation projects.

In the case of the ***New Jersey Route 31***, the recognized lack of funding for the initially proposed Flemington Bypass was a major impetus for the decision to eliminate this project—even though it was already part way through the NEPA process.

Despite the initial interest of the MPO in the development of the ***Texas Kelly Parkway*** project, funding has not been identified for the project. A portion of the project, the Kelly Crossroads reconstruction, is listed in the 2008–2011 TIP as a project with environmental clearance, but no funding is allocated for activities. The San Antonio–Bexar County MPO's LRP, Metropolitan 2030, lists the Kelly Parkway as a tolled roadway with a planned fiscal year of 2035. No funding is allocated, and the project is designated as an unspecified public-private development agreement.

Challenges in Solution Screening

Lack of Adequate Screening Criteria

Inadequacies surrounding the screening criteria used to compare and eliminate solutions in each stage of transportation decision making are a common barrier to effective transportation decision making. One widespread problem, also related to cross-phase issues, is the failure to look back and ensure screening criteria are representative of broader visions and goals established through planning and in the development of a purpose and need in environmental review. Also typical is the failure to use screening criteria that appropriately represent all aspects of a solution, including impacts to both the natural and human environments and long-term costs and

benefits. In addition, the selection (and application) of inadequate screening criteria can contribute to unequal consideration of all alternatives (e.g., ruling out transit and other nonhighway options with a cursory review).

Failure to Fully Consider a Broad Range of Alternatives

The ***Woodrow Wilson Bridge replacement project*** is an example of a highway project in which the need was clear given the deteriorating condition and insufficient capacity of the existing bridge (see Figure 3.3). However, the decision-making process took many years longer than expected because of disagreement over project design and alternatives under consideration. In this case, FHWA, along with agencies in Virginia, Maryland, and the District of Columbia (D.C.), began examining alternatives in 1989 to solve the bridge's capacity and structural problems. FHWA issued a draft EIS in August of 1991, analyzing five alternatives for replacing the bridge.

(a)

(b)

Source: Courtesy of Woodrow Wilson Bridge Project.

Figure 3.3. Woodrow Wilson Bridge: (a) circa 1962 and (b) design rendering of new bridge.

Because this draft EIS met with significant public dissatisfaction, additional alternatives were identified and FHWA supplemented its 1991 draft EIS twice, releasing the first supplemental draft EIS in January 1996 and the second in July 1996. FHWA issued its final EIS in September 1997 and selected the preferred alternative in the ROD in November 1997. Controversy set back the project at least another 2 years when, in January 1998, the city of Alexandria filed a lawsuit against the project alleging that alternatives with fewer lanes should have been considered. Although Alexandria eventually reached a settlement with FHWA in March 1999, the lawsuit was continued by three Alexandria-based organizations acting as plaintiffs. In April 1999, the U.S. District Court ruled in favor of the plaintiffs. FHWA appealed to the D.C. Circuit Court, which reversed the lower court's decision in December 1999. A new supplemental draft and final EIS were then completed and FHWA signed its ROD in June 2000, more than 10 years after the start of the NEPA process.

The potential for transit and multimodal alternatives in a project is frequently a source of controversy, particularly in cases when the state DOT was not prepared to address these options as a component of the transportation solution. Some of the most conflicted projects were those in which the public or interest groups were lobbying for a greater transit dimension. In the ***I-710 corridor to the ports of Long Beach and Los Angeles***, neighborhood groups and local committee members insisted that a rail alternative be considered a part of the solution. Their insistence spurred a whole new public outreach effort and alternatives analysis.

Some of the challenges in embracing transit and multimodal alternatives stemmed from institutional issues and lack of integration between transportation agencies and MPOs. Moreover, transit and other multimodal alternatives were often difficult for state DOTs to examine in relation to highway investments, particularly at the point of a NEPA process. In many cases, transit and multimodal alternatives were better addressed at the regional planning level or in a corridor-level planning study. For example, the ***Maricopa Regional Transportation Plan (RTP)*** was a case study of a regional plan that expanded emphasis on transit—the level and type of transit was one of the most contentious elements of the plan.

Data Availability

Relying on data and information to make decisions, especially fine-scale decisions, can present a barrier to integrating environmental considerations early in the planning process. This barrier can arise even when efforts are taken to improve GIS data and coordination processes.

For instance, the largest obstacle encountered in the development of ***Colorado STEP UP*** was the lack of availability of the necessary data. The issue of scale compounds the issue of

data gaps, given the differences in the scale of data needed between the long-range planning and project planning steps. On the one hand, the most consistent data sources are at the state or federal level, but these data are often not refined enough for project considerations. On the other hand, detailed data, such as parcel data or species inventories, are not uniformly available beyond the regional scale. Although the STEP UP leadership team envisioned a fully populated database containing many different environmental layers that could be integrated seamlessly with Colorado DOT's information and electronic infrastructure, fulfilling this vision is currently not possible. STEP UP does not include data from several sources; the available data then tell only part of the story. Relying on those data to make fine-scale decisions would be challenging.

In developing the ***Binghamton Long-Range Transportation Plan***, the BMTS encountered some technical challenges in moving the output from the consultant's land-use model into its travel demand model. The land-use model used units of 30+ acres, called community elements, which were defined by combinations of land-use types; but these units did not automatically mesh with the traffic analysis zones used in the BMTS travel demand model. Nevertheless, thanks to the technical ability of its staff, BMTS was able to overcome these technical obstacles to conduct traffic analysis of the land-use scenarios.

CHAPTER 4

Success Factors That Foster a Collaborative Process

A summary of success factors from the case studies that contributed to the development of the Framework is provided in Table 4.1. Many of the success factors identified in the case studies were part of the technical process and did not affect the design of the Framework; however, they are captured in the case studies available at http://www.trb.org/StrategicHighwayResearchProgram2SHRP2/Pages/Case_Studies_in_Collaboration_373.aspx. Some of the techniques and strategies found to be effective for involving agencies and the public in the transportation decision-making process are included in Appendix A. The use of technology contributed to the success of multiple case studies. While listed as a success factor, the details around specific types of technologies that were used are described in Appendix B.

Manage Risks

Much of the success described in the case studies may be attributed to the effectiveness of project management—in particular, the identification and management of key risks. Key risks are uncertain events that have an effect on a project's scope, schedule, or budget. Risk management is the practice of dealing with key risks by preparing for them, developing response strategies, and monitoring risk throughout the project life cycle. In short, effective risk management is dealing with risks before they arise rather than reacting to them after the fact.

Risks to a project's scope, schedule, or budget were the predominant risks encountered by most state DOTs interviewed. In several of the case studies, project teams did not adequately identify and plan for risks that otherwise they could have identified as high-impact risks. These risks included the following:

- Community and interest group concerns about environmental and community impacts, such as the growing community concerns about freight truck pollution in the ***California I-710 study***;
- Rising costs, as in the ***Utah I-15 NOW study***, or lack of adequate funding for the project, as in the ***New Jersey Route 31 Flemington Bypass project***; and
- Shifts in political support and within the business community, such as in the ***Texas Kelly Parkway project***, in which Union Pacific's decision to build a new intermodal terminal facility south of downtown San Antonio reduced projected traffic demands and eliminated part of the need for the project. These types of political and business community-related risks are particularly difficult to anticipate and surmount.

Since any one of these risks could effectively sideline a project, state DOTs employed a variety of risk response strategies. For instance, the project team in California developed a new hybrid alternative to please the community; and in New Jersey, the team developed an alternative that both cost less and was more consistent with the state's smart growth principles. These strategies were appropriate to the level of the risk encountered and the degree to which that risk affected the project's scope, schedule, or budget.

Anticipate Environmental and Social Issues

The involvement of key constituencies, such as resource agencies or members of the public affected by a project, is a key aspect of risk management. Establishing public involvement and resource agency participation in the planning and project development stages makes it possible to mitigate risks by finding a fatal flaw early in the process.

The NEPA-404 merger process can be viewed as a means to mitigate risk by ensuring and documenting concurrence on decisions, to avoid the risk of having to revisit past decisions. The ***North Carolina US-64 project*** used a proactive merger of NEPA and Section 404 permitting processes that efficiently avoided and minimized impacts throughout the planning and development process. Moreover, advance mitigation is

Table 4.1. Summary of Success Factors from Case Studies That Affect Design of Framework

Manage Risks
Anticipate environmental and social issues
Anticipate public concerns
Use a Context-Sensitive Approach
Listen to the public
Focus on enhancing places, not just enhancing mobility
Link Phases of Transportation Decision-Making Process
Bring environmental issues into long-range planning
Transfer information to subsequent phases
Create an implementation plan and conduct follow-up
Connect vision goals with alternative selection
Integrate Transportation, Land-Use, and Environmental Issues
Partner with local governments to integrate land use and transportation
Practice good environmental stewardship
Structure Decision Making/Use a Formal Process
Use Performance Measures and Evaluation Criteria
Collaborate with Agency Partners and the Public

not only an element of environmental stewardship; it can be a means to minimize risks associated with permitting. NCDOT funded the statewide Ecosystem Enhancement Program (EEP) to assess upcoming wetland and ecosystem impacts. NCDOT directed environmental mitigation investments to the places where they could do the most good, addressing watershed needs identified by agency experts and local communities. Not only was this beneficial from an environmental resource perspective, but through the program, NCDOT minimized the risk that it would not be able to get permits for projects, thus increasing the predictability for NCDOT projects.

An example of anticipating social issues occurred in the ***New Jersey Route 31*** case, in which additional modeling was conducted to address anticipated concerns. Although the state's integrated transportation and land-use plan, called the Framework Plan, was developed through broad public and stakeholder participation, there were concerns that the proposed solution—a parkway and improved network of local roads—would not meet traffic needs in the corridor. In particular, there was a risk that local roads, which would not be funded by NJDOT, might not be built—thus affecting traffic congestion and community relations.

The project team developed a travel demand model to simulate the long-term performance of the Framework Plan and other alternatives. Initial results from the modeling effort showed that the road network in the Framework Plan could be designed and operated to achieve acceptable levels of service. As the planning process continued, the consultant modeled the long-range performance of variations of the Framework Plan as revised by the local planning committee. The modeling showed that the build scenarios would avoid the widespread queuing and travel delays seen in the modeling of the no-build alternative, and thus that they had the potential to provide long-term performance.

In response to resident concerns that any rezoning would financially overburden the community and the two area school districts, the project team commissioned a market study and fiscal impact analysis. The market study compared development trends in the region with the community's current zoning. It concluded that there was little demand for much of the land in the community that was zoned for industrial use; it found instead a strong demand for primary housing, including types that would not tax the capacity of the area's schools. The fiscal impact analysis showed the impact of different development scenarios on projected tax revenues and on the cost of public services and infrastructure. It estimated revenues and costs of different types of development to inform the community of possible fiscal impacts. These analyses were used to support the changes identified in the land-use plan: to rezone from predominantly industrial and commercial zoning to a more balanced mix of land uses with significantly more residential and open space that would not place undue burden on the community. The impacts of these changes were run through the model as well.

According to interviewees, the traffic modeling results played an important role in convincing members of the community and offices within NJDOT that the Framework Plan was feasible and could be designed to achieve acceptable levels of service, without building a bypass. This extra step improved community relations.

Anticipate Public Concerns

Keep the Public Informed

A goal of any risk management plan is to minimize surprises. This is especially true when it comes to communicating with the public. In more than one case study, active efforts were made by state DOTs to keep the public fully informed, minimizing the chance of an unwelcome surprise.

An example of anticipating community concerns occurred in the ***US-131 S-curve replacement project***. Michigan DOT and the mayor of Grand Rapids collaboratively opted to close off the road in its entirety, shutting off major access to downtown Grand Rapids during construction to expedite completion of the project. To mitigate the economic, social, and public relations risks of this decision, the state DOT assigned

an internal communications specialist to maintain consistent, full-time community relations and media coordination for the project, in addition to supporting the communications effort with a public relations firm. Michigan DOT partnered with the local transit authority (known as The Rapid), at a cost of $1.2 million, to provide alternate commuting options. These options included free parking and Rapid bus service to downtown via a dedicated bus lane. The Rapid added bus service during rush-hour and provided a guaranteed ride home system. The transit authority also worked with local businesses to explain the detour planning. Ultimately, the downtown highway closure ran smoothly and the project was a success.

When project costs continued to shift on the ***Utah I-15 NOW project***, Utah DOT reduced a good portion of the public uproar by keeping the public informed about cost projections to the best of its ability. In the ***US-24 New Haven, Indiana, to Defiance, Ohio, project***, Ohio DOT actively educated the public about costs and even completed a fatal flaw analysis, ruling out alternatives that were not cost-effective.

Approach Potential Opposition Early

In the US-24 case, Ohio DOT collaborated with two important groups. It approached the Sierra Club and Farming Americans Resisting More Unneeded Pavement (FARMUP). The Sierra Club was interested in impacts to high-quality wetlands and habitat for the federally endangered Indiana bat. FARMUP was concerned about impacts to farmland and increased development along the new US-24 alignment.

Even though the Sierra Club and FARMUP were initially more interested in another segment of the corridor, the state DOT got their feedback on the New Haven to Defiance segment. After working together, they agreed about the logical endpoints for the project. In turn, Ohio DOT avoided a potential lawsuit, proving this early collaboration well worth its time.

Likewise, the project team for the ***Colorado US-285*** case, worked with the Sierra Club and other members of the advocacy community from the project start. Not far from the US-285 project was another project to reconstruct a mountain pass that the public viewed as a failure. The Sierra Club, among others, felt that the project failed to consider area wildlife and thought FHWA had merely pushed it through. When the issue of wildlife underpasses came up in the US-285 project, the team's previous discussions proved to be a valuable starting point in these discussions.

Don't Avoid or Side Step Issues

The ***Texas Kelly Parkway*** project team used the project management principle of "don't let sleeping dogs lie." The team neither avoided issues nor proceeded simply hoping that certain issues would not arise or become a problem later in the process. For instance, team members knew that the biggest challenge was going to be separating military issues from transportation issues. The work they were doing would naturally be confused with the work the Air Force was doing. Thus, from the start of community outreach, the team focused on making this distinction. When something looked as if it might become an issue, the team dealt with it then—meeting early and often.

Reevaluate Approach If Needed

Several of the case studies involved an initial failure or decision point at which the project sponsors needed to revisit a previous decision. Although these redo loops are generally inefficient from the standpoint of timing, the reexamination of previous decisions was done in these cases to address circumstances or features which initially were causes of dissatisfaction. Consequently, the reevaluations were beneficial in terms of developing project solutions that better met community and environmental values, as well as financial constraints.

For instance, the ***Route 31 Integrated Land Use and Transportation Plan*** in New Jersey was an attempt to develop a more comprehensive and workable solution than a long-planned bypass around the town of Flemington. NJDOT recognized that the bypass highway was too costly to be funded and could probably never be built. Moreover, looking at transportation in the context of land use and community needs, this project did not fit with the state's newly emerging smart growth principles and was not ultimately the best solution for the community. Even though the bypass had been in the planning and development stages since 1987 and was included in the region's long-range metropolitan transportation plan, NJDOT determined in late 2003 that it should reexamine the corridor in a new way.

As NJDOT proceeded with developing a new integrated land-use and transportation plan, there was an increased recognition that the new plan would have implications for another project—the replacement of the nearby Flemington Circle with a grade-separated interchange. Although the Flemington Circle project was already in the final design stages, many residents and local business owners opposed the project; the elimination of the proposed bypass caused participants in the planning process to further question the value of the circle project. Within NJDOT, there was pressure to move forward with the circle project since it had already advanced so far into final design. However, in response to public and political action, NJDOT leadership put the final design of the circle elimination project on hold. The Route 31 project team was then able to include the circle and its surroundings in its study area.

Midway through the corridor study for ***I-710 in California***, public furor erupted over potential health impacts and relocations. This public outcry prompted the Metropolitan Transportation Authority (MTA) to develop a new public involvement process. The MTA formed a system of community advisory committees and charged them with guiding development of a new alternative for the corridor. The community advisory committees gave residents better avenues to be heard, providing input directly to the policy committee. This helped regain the trust and buy-in of the local communities and ensured meaningful involvement, including redirection of the alternatives. These committees led decision makers to develop a new hybrid alternative that addressed air quality concerns by diverting some truck traffic to rail, supporting electrification and other strategies in the port, and separating truck traffic from general traffic on key segments of the interstate. This hybrid became the locally preferred alternative.

Use a Context-Sensitive Approach

Common among successful cases studies were times when state DOTs developed and used context-sensitive solutions (CSS). CSS is a collaborative, multidisciplinary, and integrated approach that relies heavily on meaningful stakeholder and public involvement to plan, develop, and maintain transportation systems and facilities in a manner that preserves or enhances aesthetic, scenic, historic, environmental, and community assets in balance with safety and mobility needs.

A context-sensitive approach encompasses many of the other identified success factors. In the case studies, projects typically exhibited breakthroughs when state DOTs applied new levels of context sensitivity. The cases that were most successful were proactive in working with opponents early in the process. Another key to the successful outcome of several projects was close collaboration with the community to meet an array of needs beyond highway improvements. The integration of transit, the inclusion of additional enhancement features, or the use of innovative mitigation concepts gave these projects a CSS component that resulted in broad acceptance of the project.

For instance, in the ***California I-710*** case, the project proceeded only after initial alternatives were scrapped and options within the framework of the community's health concerns about emissions from diesel trucks were reexplored. The ***US-24 project in Ohio and Indiana*** was held up for decades because property owners opposed the taking of their farmland for highway right-of-way. Consequently, in the most recent analysis of the project, Ohio DOT coordinated with individual property owners as alternatives were developed to identify direct impacts to prime farmland, drainage structures, and access. Whenever feasible, the design was modified to avoid or minimize impacts by locating the road along property boundaries, fence lines, or existing railroad rights-of-way. ***I-5 in Oregon*** added bike/pedestrian facilities to accommodate the community's desire to encourage non-automobile forms of transportation. The design of ***US-285 in Colorado*** included a depressed median that both improved safety for drivers and provided a grassy recovery area for animals trying to cross the road within the confines of a narrow, winding mountain highway (see Figure 4.1). Interchanges were modified and even eliminated based on community preferences, reducing the cost of the project.

Listen to the Public

The skills to implement CSS draw on everyone's abilities and insights, but the willingness to absorb other perspectives is enhanced when listening demonstrably occurs. This also involves a willingness to change the process and in some cases depart from the normal design sequence.

For example, the ***Oregon I-5 Beltline Interchange*** project proceeded after the state DOT acknowledged that a new approach was needed. The successful iteration started with interviews of stakeholders about their concerns and initiation of stakeholder committees in the context of a collaborative decision-making process. Oregon DOT and FHWA used an innovative intergovernmental agreement to shift project

Source: Reprinted with permission from C. Gaskill, *Cost-Benefit Study of Applying Context Sensitive Solutions to US-285, West of Denver, Colorado*, presented at 86th Annual Meeting of the Transportation Research Board, Washington, D.C., 2007; courtesy of Jacobs Engineering.

Figure 4.1. Rendition of grade-separated intersection for US-285.

design responsibilities to the city of Springfield to reconcile local preferences with federal standards.

In the case of the ***Texas Kelly Parkway***, CSS entailed personal contact, getting to know the community, and understanding how to effectively engage them and bring them into the process. Texas DOT developed a good team with a combination of local people who had insight into the community. When the project team considered possible locations for a community project office, it elicited ideas from those who lived in the area and ended up selecting a location near a major bus line and near where people went to pay their bills. The office served as a convenient place for project meetings and a source of project information.

In the ***New Jersey Route 31*** study, the project team conducted one-on-one interviews with stakeholders such as property owners, developers, interest groups, and local governments (both elected officials and technical staff). These interviews provided valuable insights into site-specific development issues and the interests of local jurisdictions with regard to the proposed bypass project. The project team also created an advisory group that included representatives from NJDOT, FHWA, local governments, and local business associations. To facilitate both the stakeholder interviews and advisory group meetings, the project team held multiday design workshops. These workshops, which included stakeholder interviews, site visits, and working sessions, created a studio environment that helped the project team test design ideas and continue to learn about local priorities and issues.

Focus on Enhancing Places, Not Just Enhancing Mobility

A place-centered approach to helping citizens improve public spaces and make great communities is an approach that goes beyond thinking about mobility and the movement of vehicles; it considers the context of transportation within community life. For instance, streets can be transformed into places that foster public life, if there is community and institutional support for that idea. This philosophy of place-making centers on the belief that a public-participation process defining and responding to community conditions and needs from the outset is one of the most critical factors in achieving transportation design that is truly sensitive to its context.

In the ***US-131 S-curve replacement project*** that ran through the heart of downtown Grand Rapids, the state DOT significantly changed the prospective project in response to stakeholder input. Michigan DOT's scope expanded from repair of a single bridge to full modification and replacement of the viaduct with a design sensitive to the surrounding urban environment. While gaining agreement to proceed expeditiously on an emergency repair was clear motivation to collaborate, the state DOT was sensitive to the importance of the bridge and adjacent landmarks in creating a sense of place for Grand Rapids residents.

To specifically address aesthetics, Michigan DOT hired a subcontractor, who built a model of the future S-curve to serve as an illustration in meetings with community representatives. The city and university commented extensively on the aesthetic designs. The university also hired a contractor to draw up designs and submitted those to the DOT's subcontractor. The subcontractor incorporated some of those ideas, including a decorative feature on the bridge that indicated where the river began and ended.

Michigan DOT's designs included bridge supports as arches, and the arch theme was continued throughout the walls and other sections of the structure (see Figure 4.2).

(a)

(b)

Source: Courtesy of Michigan DOT Photography Unit.

Figure 4.2. Bridge supports as (a) arches and (b) parking available under bridge.

Decorative lighting was added along the S-curve, and underpasses were given more than ordinary lighting. Working with Grand Rapids staff and area utility companies, Michigan DOT moved certain electric lines underground, allowing the removal of large transmission towers. The city of Grand Rapids built on the DOT's direct aesthetic work and developed a park and nonmotorized path adjacent to the S-curve, and it installed landscaping along the US-131 ramps. Under the S-curve, with the help of city and other local partners, two city streets were connected. Excess state-owned property was converted to much needed downtown parking. A new walkway to accommodate pedestrian traffic was added along with other sidewalk and landscaping improvements. Additionally, one of the distinctive arches of the new S-curve serves as a major bus stop for the nearby Grand Valley State University campus. Stakeholders reported that they felt a sense of ownership in the project and that their various views were realized in the final product.

The ***Binghamton Metropolitan Transportation Study's*** long-range transportation plan, *Transportation Tomorrow: 2030—Placemaking for Prosperity,* makes clear that the local MPO will focus its investments in the core communities and will not spend federal transportation funds on projects that facilitate suburban sprawl. This central theme of place making contributed to the plan's success in addressing a wide range of customer needs, such as safety considerations for elderly pedestrians and drivers, waterfront redevelopment, support for the University of Binghamton downtown campus, and the operational efficiencies of public transit.

Link Phases of Transportation Decision-Making Process

Bring Environmental Issues into Long-Range Planning

A number of factors in traditional long-range transportation planning limit its use as a foundation for project development, particularly as it relates to environmental issues. These limitations include the following:

- The LRP does not effectively address environmental considerations.
- Lack of resource agency involvement during the planning stage inhibits the integration of these considerations.
- Time and cost impacts to a project can balloon significantly due to unknown environmental issues.

The ***STEP UP*** process, initiated by Colorado DOT and the NFRMPO, attempted to address these concerns by bringing environmental considerations that might affect project development directly into the regional long-range transportation planning process.

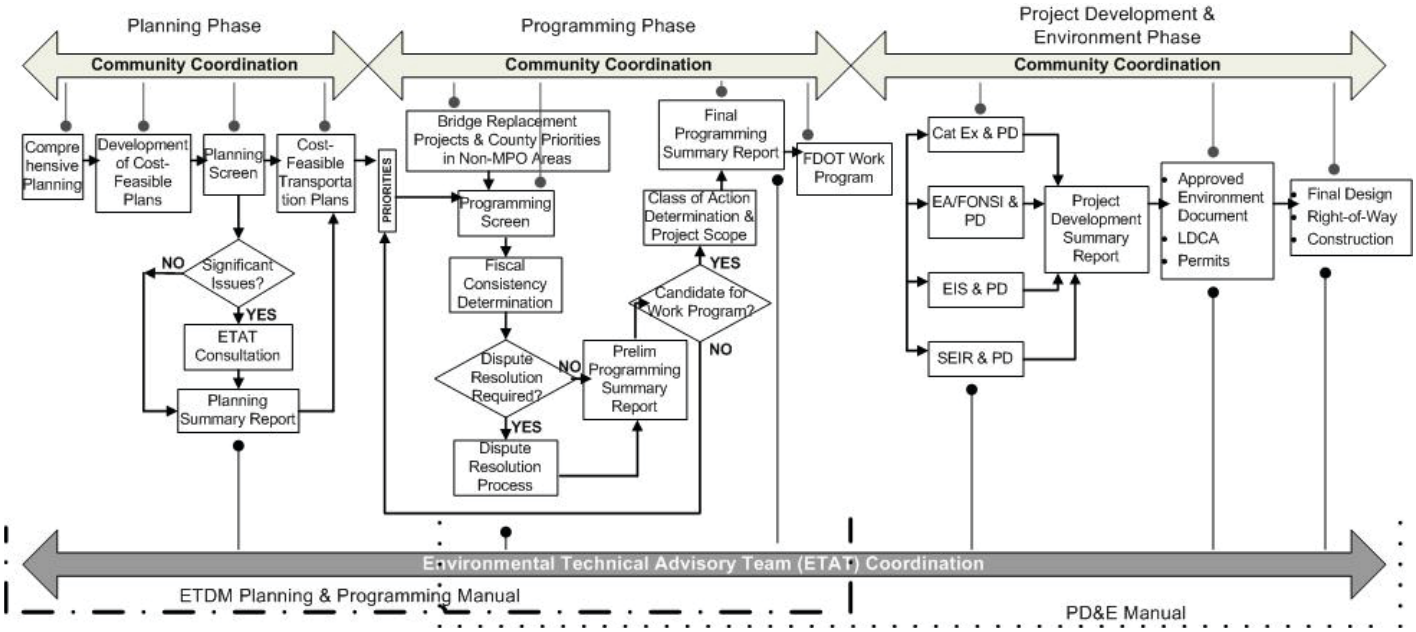
The case studies also revealed that corridor planning processes could help in identifying potential community and environmental issues before NEPA analysis. Several case studies showed that corridor planning processes were useful in helping engage the public in thinking about the transportation needs of a corridor and addressing potential community and environmental concerns at a broad-scale level before conducting a detailed project-level analysis.

WSDOT's Reinventing NEPA process, used on the ***I-405 corridor***, attempted to move NEPA decision making into the planning process using a programmatic EIS and the typical NEPA steps to make policy level decisions and develop a long-range, multimodal corridor plan. WSDOT conducted a customer survey to find out how the department needed to improve. Respondents requested additional project information, more project design flexibility, and the opportunity for meaningful public input at key steps in WSDOT's decision-making process. In response, WSDOT developed a strategy to integrate planning and project development with the NEPA process. It used a structured decision-making process designed to engage the regulatory agencies, local governments, and citizens at key decision points. And for its I-405 Corridor Program, WSDOT aggressively partnered with four co-lead agencies that ultimately needed to be involved in the final decision. As a result, WSDOT was able to overcome strong public opposition and complete a controversial programmatic EIS in a surprisingly short amount of time.

Similarly, the ***US-285 project in Colorado*** conducted a feasibility study, which acted as solution screening and helped advance the subsequent NEPA process. Within the feasibility study, the earliest conceptual designs were developed to avoid environmental resources and address public concerns; that enabled the NEPA document to be conducted as an EA, rather than an EIS.

Transfer Information to Subsequent Phases

Florida's ETDM Process is used to accomplish early agency participation in project decision making, efficient environmental review, and meaningful dispute resolution. The fundamental goal of the ETDM Process is to improve transportation decision making in a way that protects the human and natural environments. The ETDM Process is used for major transportation capacity improvement projects. The ETDM Process comprises three phases: planning, programming, and project development (or environmental review), as shown in Figure 4.3. Efficient interaction with agencies and affected communities is gained by two screening events, the planning screen and the programming screen, that are completed and integrated into the transportation planning process. Information and recommendations from agencies and the public, gathered during the screening events, are summarized and



Source: Adapted from *ETDM Quick Reference Guide*.

Figure 4.3. ETDM Process overview.

can provide the basis for technical studies and preliminary engineering during project development.

At the end of planning, programming, and project development, the ETDM coordinator publishes a summary report with the commentary, findings, and recommendations of the project to date. This report comprises the project record and is used in subsequent phases to direct future work. Input received from agencies influences project design and priorities as the project progresses. This includes selection of projects and/or alternatives for the long-range transportation plan, projects that are programmed, and ultimately, the selection of preferred alternatives in project development.

Create an Implementation Plan and Conduct Follow-Up

Given the long timeline of goals identified in visioning and long-range planning, pairing implementation plans with follow-up has been an effective method of ensuring that the goals of these early stages are implemented in later phases of transportation decision making.

Idaho's Transportation Vision 2033 identified goals for the region 30 years into the future. Since the needs of stakeholders and the stakeholders themselves change periodically, any long-range vision requires revisiting. Thus, representatives of the ITD are planning reviews of the vision at 5-year increments. Subsequent projects using Idaho's visioning process as a model have improved on it by developing a well-structured implementation plan early in the process. Stakeholders of subsequent projects have also committed to review each project against the vision to ensure consistency with vision goals. If projects are not consistent with the goals established during visioning, they are challenged and revised accordingly.

In its ***2030 RTP***, WFRC in Utah specified a strategy for implementation, but did not clearly define who is responsible for implementation and how it should be accomplished (and funded). The development of the 2030 RTP would have been considered a waste of time and money and resulted in a loss of participants' trust if not implemented properly. Furthermore, lawsuits could be filed if legal requirements were not met. The solution was to specify an implementation plan and set up funding to develop and monitor performance measures. WFRC also checked in with participants that made commitments (i.e., local government zoning changes) to ensure they were following through. In the end, the planning effort was realized and the participants and users of the system trusted that the work of WFRC was worthwhile.

Connect Vision Goals with Alternative Selection

Several case studies successfully used goals identified during visioning or long-range planning as a direct input to the selection of alternatives in subsequent phases of the decision-making process.

The preferred long-range scenario for transportation and land use was a direct input in the development of ***WFRC's 2030 RTP***. Before developing the 2030 RTP, WFRC developed the Wasatch Choices 2040 Land Use and Transportation Vision document. Through the visioning exercise, the development

of the transportation plan was integrated with other planning activities, specifically, land use.

Four alternative scenarios were developed in the vision document. The scenarios were examined against the transportation network to determine what effect each would have on the system and the needs that would arise for each. Through extensive public involvement, regional growth principles reflecting the preferred scenario were developed for integration into the 2030 RTP.

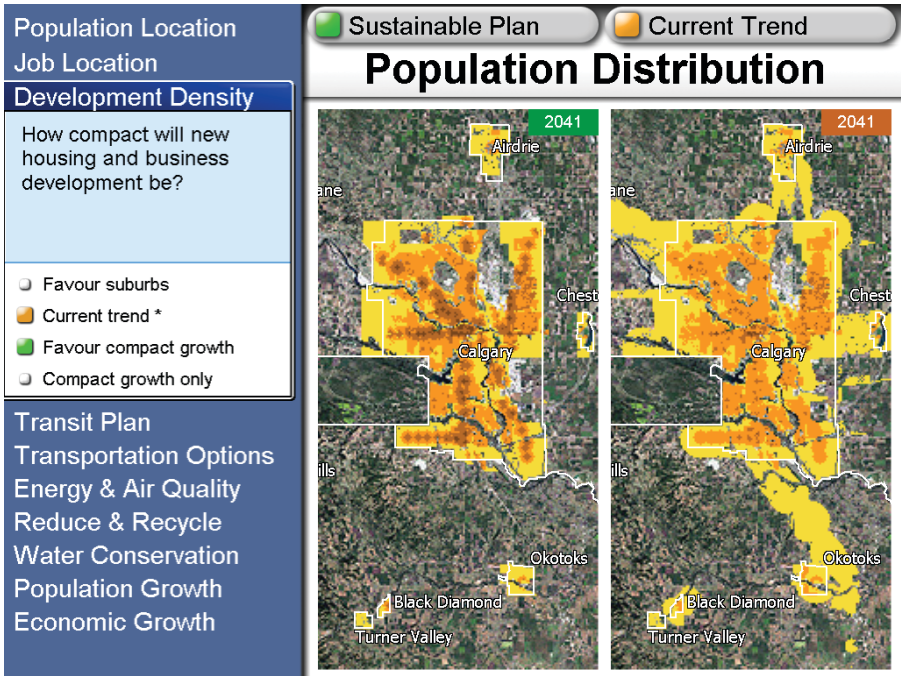
The regional growth principles from the visioning process were a direct input to the assessment of system needs. Once the transportation needs were identified, three system-wide alternatives were developed. The alternatives were evaluated and scored against 19 measures. The alternative that was closest to the vision was selected and endorsed by the Regional Growth Committee and became the base system and framework for the 2030 RTP.

Growth management planning is mandated in the state of Washington by the Growth Management Act. Serving as both the regional planning agency and the MPO, the Puget Sound Regional Council (PSRC) is responsible for long-range comprehensive growth management and long-range transportation planning. As such, PSRC developed a process to integrate growth management policy decisions with transportation policy decisions through the ***TIP Policy Framework*** for the PSRC's project selection process.

The PSRC's TIP Policy Framework establishes regional policy direction and project selection criteria to ensure that transportation projects selected to receive federal funding through PSRC are consistent with the regional long-range growth management plan, VISION 2020, and the regional long-range transportation plan, Destination 2030. The TIP Policy Framework establishes criteria for the competitive selection process used in programming. Through this process, regional and countywide TIP candidate projects receive scores that are based on how well the project meets individual criteria derived from VISION 2020 and Destination 2030. The process also has built-in accountability in that the projects selected for federal funding are monitored for success through project tracking policies established in the TIP Policy Framework.

In the creation of ***Idaho's Transportation Vision 2033***, it was understood that interactions between housing, land use, demographic change, and economic conditions will have a critical impact on transportation solutions. The approach used to identify and select a transportation vision was developed with the insight that public participants do not see the world as broken down into silos and therefore demand a more holistic treatment of the visioning process. To support this approach, the MetroQuest scenario planning tool was configured to integrate models, including housing, land use, transportation, demographics, resource management, and economy (see Figure 4.4).

Using MetroQuest, stakeholders were able to explore and understand the synergies between land use, transportation, housing, environmental management, and economic



Source: MetroQuest images provided by Envision Sustainability Tools.

Figure 4.4. Screenshot of MetroQuest.

development in a workshop setting. Workshop participants used an iterative process to select a preferred scenario that best met their collective priorities. The result was a long-range vision for transportation that was informed by land-use and other associated plans. Once a preferred scenario is reached, MetroQuest allows planners to export the preferred scenario in GIS and spreadsheet formats compatible with other GIS or analytical modeling systems. The result is that the preferred scenario can be saved in a workshop and then further analyzed and imported into other more detailed planning activities.

The ***Sacramento Region Blueprint*** is the result of a visioning effort spearheaded by SACOG in California. The blueprint identifies the region's preferred growth strategy. I-PLACE3S, a land-use projection visualization tool, was used to help compare different growth scenarios. The blueprint is currently being used in programming to guide the selection of transportation projects for placement on the MTP 2035.

Integrate Transportation, Land-Use, and Environmental Issues

Partner with Local Governments to Integrate Land Use and Transportation

State DOTs are increasingly partnering with local governments to integrate land-use and transportation planning. This collaboration not only ensures a balance between economic growth and environmental stewardship, but also minimizes potential conflict in the planning process. Moreover, a range of stakeholders, from elected officials to environmental groups, recognize the value of transportation and land-use integration as a way to ensure that investments in transportation are not undermined or wasted by land development practices that compromise the viability of those investments (*1*).

State DOTs have taken a variety of approaches to partnering with local governments, often via MPOs and regional councils of government. In many areas, though, current development patterns and decision-making structures have made this an uphill struggle.

In the ***New Jersey Route 31*** case, NJDOT took a different approach from its traditional focus on road building and looked at innovative approaches to meet mobility and community needs. Under this change in direction, NJDOT ended up studying a scaled-down and more context-sensitive highway option for the Route 31 corridor. This option involved replacement of a bypass highway project concept with a parkway and interconnected street network.

The change in approach stemmed from efforts to ensure that NJDOT's programs were consistent with the state's smart growth principles. NJDOT saw that the conventional strategies (e.g., additional lane-miles and grade-separated interchanges) were spurring growth, which was quickly negating the congestion relief gained from additional highway capacity. NJDOT realized that it should engage local governments and work with them to develop land-use and transportation policies that would break the cycle between increasing highway capacity and sprawl. Moreover, NJDOT recognized the high costs of road widening, often including taking of homes and businesses, relative to the benefits they provided. Thus, the agency adopted a philosophy that the state's limited transportation funds should be prioritized for communities that were willing to adopt land-use plans that would preserve the utility of the state's investment.

In the U.S. Route 31 case, NJDOT engaged the help of an interagency local planning committee. Initial planning activities built consensus around a conceptual alternative to the Flemington Bypass that addressed both land-use and transportation needs in the corridor. This conceptual alternative then served as the starting point for a second round of interactions with the community at large.

The Sacramento Area Council of Governments (SACOG), which is responsible for the MTP, recognized the need to link its transportation planning with land use. To accomplish this, SACOG spearheaded an effort to create a blueprint for growth in the Sacramento region over the next 50 years. Since SACOG does not have land-use authority over local jurisdictions, working with local jurisdictions throughout the ***Blueprint project*** was vital to achieve buy-in and support for the preferred scenario.

Because many agency structures and cultures do not lend themselves to integration of land-use and transportation planning, state DOTs have had to be flexible in their approach. For instance, in the ***Colorado US-285*** case, the state DOT was able to convince the local MPO that carefully designed access points would limit sprawl. The idea was that widening would facilitate traffic flow, but the design of the access points would restrict the ability to develop surrounding land.

Practice Good Environmental Stewardship

The case studies illustrated that state DOTs took into consideration the effects their transportation projects had on biodiversity at the ecoregion level. In part, this is because of the broadening notion that, in addition to resource agencies, DOTs serve in the role of public stewards. Increasingly, the public expects government agencies to work in tandem to deliver for the common good.

Establish Early Coordination with Resource Agencies

Coordination with resource agencies in the NEPA process is critical for moving a project forward, and case examples show

that moving coordination earlier into the planning stages can be beneficial. The case studies also include examples of how delaying coordination with the agencies can create problems in the NEPA process. For instance, in the ***US-24 Ohio project***, waiting until the preferred alternative was identified to coordinate with the resource agencies resulted in a mid-project change in direction that added a year to the project schedule.

As exhibited in the ***Colorado STEP UP project***, establishing early coordination with resource agencies in the transportation planning process has benefits. When resource agencies are made aware early in the process that a large project is proposed for an environmentally sensitive area, they can identify the environmental issues earlier and with more certainty. Resource agencies can then plan accordingly and get productively involved with the project at the corridor stage, saving state DOTs time and money while promoting environmental stewardship and sustainable transportation infrastructure development.

Resource agency involvement at this early stage increases understanding of the larger picture, available trade-offs, and limitations. NCDOT's EEP, profiled in the ***North Carolina US-64*** case study, is an excellent example of resource agency coordination, resulting in improved environmental outcomes. The EEP enables multiple project impacts (wetlands, stream corridor, water quality, species, and habitat) to be addressed in a comprehensive manner, targeting mitigation resources to better protect the natural resources of the state by assessing, restoring, enhancing, and preserving ecosystem functions and compensating for impacts at the watershed level.

In addition to exceeding the state and FHWA's no-net-loss objectives for wetlands, the EEP has implemented mitigation years earlier than NCDOT's project-letting schedule previously allowed, thus expediting projects and eliminating temporal loss of wetland and riparian areas. The approach reduces permit staff workload, rework, and duplication of effort, saving time and money. It also reduces project controversy; improves communication, planning, and environmental stewardship; and serves as a model for positive interagency relationships that dramatically increases the ecological effectiveness of the investments of public dollars in compensatory mitigation.

Consider Environmental Impacts Early in Planning

An ecoregional approach streamlines project delivery by avoiding, minimizing, and mitigating many of the environmental impacts that projects encounter. By using natural resource data in the early stages of planning, state DOTs can steer clear of costly delays later in the life of their projects. Additionally, DOTs that adopt a proactive approach to conservation become a full partner in implementing the conservation strategy for the entire state (*2*).

An excellent example of this is the ***Colorado STEP UP process***. It increased consideration of environmental impacts and resource agency involvement early in the transportation planning process. Moreover, it helped ensure that projects proceed more quickly through NEPA documentation during the project development phase. The project's web-based GIS tool and database also eliminated redundancies in environmental analysis by identifying critical issues earlier. This information could then be used by similar projects in the same area.

Undertake Advanced Mitigation

Mitigation packages by state DOTs are becoming more comprehensive. Increasingly, they are taking wider watershed, ecosystem, and ecoregional views on how to improve affected resources, especially threatened and endangered species. For example, a comprehensive mitigation package was developed for the ***Woodrow Wilson Bridge project***. It encompassed the following:

- Installation of 22 fish passageways and one fish ladder on Rock Creek and Anacostia River tributaries to allow fish to spawn upstream of previous man-made barriers;
- Stocking of 15 million river herring in Rock Creek and Anacostia River tributaries;
- Establishment of an 84-acre bald eagle sanctuary in Prince George's County, Maryland;
- Building of a fish reef in the Chesapeake Bay using thousands of tons of the old bridge;
- Preservation or creation of approximately 146 acres of wetlands at various locations in Virginia, Maryland, and D.C.;
- Planting of 20 acres of river grasses in the lower Potomac River for fish habitat and water cleaning purposes; and
- Preservation of more than 140 acres of woodlands in Prince George's County, Maryland.

Mitigation commitments such as these were recognized nationally more than once as model examples of environmental stewardship. The project's Fish Passage Program received multiple awards. The protective measures the project took during construction of bridge foundations were equally innovative. Perhaps the most dramatic evidence of the project's environmental sensitivity, though, was the successful breeding of generations of bald eagles nesting immediately adjacent to the property (*3*). Thus, the effect this mitigation package had in engendering support for the project and leading to the project's success was substantial.

Several case studies also illustrated how in-lieu-fee agreements are being used. Under an in-lieu-fee agreement, the mitigation sponsor collects funds from an individual or a number of individuals who are required to conduct compensatory

mitigation under Clean Water Act Section 404 or another state or local wetland regulatory program (*4*). In-lieu-fee agreements offer the opportunity to perform mitigation in advance, reducing temporal impacts; increasingly DOTs are also performing other mitigation in advance in efforts to collaboratively achieve the greatest environmental benefit and reduce uncertainty.

North Carolina's EEP, applied in the ***US-64*** case, had both direct mitigation and in-lieu-fee components. In the ***Utah I-15*** case, in-lieu-fee payments were used on the project's minimal wetland impacts, facilitating direction of wetland mitigation investments to target the greatest wetland and water quality improvement needs in a watershed.

In the case of the ***I-405 Corridor Program***, WSDOT's decision to provide advanced mitigation was a key factor in achieving agreement with the resource agencies during its Tier 1 EIS. For the Tier 1 EIS, the agency committed to a comprehensive set of mitigation measures that not only covered the new program but also previous losses to some degree. Likewise, resource agencies involved in the I-405 case were innovative in that they took a broader, watershed approach to analyzing resource needs, when in the past they had focused on detailed site-level impact analysis and on-site and/or in-kind mitigation. This flexibility was significant and a turning point in the project, as resource agencies often get caught between their regulatory requirements and the limitations of a Tier 1 EIS analysis and/or planning-level data.

In the end, WSDOT's commitment to fund a comprehensive set of mitigation measures was a pivotal factor that allowed the resource agencies to reach concurrence and keep the project moving forward. The opportunity to achieve those benefits eventually outweighed initial resource agency concerns that giving concurrence to the total program would undermine or predetermine its ability to assess project-level EIS documents in the future.

Ensure Fulfillment of Environmental Commitments

State DOTs are also improving accountability for the environmental commitments they make. The commitment tracking system used in the ***Woodrow Wilson Bridge project*** was a key factor in assuring stakeholders their concerns would be consistently addressed and that the transportation agencies and contractors would maintain expected environmental standards. In concert with the tracking system, FHWA established an independent environmental monitor to observe and report on the status of all agreed-on mitigation.

FHWA's use of the tracking system was vital to the project development, permitting, and delivery processes. It became the repository of over a thousand commitments and could be reviewed and updated at any time in response to project activities or agency or public inquiries. It provided a method for ensuring that commitments were carried out. Furthermore, this tracking system now serves as a record of the mitigation process and is the basis for accurate and efficient reporting to permitting agencies and other interested organizations.

The Maryland State Highway Administration now makes its Environmental Monitor Toolkit, an online tracking system with daily inspections of all sites with Section 404 permits, available to interested resource agencies. A separate system tracks projects with lower-level impacts that are inspected on a weekly to monthly basis. These efforts have been fundamental to developing a unique level of trust and confidence among the state DOT and resource agencies.

Structure Decision Making/ Use a Formal Process

The ***I-405 Corridor Program*** was initially expected to include one large committee of stakeholders comprising elected officials and technical experts from the regulatory agencies. All committee members were expected to be at the table to reach consensus and make decisions together. However, on two other projects, WSDOT learned this process left something to be desired. On those projects, people attended meetings on topics about which they had no expertise. A lot of time was spent bringing everyone up to speed. Discussions went astray and often resulted in gridlock. Instead, the I-405 Corridor Program implemented a tiered committee structure designed as a continuous flow of information and decision making between three formal committees (*5*).

This process allowed for more informed discussion and produced deliverables that were tailored to the people who sat on the committees. Each committee was responsible for its own area of expertise, but the committees met together as needed to discuss issues and exchange ideas. Most participants agreed this approach was much more efficient.

This process allowed issues to be brought forth and addressed at each step in the decision-making process rather than waiting until the draft or final EIS stage, which usually resulted in substantial revisiting of completed analysis and design. This process also allowed participants to feel they achieved at least part of what they needed and to reach consensus to keep the project moving forward.

It should be noted that there were some issues with roles and responsibilities in the I-405 Corridor Program. The programmatic EIS process was marked chronologically by a system of three concurrence points and nine consensus points. From the establishment of the committees in 1999 to the signing of the ROD in October 2002, the Corridor Program took a little more than 3 years to complete. However, due in part to the difficulty of gaining concurrence and recent changes in federal law, WSDOT decided not to repeat this approach. The department found it difficult to gain concurrence among

all agencies. Some members of the project management team felt the resource agencies had too strong a role in the decision-making process and felt the process would have gone smoother had the agencies acted in more of an advisory role.

Currently, WSDOT and FHWA are revising the process to be more consistent with the requirements of the most recent federal transportation funding bill, the Safe, Accountable, Flexible, Efficient Transportation Equity Action—A Legacy for Users (SAFETEA-LU). FHWA's final guidance for implementing Section 6002 of SAFETEA-LU makes clear that the lead agency is responsible for determining the final purpose and need for the action and the range of alternatives, after considering input from the public and participating agencies. The guidance goes on to say, lead agencies may need to renegotiate or dissolve a merger agreement that calls for other agencies to concur in purpose and need statements or the range of alternatives if the agreement is not expediting project development. WSDOT and FHWA have interpreted this to mean that requiring written concurrence is not necessary and may hinder streamlining objectives.

I-15 in Utah moved forward without major delays and was able to streamline project delivery by using a design-build approach. In October 1999, a large study was initiated to look broadly at transportation issues and solutions across urbanized parts of Utah, identifying needed improvements. The NEPA process moved forward from 2001 to 2004, and at the end, Utah DOT decided to proceed with a design-build approach to expedite delivery. In 2005, supplemental funding approval by the state legislature enabled the project to move forward, and the I-15 NOW project broke ground in spring of 2006.

Several of the case studies used a merger process and/or formal concurrence points between agencies at specific key decision points to streamline the decision-making process. A formal merging of the NEPA and Section 404 permitting processes can help save time on the permitting end and, by gaining concurrence, can help avoid redo loops on basic decisions, such as purpose and need. This approach can work effectively, as in the case of the ***Woodrow Wilson Bridge***. Despite the lawsuits and controversy that delayed the Woodrow Wilson Bridge project, the sense of urgency regarding the need to replace the deteriorating bridge also called for innovative approaches. FHWA was able to expedite the final stages of project development by completing concurrent NEPA and Section 404 permitting processes, using the draft and final supplemental EISs to serve as the initial and final permit applications, respectively. The U.S. Army Corps of Engineers (USACE) was a cooperating agency on the supplements, held joint public hearings with FHWA, and issued its Section 404 permit approximately 2 weeks after FHWA completed its final supplemental EIS and signed the ROD.

In the development of ***Caltrans's corridor system management plan (CSMP)*** for the I-880 corridor in Alameda County, Caltrans brought together all agencies and jurisdictions involved in moving people along the corridor to consider not only the immediate highway but the arterials and public transit within the corridor as well. Doing so helped ensure that the big picture would be considered in the decision-making process. Caltrans and the Metropolitan Transportation Commission (MTC) brought all of the participants together to develop and agree on the CSMP process. To support the collaborative process, the participating members of the CSMP process were required to sign a charter stating that they were committed to improving transportation along the corridor and working together to attain the benchmarks set according to the agreed-on performance measures. This step helped formalize each organization's commitment to making fundamental improvements to transportation along the corridor.

Use Performance Measures and Evaluation Criteria

Performance measures were an integral part of some of the model processes encountered in the case studies. Performance standards and measures facilitated accountability, built stakeholder trust, and assisted maintenance of a directed course of action, guided by plans and agreements.

Several of the case studies illustrated how performance measures improved the decision-making process through knowledge sharing and clarification of the issues, but each case used performance measures in different and innovative ways.

In the ***Maricopa RTP***, the MAG planning process was notable in that it began with the establishment of policy and then followed with implementation strategies and performance measures. MAG's Transportation Policy Committee established goals, objectives, and performance measures for the RTP over a series of meetings and workshops, drawing on five expert panel forums and 16 focus group sessions held in the region over the previous 2 years.

The consensual development of policies is often the most difficult step in the development of a regional transportation plan. Urban areas often establish high-level goals that can be supported universally. In contrast, Maricopa County not only established specific policy goals but, in addition, set performance measures to provide feedback on successful implementation of these goals, providing quantitative means to evaluate often qualitative standards. The strong policy framework prevented the process from bowing to special interests and political manipulation.

The inclusion of performance measures and evaluation criteria was also crucial to getting the approval of the legislature and the public. Performance measures were one of the most important elements of the plan, politically. Legislation

that enacted the 1985 sales tax included a requirement for performance audits every 5 years to evaluate plan success. These audits proved valuable in making plan adjustments. Fully funded performance measures provided quantifiable assessment tools linked to goals and objectives.

In the ***Binghamton metropolitan transportation study***, project stakeholders used performance measures to evaluate different growth scenarios and their ability to meet the stakeholders' goals. The goals focused on solving the region's challenges of infrastructure use and maintenance, economic revitalization, and sustainment of a vibrant but shrinking community. They overlapped the goals and measures, so that the measures would link to more than one goal; for example, the percentage of population in "enhanced community elements" served as an indicator for both economic revitalization and community issues. Using these measures, stakeholders evaluated four possible future scenarios: outward trend (baseline), outward growth, inward trend, and inward growth. Subsequently, the stakeholders chose an inward moderate growth scenario, as it outperformed the others in those performance measures.

The team in the ***Oregon I-5 Beltline Interchange*** study used performance measures for the rebuild of a specific interchange/intersection. A stakeholder working group (SWG) was developed during this project to capture the wide range of stakeholder interests and communicate those interests with the project team. Members of the SWG established criteria to evaluate the performance of feasible alternatives against the full range of stakeholder values and then used the criteria to rank the alternatives. The criteria list was diverse, using threshold and evaluation, and absolute and ranking criteria. The threshold criteria were that the alternatives had to be phased and had to improve safety, provide business access, promote multimodalism, and minimize property displacement.

The SWG established 26 evaluation criteria to evaluate the performance of feasible alternatives against a full range of community values. Evaluation criteria spanned five broad categories: cost, implementation, transportation, safety, and the natural and human environment. They were also weighted on the basis of each stakeholder's values and community desires and relative importance. When feasible, measurements were quantitative, such as acres of wetland impacts or the number of business displacements. Otherwise, the measures were qualitative, establishing a high, medium, or low scoring scale based on relative desirable characteristics. Each alternative was later given a performance rating based on both the general performance with the evaluation criteria and its weighted value-laden rating.

The use of a decision support system (DSS) was critical for the comparison of evaluation criteria. DSS is the name often given to computerized decision tools that help with complex decision making. Typically, these tools help evaluate alternative options or scenarios, deal with complexity, and have a clear, reproducible procedure.

Oregon DOT used Criterium DecisionPlus as its DSS. Criterium DecisionPlus is desktop decision manager software that uses a multiattribute utility analysis to evaluate and compare alternatives based on community values, as represented by the SWG. Before its use, the SWG and project team created threshold criteria, essentially the "fatal flaw" analysis. In this process, the SWG identified the major concerns relating to the project. These concerns became the evaluation criteria.

The DSS helped keep debate productive and focused on the objectives. The SWG developed criteria, as driven by their interests. The weighting process helped the group focus on the issues of importance to the community. As a result, the group did not waste time on issues that would leave the performance of the alternatives unchanged. Ultimately, this approach to decision making enabled sharply divided jurisdictions to develop shared ownership in the process and its eventual outcome.

The SWG used information from the DSS to aid its discussion about objectives and functions, which fed into discussions on which alternatives to move forward for evaluation in the environmental assessment. Specifically, the tool was helpful in identifying which alternatives least met community values (the lowest scores) and which few merited more consideration (the highest scores). The tool supported discussion, but the evaluation results were not viewed as the answer. The group's recommendations resulted from creating hybrids of several options that scored well in the evaluation.

Criterium DecisionPlus enabled the team to step back from the alternatives themselves, to identify valuation criteria, and to weight those criteria. Ratings were focused on the objectives of the project and stakeholders' values. Sensitivity analysis showed all stakeholders how rankings of alternatives might change, depending on values.

In another situation, the ***Colorado STEP UP*** program used performance criteria as a screening mechanism in its local funding disbursements. Outside of the NFRMPO's corridor strategy, it also used environmental data for its local project prioritization process. The localities would submit projects based on several different cost, mobility, and environmental avoidance criteria. The success and probable inclusion into the fiscally constrained plan depended on how well the projects met these predetermined criteria, essentially requiring a certain level of performance to even be considered for funding.

Development of evaluation criteria before the identification and screening of alternatives proved to be important in some case studies. On the ***Utah I-15 NOW*** project, local business interests favored an intersection alternative that had no impacts on existing businesses. However, analysis of that

alternative showed it would not meet FHWA requirement to serve 20-year transportation needs. Thus, it was dropped from consideration.

Developing a set of performance measures that all participating agencies agreed on was essential for creating a common baseline for measurement and decision making throughout ***Caltrans's CSMP*** process. Alternative congestion management strategies were analyzed and selected in the development of the CSMP for the I-880 corridor in Alameda County. The recommendations from the CSMP are intended to inform the MTC in its development and update of the TIP. The result is that the MTC will be able to put forward projects that will improve the overall efficiency of the corridor.

The CSMP was designed to be a collaborative process among all agencies involved with moving people and goods along the corridor. For the I-880 corridor, the participating agencies included Caltrans Headquarters, Caltrans District 4, the MTC, Alameda County Congestion Management Agency, Bay Area Rapid Transit District (BART), and the local jurisdictions. It was considered crucial that participating agencies agree on both the performance measures used to analyze and choose congestion management strategies and projects and the source of data supporting those measures. The performance measures used in developing the CSMP for the I-880 corridor in California were based on quantitative data focusing on three key areas: mobility, reliability, and safety. The mobility performance measures were based on travel time and delay. The reliability performance measures captured the relative predictability of the public's travel time and how much mobility varies from day to day. The safety performance measures were generally based on the number of accidents and accident rates. The primary objective of the performance measures was to provide a sound technical basis for describing traffic performance on the corridor. Most of the performance measures used had been developed by Caltrans operations staff over years of experience with other projects and analysis. However, the entire project team evaluated and decided on which performance measures were relevant for the I-880 corridor.

Compared with the performance measures used to select congestion management strategies in California's CSMP process (which were based on quantitative data focusing on transportation mobility, reliability, and safety), selection of the preferred long-range transportation vision for ***Idaho's Transportation Vision 2033*** relied on a broader set of criteria integrating transportation with land use, housing, environmental management, and economic development. These performance measures were based on stakeholder preferences.

The ITD initiated an extensive dialogue and strategy process to create Idaho's Transportation Vision through 2033. The visioning process brought together academia, resource agencies, and the public and private sectors in workshop settings. As part of that process, the collective priorities of workshop participants were used to develop screening criteria for selecting a preferred scenario. Workshop participants used individual wireless keypads to register their values and priorities. MetroQuest software was used to create and compare alternative scenarios based on the criteria developed through participants' input. Through this process, the performance of the alternative scenarios is measured directly by the priorities indicated by workshop participants.

Collaborate with Agency Partners and the Public

The International Association for Public Participation (IAP2) offers a widely used spectrum for public participation suggesting the following levels of engagement (*6*):

- *Inform*: To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities, and/or solutions.
- *Consult*: To obtain public feedback on analysis, alternatives, and/or decisions.
- *Involve*: To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.
- *Collaborate*: To partner with the public in each aspect of the decision, including the development of alternatives and the identification of the preferred solution.
- *Empower*: To place final decision making in the hands of the public.

These same levels of engagement apply to participation with agencies. Many of the case studies had good examples of techniques used to involve the public and agencies in the transportation decision-making process; however, those that used a truly collaborative process found real success. Examples of the most collaborative approaches are included here. Additional successful practices for engaging and involving both agencies and public stakeholders are included, as Appendix A.

In the ***WSDOT I-405 Corridor Program*** study, the project was supported by an executive committee made up of local elected officials. The executive committee focused on what its members believed to be reasonable alternatives consistent with local land-use planning, which also helped the committee get through the process in a timely manner. The executive committee took ownership of the decisions and became advocates for the selected alternative. In turn, it publicly supported the project in front of regional constituents, the Washington State Legislature, and the Office of the Governor.

In the ***Maricopa RTP*** development, involvement of the business community was essential to the success of the transportation plan and area tax increase. Business leaders served as liaisons between the MAG, area lawmakers, and the public.

They were the glue that held the collaborative framework together. Representing diverse transportation, land-use, and business development interests, business leaders were the key to the success of local taxing initiatives. They demonstrated a strong respect for the technical ability of the MAG staff, the planning process, and the criteria used to establish transportation needs. Their official public leadership role on MAG task forces provided credibility to decision making and inhibited alliances toward special interests.

In addition, the business community had the ability to act outside of the constraints of elected officials to assess public interests and support for different plan structures. During development of the Maricopa RTP, the business community took polls and other measures to gauge public sentiment toward particular plan options. They were able to present a realistic perspective on those plan attributes that would lead to success.

The creation of ***Florida's ETDM Process*** was collaborative in that it was developed to support transportation decision-making procedures for the state of Florida, not just the Florida DOT (FDOT); and it came into being through a joint effort among FDOT, FHWA, and other state, federal, and local government agencies to reexamine the entire transportation planning and project development processes within each agency. First, agency heads agreed to participate in the development of the process. Then, through a series of interagency work groups and task teams, the new process was developed for the state. Under the leadership of FDOT's Central Environmental Management Office, process refinements have been ongoing since the ETDM Process began. Regularly scheduled ETDM coordinator meetings are conducted to identify and address issues that arise during ETDM implementation. If necessary, special interagency task teams are formed to address these issues. Every agency, as well as FDOT, adjusted its business practices to accommodate the new ETDM Process and the workload requirements to support the new process. FDOT reorganized staff and management positions to accommodate the responsibilities, while other agencies opted to create new positions or sections within their existing structure. The roles, responsibilities, and expectations for agency participation throughout the ETDM Process are codified in agency agreements. When needed, funding for dedicated staff is made available through funding agreements.

Beyond development of the process, early and continuous agency involvement is a key component to the success of the implementation of the ETDM Process. Agency interaction occurs throughout the life of a project to ensure that transportation decisions are balanced with effects on natural, cultural, and community resources, land-use decisions, and other agency goals or objectives. This is accomplished through an environmental technical advisory team (ETAT). An ETAT, consisting of planning, regulatory, and resource agencies, has been established for each of the seven geographic FDOT districts. Each agency appoints a representative or representatives who are responsible for coordinating and performing all actions to satisfy their responsibility with respect to the planning and development of transportation projects. The ETAT representatives have authority and responsibility to coordinate internally and represent their agency's positions. The role of the ETAT representatives changes from advisory during the planning and programming phases to coordination during environmental review and permitting. Through the ETAT, the ETDM Process fosters a team approach to identifying transportation solutions that are responsive to environmental and cultural preservation goals and to community livability objectives. Early coordination and consultation among FDOT, MPOs, and resource agencies improves the mutual awareness and understanding of mobility needs and environmental protection, which continues through each phase of the ETDM Process. It is important to note that early involvement in the ETDM Process begins during project planning before significant resources have been spent on technical studies and project design.

One of the first steps in creating an environment of trust is to identify affected stakeholders and clearly establish their roles. For instance, in the ***Woodrow Wilson Bridge*** case, FHWA formed stakeholder participation panels. FHWA proposed and organized four panels: the Telegraph Road Interchange Panel, Jones Point Park Panel, Route 1/Washington Street/Urban Deck Panel, and Maryland Interchanges Panel. FHWA defined stakeholders, including bridge users, as those individuals and groups directly affected by the project. The purpose of the panels was to identify valued community characteristics, define community goals and guidelines for the final design, and work with designers and planners to codevelop concepts and proposed designs that enhanced and preserved the natural environment, the built environment, and the social environment of the community. The project team made clear to prospective panel members, however, that alternatives would not be revisited and that the preferred alternative was the focus of the panel's work.

On the ***I-5 Beltline Interchange project***, Oregon DOT developed a planning study (the Interstate 5/Beltline Interchange Facility Plan) for the interchange, which recommended five alternatives for further evaluation. However, despite Oregon DOT's coordination with local stakeholders, considerable disagreement remained with regard to the best solution. Oregon DOT recognized that a new approach was needed to complete the next step in the process, an EA. The department used a highly structured decision-making process to engage a SWG that was made up of technical experts and representatives of businesses, neighborhood associations, special interests, and elected officials.

One of the most unusual aspects was the shared authority of the decision team. Decision team members signed a formal agreement that established protocols for communications and decision making between a wide range of stakeholder interests, including individual property owners, neighborhoods, interest groups, business representatives, and local jurisdictions. The roles and responsibilities were spelled out in protocols agreed to in writing by each member of a SWG. The protocols for communications included requirements for meeting attendance, clearly defined roles and responsibilities, agreement to keep an open mind and be respectful of others' views, and accord to include minority opinions when unanimity was unattained. Decisions were made by majority vote with the team reaching consensus at each decision point.

The local governments—Eugene, Springfield, and Lane County—had great say in the process. It was unusual for local governments to have this much influence in the process when they are relying on outside funding. In fact, at one point, FHWA and Oregon DOT were outvoted by local officials. Per the process, the two agencies ended up submitting a minority report. Statutorily, FHWA and Oregon DOT had final decision-making authority regarding the preferred alternative, but without local support, the project would not have moved forward.

Although not everyone was happy with the final decision, all agreed the process was excellent. Many stakeholders believed this was a more transparent decision-making process. Some surmised that, had Oregon DOT started this process with the development of the facility plan, the entire project would have gone much faster and the opportunity for distrust and confusion would have been significantly reduced.

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CHAPTER 5

The Collaborative Decision-Making Framework

Moving Beyond Individual Barriers and Success Factors

The case studies show that there are strong motivations to collaborate. Collaboration is not a new topic for the transportation industry. The discussion really began in 1991 with the enactment of the Intermodal Surface Transportation Efficiency Act (ISTEA). With the first acknowledgement that decision making about transportation improvements is not conducted in a vacuum, this early transportation legislation represented something of a sea change in the industry. By the late 1980s the interstate system was largely funded or under construction, allowing the federal gasoline tax revenues to be redirected to other needs. At the same time, public concern over environmental issues such as acid rain led to amendments to the Clean Air Act in 1990. As ISTEA was drafted, environmentalists and others urged Congress to emphasize the needs of people rather than automobiles and to make the environment an integral part of transportation decision making. As a result, the new transportation legislation focused on improving transportation not as end in itself but as the means to achieve important national goals, including economic progress, cleaner air, energy conservation, and social equity (*1*).

Considering the stringent requirements for engagement, an apparent willingness of professionals to collaborate, and actions taken to support collaboration, why do most transportation professionals still see this as a weak link in the decision-making process? Why can't we just do it?

The difference that collaboration made in many of the case studies is clear. Would these specific approaches work for every state or region? Probably not. However, when studied in depth, specific examples of successful collaboration offer many insights into how to get it right, as well as what may undo the best laid plans. Practitioners are hungry for examples of successful projects that they can imitate to enhance the possibility of success. Well supported case study reports are an invaluable resource to transportation professionals at all levels.

However, transportation practitioners are also keenly aware of the differences between individual projects and plans. What works well in one instance can prove woefully inadequate in another. All projects have individual contexts, and even the most carefully documented project does not provide sufficient detail on how to collaborate in each step of each phase of decision making. The challenge is to turn successful project examples into the systematic inclusion of collaboration in the entire transportation process. The value that case study examples provide is in their collective wisdom.

The answer lies in systematically institutionalizing collaborative decision making as a business practice and providing user-friendly guidance in the form of the Framework. It is absolutely essential to have the right people at the table at the right time with the right information to make good choices that will stand up to scrutiny. The Framework helps practitioners do this at all levels; it is flexible and adaptable, is usable by all transportation agencies, and provides specific information on how to support collaborative decision making within the existing laws and regulations.

The Framework directly responds to the main barriers to project or program delivery identified in the case studies and described in Chapter 3. It encompasses the success factors found in practice and described in Chapter 4. The connection between barriers and success factors in the case studies and components in the Framework is described in Table 5.1. The Framework itself is described in the following sections.

Structuring the Framework Around Key Decision Points

To make the Framework applicable to the entire universe of transportation participants, the structure must be rather high level. This can be problematic. The way of implementing transportation improvement projects may be quite different in Kansas and Kentucky. Transportation regulations map out the requirements, and these have been interpreted

Table 5.1. Connection of Barriers and Success Factors Identified in Case Studies to the Framework

Barrier Identified in Case Studies	Applicable Solutions from Case Studies	Relationship to the Framework
Cross-phase issues	Link phases of transportation decision making Structure decision-making process	The Framework encompasses the key decision points in four phases of transportation decision making: long-range planning, corridor planning, programming and fiscal constraint, and environmental review. The linkages between these four phases are identified in the Framework along with details surrounding transfers of data, analysis, and decisions. In addition, the roles and interests of key partners—FHWA, state transportation agencies, MPOs, and resource agencies—are specified for each phase, giving all partners an awareness and mutual understanding of each other's interests and role.
	Use a context-sensitive approach Integrate transportation, land-use, and environmental issues	For each key decision point, the Framework describes where the inputs and outputs of data, analysis, and decisions occur between transportation decision making and the following issues: • Human context (including land-use planning); • Ecological planning; • Air quality; • Capital improvement planning; and • Safety and security planning. In addition, the Framework broadly identifies the partners who should be at the table at each key decision point and specifies their roles (decision maker, adviser, or observer). Bringing these partners into the transportation process at key decision points ensures that their missions as conservation planners, land-use planners, and so forth are represented. The Framework is the structure of key decision points that constitute the transportation decision-making process. Further structure could be built around the Framework, such as the use of formal agreements; however, this is better accomplished by each implementing organization.
Insufficient engagement of the public and agencies	Collaborate with agency partners and the public	The fundamental principle behind the Framework is collaboration—both with the public and with partners in decision making. To support collaboration with the public, the Framework provides two sets of questions related to collaboration with the public at every applicable key decision point: (1) questions about stakeholder interests that partners should ask, and (2) questions partners should ask stakeholders to understand/gather information about their interests. Eventually the Framework will be accessible in a publicly available web tool. One section of the tool will be devoted to collaboration with stakeholders in transportation decision making. It will link to a diagnostic tool that will help users gauge the level of collaboration in their processes and provide recommendations for improvement. For every key decision point, the Framework assigns a role (observer, adviser, decision maker, or no role) to each of the partners in transportation decision making: FHWA, state DOTs, MPOs, and resource agencies. Corresponding questions are provided which represent each partner's interests in that key decision point. The interests of each partner are described by phase. By integrating transportation decision making with other processes such as land-use planning and capital improvement planning, other partners are necessarily brought into the decision-making process. The Framework provides information at the key decision point–level of how these processes should be integrated with transportation decision making. The diagnostic tool will provide the same function for collaboration with partners as with the public: it will allow users to gauge the level of collaboration in their processes and provide recommendations for improvement.

(continued on next page)

Table 5.1. Connection of Barriers and Success Factors Identified in Case Studies to the Framework (continued)

Barrier Identified in Case Studies	Applicable Solutions from Case Studies	Relationship to the Framework
Turnover and loss of key leaders	Structure the decision-making process	The collaborative approach to transportation decision making lessens the risk of turnover and loss of key leaders by streamlining the decision-making process. One principle of the structured approach of the Framework is that once a key decision has been made, it is not revisited. This diminishes the redo affect when new leadership wants to take a new look at past decisions. While the Framework does not recommend specific documentation, the approach could be further strengthened in its implementation by instituting formal agreements at key decision points or to the overall structure of the decision-making process.
Funding constraints	Manage risks	Decisions made in every phase of the transportation process should be based in fiscal reality, but, typically, only minimal information from the fiscal constraint process is transferred beyond the planning phase. The Framework links the phases of decision making by integrating the programming and fiscal constraint processes and specifying the flow of data, analysis, and decisions between long-range planning, programming/fiscal constraint, corridor planning, and environmental review. In this way, fiscal constraint can be considered in the development of corridor plans, and anticipated revenues, costs, and sequencing are provided for consideration in the environmental review process.
Challenges in solution screening	Use performance measures and evaluation criteria Link phases of transportation decision making	Solution screening is a key focus of the Framework and its applications and case studies. Every phase of transportation decision making encompassed by the Framework includes two key decision points in some form that involve approving a vision and/or goals and approving evaluation criteria methodology and performance measures that can be used to determine how well each possible solution meets the vision and goals. These key decision points are connected through the transfer of data, analysis, and decisions to the vision, goals, evaluation criteria, and performance measures used in earlier phases. In subsequent phases, any solutions that were eliminated early in the decision-making process are known, along with a reason for that elimination. In addition, the specific contribution of each key decision point to solution screening is specified. These data will eventually be presented in one place through an application on the web tool. Case studies that focus specifically on solution screening will also be accessible from the tool.
Data availability	Link phases of transportation decision making Integrate transportation, land-use, and environmental issues Structure decision making Collaborate with agency partners and the public	While the goal of the Framework is not to provide actual data, the approach fosters making data more accessible by (*a*) linking the phases of transportation decision making, (*b*) integrating transportation decision making with external processes, (*c*) cultivating a collaborative approach that enables better access to data from partners and stakeholders of the decision-making process, and (*d*) detailing the data needed at each key decision point.

by individual agencies into supporting procedures. For the Framework to be useful, these individual procedures must fit under the collaborative umbrella without requiring wholesale upheaval of the current process in individual agencies. For this reason, changes in the procedural steps, or technical process, must be targeted to support collaboration at key decisions.

Decisions that require approval from a high level of authority, need consensus among decision makers, or are required by law or regulation can be identified as key decisions. Between these key decisions are many smaller decisions and process steps that represent the technical transportation process. The philosophical basis of the Collaborative Decision-Making Framework is that collaboration at the highest level within any process requires collaboration at the steps that support the key decisions. In essence, institutionalizing collaboration at the key decision points is expected to foster collaboration in the supporting technical process; however, exactly how collaboration is implemented in the technical process will vary from state to state or region to region.

The Framework represents a structure of the key decisions which are common to all transportation agencies and which support the transportation decision-making process. The 44 key decision points that constitute the Framework are shown in Figure 5.1. The analogy of a file drawer with individual folders is useful in understanding the information contained within a key decision. The folders in each key decision contain information on the purpose and outcome of the decision; the specific roles of each of the decision-making partners; the potential for integrating external processes and linking individual key decisions; the questions that policy makers must address to make the decision; and the data, tools, and technology that may be used to support the decision. This concept is further illustrated in Chapter 6 of this report.

The relationships between key decisions and the supporting processes that exist within an individual agency can be confusing. Most practitioners are primarily concerned with the individual steps that guide their day-to-day work. This is clearly evident to the NEPA practitioner following the highly structured steps that dictate the progression through environmental review. It is equally true in long-range planning, corridor planning, and programming. Many individual decisions are made before a more encompassing decision (such as the approval of the project purpose and need) is elevated to the decision-making authority within the process. In this way the technical process may be said to exist between the boxes of the Framework. The individual processes of 50 state DOTs and more than 300 MPOs can therefore be mapped to the Collaborative Decision-Making Framework, providing a common foundation for integrating collaboration universally.

Building on the Key Decision Points

What exactly is in each key decision point that supports collaboration? The basic information in each key decision point answers three main questions:

- Who are the collaborative decision-making partners?
- What information do the decision makers need?
- How does the technical process support making the decision?

Answering these questions is not quite as simple as it sounds. Knowing who the partners are requires understanding their roles and the information they bring to the process. Responding to the needs of decision makers requires an understanding of the data, analysis, and decisions that are available to consider. The technical process must be able to provide this information through data collection, analysis, and communication to decision makers.

Because the Framework represents an organizing structure for data that supports collaboration, more data can be added over time. Many SHRP 2 research projects support and enhance the basic Framework data. For example, the SHRP 2 Capacity Project C02 creates a framework for performance measurement for additions to highway capacity. The use of performance measures applies to specific key decision points. Supporting information from the C02 project about the performance measures to consider and the data needed to implement individual performance measures is incorporated into the key decision point structure. Collaboration is enhanced when many relevant topics can be considered at the appropriate point in the decision-making process.

The key decision point structure, therefore, allows the decision-making process to connect to existing technical processes. This connection helps transform individual processes by driving collaboration back into the small steps of making decisions. Although this represents a top-down approach, it is not prescriptive. A change in the underlying technical process represents an evolution as more efforts are made to collaborate over time. What may begin as an interest in the selection of alternatives during environmental review may migrate back into the planning phase to the collection of scenario information. This can only happen when the full transportation decision-making partnership is engaged with the necessary support to make the right decisions.

Using the Framework

The Framework and the content within it are of little value if not understood, accessed, and applied by practitioners. The Framework serves as a common foundation on which tools

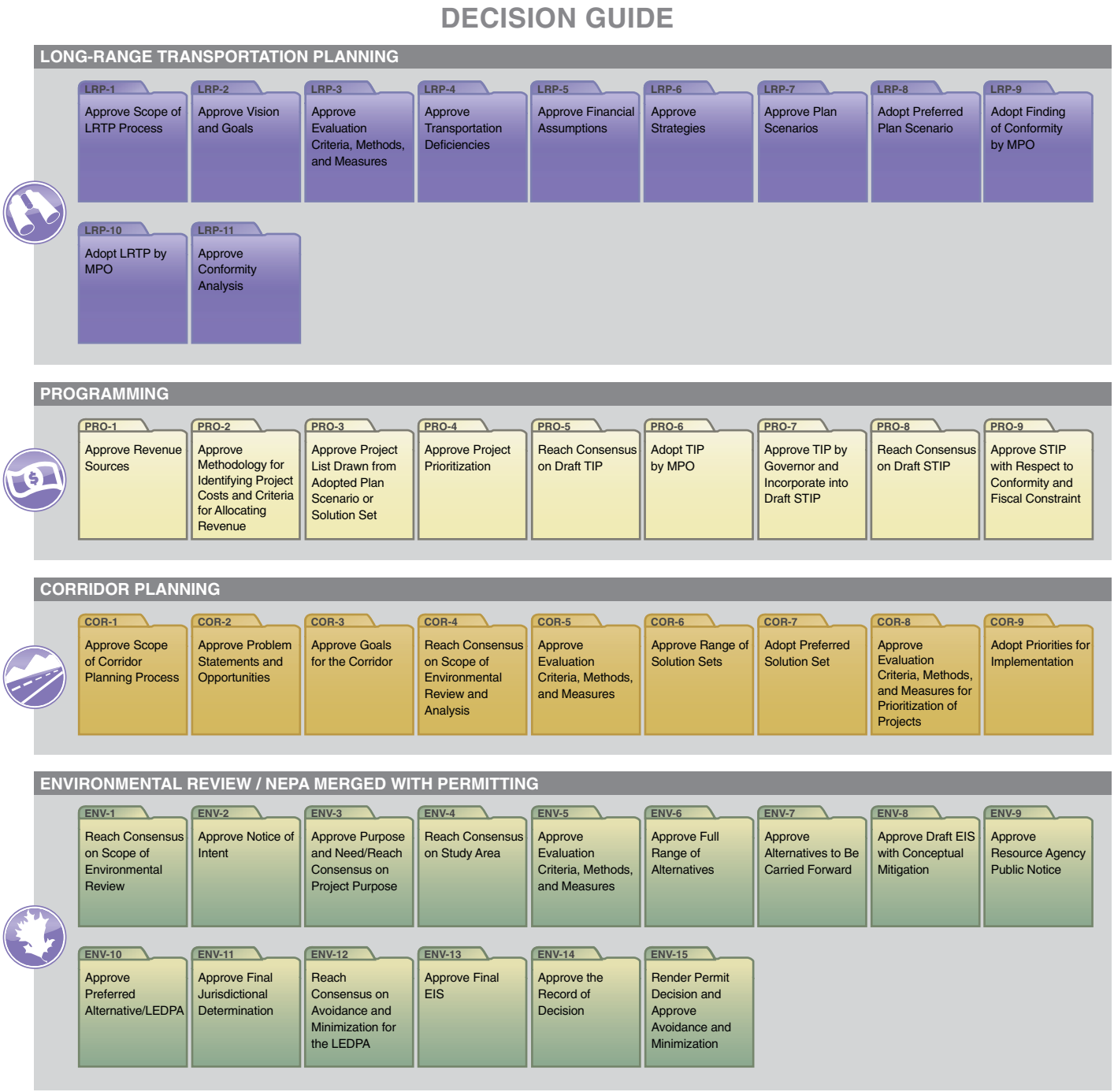

Figure 5.1. The Collaborative Decision-Making Framework. (Note that since the writing of this report, the Framework has been renamed Decision Guide.)

and applications that are ready to implement in practice can be built. The tools and applications with the most pressing need and broadest applicability were developed first. For example, applications have been developed around using the Framework to streamline the transportation decision-making process for a corridor or bottleneck project, link MPO long-range planning and environmental review, and diagnose (and remedy) less-than-satisfactory collaboration in any stage of transportation decision making (see the Collaboration Assessment section in Chapter 6 for details). To make these products readily available and to foster ongoing growth and development of the Framework and its applications, they will be packaged into a publicly available web tool. An example of a Framework application is provided in this section. The web tool is described in Chapter 6.

The Framework consists of 44 individual key decisions, each one containing extensive information for practitioner

use. This vast amount of data can be overwhelming if considered in its entirety. However, that is not necessary or even advisable. The most beneficial aspect of the Framework is that it is highly flexible and adaptable. It is possible to select a subset of individual key decisions, either within a phase or across phases, to address a particular challenge or need. For example, many agencies have a strong interest in linking long-range planning and NEPA. Specific key decisions offer the most support for this challenge, and these can be combined to form an application of the Framework.

Linking planning and environmental review is a systematic approach that transfers information, analysis, decisions, and products created during long-range transportation planning to NEPA as the starting point for the environmental review (NEPA and permitting) process. Linking planning and environmental review benefits practitioners in both phases. Long-range planners see that the technical work and stakeholder input is acknowledged and built on and results in the eventual selection of project alternatives. NEPA practitioners avoid duplicative work, have a better foundation for their decisions, build public trust, and increase the efficiency of the environmental review process. The most recent transportation legislation also encourages the participation of resource agencies in the planning process. These collaborative relationships can greatly enhance the ability to integrate the two processes.

This interface between planning and environmental review makes it possible to streamline the project development process by incorporating documented early decisions into the NEPA process. In linking planning and NEPA, the development and transfer of information between long-range planning and environmental review involves less than 20 key decisions across all phases. The Framework provides information needed at each key decision, as well as what should be transferred across phases.

The use of the Framework as an application provides the most powerful example of the flexibility it offers. The topics listed below are those applications of the Framework that will be available in the initial version of the web tool:

- Project streamlining for a corridor or bottleneck project;
- Integrated planning (i.e., integrating transportation decision making with other planning processes);
- Linking planning and NEPA;
- Stakeholder collaboration;
- Corridor planning;
- Long-range planning;
- Environmental review (NEPA merged with permitting); and
- Integrated programming and fiscal constraint.

Users will find that the Framework can be applied to any topic area of interest. Over time, as practitioners become familiar with the tool, they will develop applications to support their specific needs and interests tailored to their own individual process.

Reference

1. Solof, M. *History of Metropolitan Planning Organizations.* North Jersey Transportation Planning Authority, Newark, N.J., 1998.

CHAPTER 6

The Web Tool: Transportation for Communities—Advancing Projects through Partnerships

Even with the Framework as an organizing structure, the quantity of detailed data is overwhelming in report format. Using a web-based format with supporting animation and linking capabilities as a delivery tool makes this information both accessible and engaging. Through this medium the complex relationships between the data and the key decision points become invisible to the user. Therefore, Transportation for Communities—Advancing Projects through Partnerships (TCAPP) was built as part of this project and a beta test version may be found at http://www.trb.org/Main/Blurbs/166046.aspx. (Note that since the writing of this report, TCAPP has been renamed PlanWorks.)

TCAPP pairs the Framework with case studies and tools that enable it to be accessed, understood, and applied with relative ease. Within TCAPP, users are able to compare their current decision making with examples of successful collaboration elsewhere to identify where changes may be the most beneficial. The tool provides access to future research that will be incorporated into the Framework and to an expanding case study database, and it also provides the opportunity to interact with other practitioners to share experiences and improvement ideas. As this community of interest continues to grow, the supporting information will also expand through practical examples and innovative approaches that enhance the way of doing business. Having the right people at the table with the right information at the right time will confirm that true collaboration can result in better solutions to transportation challenges.

Description of TCAPP

People enter TCAPP through the perspective they bring to transportation decision making today, be they managers, practitioners, or stakeholders. Although these viewpoints are not mutually exclusive, what is of primary importance to each is different. One aspect of the Framework is that it speaks to all audiences in their language and in recognition of what they care about.

Before TCAPP is finalized, SHRP 2 pilot tests will exercise TCAPP and provide feedback on its elements, information, and presentation. It is available as a beta test site, so it is anticipated that other user comments will be received as well. During this time, specific features of the web tool will change and adapt to the needs of the audience.

Figure 6.1 represents the TCAPP home page (note that this is a 2010 version of the home page). Each tab at the top of the screen provides a way to enter TCAPP to obtain information needed to answer three primary questions: Why should I change? What should I change? How should I change to ensure I have a collaborative decision-making process?

Why Should I Change?

Two areas of the tool directly support the answer to why collaboration is necessary. These are Decision Guide Basics and Practical Applications.

Decision Guide Basics provides an introduction to the Framework. This area acquaints the first-time user with sufficient information to understand how the Framework is organized, what information it contains, and why different agencies might be interested in using it. This background information to support use of the Framework is available through the following points of access:

- *Understanding the Decision Guide.* Provides the essential information necessary to use the Framework. This user's guide acts as both an introduction to the new user and a resource for additional clarification as the experienced user moves into new layers of the Framework.
- *How does my agency fit?* Allows the four decision-making partners to access the Framework through an understanding of where and how they are included in collaborative transportation decision making. This understanding is achieved by describing the interests of each partner in each

Figure 6.1. The web tool home page (2010 version).

phase of decision making, as well as the roles they operate within at each key decision point. By observing the significant integration of their interests and involvement at the most basic level in the Framework, representatives of each partnering agency will be encouraged to explore further.

- *How do stakeholders collaborate?*
- *Creation of the Decision Guide* (supported by a Google website). Provides a history of the Framework with information on the SHRP 2 Capacity program, the C01 project and its conception, and an overview of how the project was conducted in order to design the Framework.

The Practical Applications portal demonstrates that collaboration supports the efficient and effective delivery of transportation improvements through several successful approaches. This provides another answer to the question, Why should I change? The Applications of the Framework assist practitioners in linking planning and NEPA, project streamlining, and the integration of other planning processes. For users interested in these and other successful practice topics, the Framework provides detailed support.

Entry into Practical Applications begins through the application topic areas. For each application, introductory information is provided to acquaint the user with the fundamental concept of the topic area and how the Framework can be used to approach the topic area. The key implementation issues for that topic are then listed along with a description of how the Framework can be used to address those barriers. Links to the relevant key decision points, case studies, and reference material available on external sites are also provided for each application. In

this way practitioners will be able to increase their understanding on a given topic from this location.

What Should I Change?

The Collaboration Assessment is designed to help those users who are not sure how to identify whether they have a barrier to collaboration in either their established decision-making process or their relationships within the decision-making team. The diagnosis is made through a questionnaire followed by an evaluation of the responses. The user may enter the assessment from the perspective of a manager, practitioner, or stakeholder and is guided to the questions and the responding evaluation that are most relevant.

Another window into the Framework is through the Case Studies portal. Case studies provide strong supporting examples of changes made to decision-making processes in support of collaboration, so they offer another response to the question, What should I change? Case studies may be accessed by associated state, by a topic area, or from the full list of case studies. The topic area listing identifies those case studies which provide a strong example of collaboration in relationship to specific topics of interest. Topics include stakeholder involvement, linking planning and NEPA, integrated planning, and many other familiar transportation interest areas. As additional research is integrated into the Framework, the case study database will become even more robust. Selected case studies that support collaboration will be added to the Framework database, and links to ones that are related to other SHRP 2 research topics will be available at this location. In the future it will be possible for users of the site to add their own examples of collaborative plans or projects to further enhance the database.

An additional feature that is being considered for the web tool is the ability for professionals and stakeholders to engage in collaboration through the site in the Colleague Corner. The outreach efforts that initially introduce professionals to the web tool will feature a Transportation Collaboration Blog. This feature is expected to continue and possibly be enhanced to allow users to engage with each other within the tool itself. In this way, users will cross-train each other on specific aspects of the site, as well as share ongoing efforts to further collaboration.

Collaboration Assessment

Collaboration in transportation decision making can be highly dependent on relationships—both between partners and with stakeholders. For this reason, five characteristics of relationships were identified that practitioners can use to evaluate the dynamics of these relationships. These five characteristics were incorporated into two scales: one for decision-making partners and one for stakeholders (see Appendix C for a description of the methods used to create the scales). These scales, called dynamics of collaboration scales, can be used at the initiation of the decision-making process or at any point in the process when collaboration is at risk.

The five identified characteristics included in the dynamics of collaboration scales can potentially affect both the speed and quality of the decision-making process. The speed of a decision refers to the ability to reach a decision quickly, without revisiting issues or elevating decisions to a higher level of authority. A quality decision is one that all participants accept and agree to support through decisions made in other processes.

The characteristics in the two scales represent relationship issues between team members or between decision-making partners and stakeholders. An additional challenge that practitioners face is barriers within the process itself. Common barriers and solutions were identified and categorized into five major topic areas: (1) process-related barriers, (2) analytical barriers, (3) public and agency involvement, (4) institutional barriers, and (5) barriers related to tools and technology. Using this information as a starting point, the consultant team engaged experts within ICF International on process theory to further develop the dynamics of collaboration scales and potential process barriers into a self-assessment tool. This tool has been integrated into the web tool and is identified as Collaboration Assessment. The final categories included in Collaboration Assessment are provided in Table 6.1.

Collaboration Assessment has three major components: (1) criteria statements for self-evaluation, (2) summarized results of the evaluation, and (3) strategies for improvement. Each of these components relates to the process and relationship categories identified in Table 6.1. In addition, the tool offers an evaluation for both practitioners and stakeholders.

- *Criteria statements.* For each category of assessment there are several statements that allow users to evaluate the existing process or team dynamics on a five-point scale: strongly disagree, disagree, neutral, strongly agree, agree, not applicable. A full list of criteria statements is provided in Appendix D.

Table 6.1. Categories in Collaboration Assessment

Process Categories	Relationship Categories	Stakeholder Relationships
Process steps	Decision-making authority	Understanding
Institutional support	Participant stability	Communication
Data and information	Shared goals	Commitment
Tools and technology	Role clarity	
Communication	Sense of ownership	

- *Results summary.* Each response provided in the survey is given a numerical score. The scores are tallied in each category to provide an evaluation of the relative strength of collaboration with respect to that topic. The results indicate a score of weak (1.0–2.99), average (3.0–4.99), or strong (5.0), as well as the points total for that category.
- *Strategies for improvement.* At the end of each assessment, the user is provided with additional information related to the topic. This information is presented as Potential Risks, Things You Can Do, and How the Decision Guide Can Help. Each of these aspects is drawn from a general strategy document related to that category and based on existing relationship and process theory and practice. The user is also provided with access to supporting information through reference links embedded in the text and at the end of the document. An example strategy is provided in Appendix D.

Uses of Collaboration Assessment

The self-assessment offered by Collaboration Assessment can be used by any practitioner or stakeholder interested in improving the collaborative aspects of his or her involvement in transportation decision making. However, the web tool has many other uses and can be used collaboratively for greater benefit. For example, an excellent time to assess the collaboration potential or challenges that are present is at the beginning of a plan update or a new project. Project managers can conduct an assessment with all team members or ask team members to self-assess for a better understanding from the outset. Practitioners can use the self-assessment to alert management to potential risks and offer options for reducing this risk. Public involvement practitioners may find the Collaboration Assessment for Stakeholders useful in preparing citizen committees or active project participants to engage more fully. This tool can be used in many ways by individuals, agencies, or decision-making partners to identify ways to enhance collaboration in their existing process.

How Should I Change?

The key decision point represents the basic building block of the Framework. Each compartment of the web tool leads the user into increasingly specific information that culminates at the key decision. The information contained in each key decision point in the Framework provides the answer most needed by transportation professionals: how to change the existing process to make it truly collaborative.

To know what is missing or what is most effective requires a standard of comparison: a generalized successful practice that goes beyond examples and actually details the individual elements of collaboration. This information answers the questions, Who is at the table? What do they bring? What is available to support the decision that must be made? More directly, what do the decision makers want to know and how do practitioners provide this information to them?

Figure 6.2 illustrates individual elements of the key decision. Each element provides the gold standard for a collaborative process. Users have the ability to compare the specifics of their process to this gold standard to see what needs to change to enhance collaboration or, in other words, conduct a gap analysis.

In many cases, the existing process may contain everything identified at the key decision; however, a more extensive

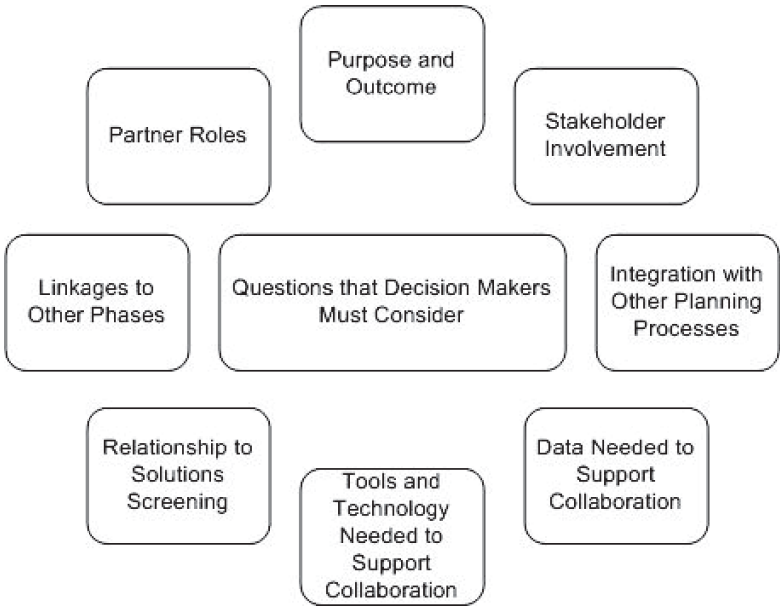

Figure 6.2. Elements of a key decision.

comparison may illustrate that an essential element of collaboration is missing at one or more points. What the case studies have demonstrated is that it takes only one missing element to create a redo loop, a delay, a lawsuit. These are the barriers to effective and efficient project delivery.

Beta Test Release of TCAPP

The beta test release of TCAPP was in January 2010. It included the features described in this report. In addition, it contained the case study content and links to relevant locations in web-based applications developed within two other SHRP 2 projects:

- SHRP 2 Capacity Project C02: Performance Measurement Framework for Highway Capacity Decision Making.
- SHRP 2 Capacity Project C03: Interactions Between Transportation Capacity, Economic Systems, and Land Use.

The first release of TCAPP was pilot tested by transportation agencies in 2010–2011 and revised based on the results.

Future Expectations for TCAPP

Over the life of SHRP 2 the results of other relevant projects will be integrated into TCAPP. When completed, the web tool will address each of these topics in the context of the decision points at which they are relevant, related case studies, and applications of the Framework.

Since the writing of this report, the results of the following projects have been integrated into TCAPP:

- SHRP 2 Capacity Project C06: An Ecological Approach to Integrating Conservation and Highway Planning.
- SHRP 2 Capacity Project C08: Linking Community Visioning and Highway Capacity Planning.
- SHRP 2 Capacity Project C09: Incorporating Greenhouse Gas Emissions into the Collaborative Decision-Making Process.
- SHRP 2 Capacity Project C12: Effect of Public–Private Partnerships and Nontraditional Procurement Processes on Highway Planning, Environmental Review, and Collaborative Decision Making.
- SHRP 2 Capacity Project C15: Integrating Freight Considerations into Collaborative Decision Making for Additions to Highway Capacity.
- SHRP 2 Capacity Project C19: Expedited Planning and Environmental Review of Highway Projects.
- SHRP 2 Reliability Project L05: Incorporating Reliability Performance Measures into the Transportation Planning and Programming Processes.

Finally, laws, regulations, and practices will change over time. The implementation planning for TCAPP and its constituent products calls for a host, an oversight structure, update capability, and, perhaps, a way for users to add content. The intent is for this Framework to be an always-current resource for the transportation industry over time.

CHAPTER 7

Conclusion

There is widespread recognition in the transportation industry that collaboration is not just a good thing; it is a necessity. The case for change has been made since the early 1990s, and the permission and guidance has been available for some time. The existing regulations require collaboration, and reauthorization is expected to give this an even higher priority with more extensive collaboration and integration of processes to increase efficiency in acknowledgement of ever shrinking resources, both financial and environmental. The focus on climate change and other emerging issues will increase the partnerships needed to support transportation improvements.

Although the interest in collaboration is present, professionals have lacked detailed information about what needs to change and how to make those changes. Well-supported case study reports are an invaluable resource to transportation professionals at all levels, but transportation practitioners are also keenly aware that what works well in one instance can prove woefully inadequate in another. All projects have their individual contexts, and even the most carefully documented project does not provide sufficient detail on how to collaborate in each step of each phase of decision making.

The answer lies in systematically institutionalizing collaborative decision making as a business practice and providing user-friendly guidance in the form of the Framework. It is absolutely essential to have the right people at the table at the right time with the right information to make good choices that will stand up to scrutiny. The Framework helps practitioners do this at all levels. It is flexible, adaptable, and usable by all transportation agencies, and it provides specific information on how to support collaborative decision making within the existing laws and regulations.

The availability of web technology to support the sharing of this information through an easily accessible medium makes it possible to implement the Framework in practice. Through an ongoing exchange of information, transportation managers, practitioners, and stakeholders will certainly develop even more ways to collaborate, improving both processes and relationships. The Collaborative Decision-Making Framework will begin the conversation and enable the change.

APPENDIX A

General Strategies from the Case Studies for Working Well with Agencies and the Public

General Strategies for Working Well with Others

A number of successful practices were used in the case studies to bring partners and public stakeholders into the transportation decision-making process and work with them effectively. These general practices are briefly summarized here.

Recognize Interests

Collaboration among decision-making partners and stakeholders has one essential commonality: involvement is based on what matters to each of them. Recognition of the interests of those outside the process is as important as understanding the mission and requirements of those directly responsible for the transportation system. The interests need not be common to all, but individual interests must be acknowledged, respected, and included in the process.

Have a Win-Win Orientation: Let Go of Positions

In Oregon, the step-by-step structured decision-making process used for the ***I-5 Beltline Interchange*** environmental assessment (EA) emphasized the importance of clearly articulating the range of stakeholder needs before identifying a solution. Oregon DOT worked with the business community group on an alternative that was designed to meet everyone's needs to the greatest extent possible.

This process encouraged participants to compromise. They were forced to explain how their needs were met by the evaluation criteria. Moreover, the facilitated discussion did not move on to discuss potential solutions until the evaluation criteria were accepted. A win-win attitude was brought to the process. Thus, by the end, everyone's needs were in line to be met.

Use Skilled Facilitators

Oregon DOT felt it got the "A-team of the consultants" on the ***I-5 Beltline Interchange*** project. The consultants were good at explaining technical information, facilitating, and moving the process along. Meetings and processes were very inclusive, and everyone was allowed to speak. Their facilitator did not allow technical experts to dominate the conversation but rather strongly encouraged everyone to participate in the discussion. At the same time, the facilitator kept people on track and kept the meetings on schedule. Meetings were well organized and the facilitator well prepared. Materials were provided in an easy-to-understand format. Agendas were prepared ahead of time and everyone knew the topic for discussion and the decision that had to be made at each meeting.

In the ***Texas Kelly Parkway*** study, Texas DOT made clear that its use of a facilitator with knowledge of the local community and the environmental justice issues that had arisen was essential to the project. Had it not been for the facilitator, the ability to identify local project champions would have been unrealized.

Be Inclusive

Idaho's Transportation Vision 2033 project team invited local governments, businesses, university representatives, tribes, and a variety of community organizations to participate in its process. In turn, over 750 people participated in a series of regional and statewide workshops.

In the ***Texas Kelly Parkway*** case, the team initiated an extensive public involvement program at the beginning of the project and directed its funding to establish personal contact with the community. The team created a neighborhood project office that was convenient and accessible. It started four advisory committees. Team members met with community members one-on-one. They attended career days at the local middle school and picked up trash through the neighborhood

on weekends. Moreover, Texas DOT picked its consultant strategically and developed a good team with a combination of local people who had insight into the community, as well as those who brought insight and expertise to the process.

Identify Leaders and Project Champions

Having effective leadership and project champions was key to many of the case studies examined. A variety of leaders, ranging from citizen advocacy groups to elected officials, stepped forward and either initiated projects or propelled them forward at critical junctures.

These project champions not only brought energy and excitement to a project, but typically, they brought the authority to commit their entire agency to a particular course of action. For instance, in ***Idaho's Transportation Vision 2033*** study, the state transportation director not only provided the initial motivation to create a statewide vision, he shepherded it through its various development stages. Similarly, in many of the case studies examined, project champions helped convince others that the mutual gain they would enjoy outweighed the costs associated with their effort.

Acknowledge Common Purpose, Motivation, and Needs

One of the project champion's most important roles is identifying and acknowledging common purpose, motivation, and the needs of project participants. He or she raises awareness of these elements and obtains commitment to what might be accomplished together. Project champions often enunciate the purpose of the collaboration and clarify how progress will be measured in terms understandable to those involved. They build trust among participants; and they evaluate what each participant brings to the collaboration and whether the contribution is sufficient to achieve the desired goals.

For instance, in the ***Colorado STEP UP*** project, the Environmental Protection Agency (EPA) and the Federal Highway Administration (FHWA) initiated attempts to integrate land-use, environmental resource protection, and transportation planning. For both the ***US-131 S-curve replacement*** project and the ***New Jersey Route 31*** project, it was elected officials that provided initial impetus for the project.

In the ***Texas Kelly Parkway*** study, a local community and religious leader emerged. He championed the project by identifying commonalities his community held with the state DOT. As soon as he supported the project, community relations improved. He talked with community members to help them see the benefits of Kelly Parkway, such as economic development, increased connectivity, and opportunities for beautification of the community. As a highly respected authority figure within the local Hispanic community, his opinions had considerable weight. In almost half of the cases studied, champions were identified outside of the formal structure of the project such as this.

Gain Political Support

As important as it is to have a project champion, it is equally important to have an influential one—namely, one who can lend political support. Politicians play a vital role in the programming and budgeting process and can play both problematic and helpful roles. In addition to providing a public perspective on investment prioritization, local and state elected officials, appointees, and transportation commission members have significant influence over the overall transportation budget. In a number of cases, political leaders were key champions for projects and critical to the amount of support the project received.

For example, the ***I-5 Beltline Interchange*** project in Oregon was advanced, in part, by the involvement of a local community group, United Front, which lobbied for the project, thus ensuring funding for the study and design in the Transportation Equity Act for the 21st Century (TEA-21). Furthermore, a local congressman was a ranking member of the U.S. House of Representatives Transportation and Infrastructure Subcommittee on Highways, Transit, and Pipelines. He supported the inclusion of $20 million for the construction of the interchange in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005.

In the ***US-24 New Haven, Indiana, to Defiance, Ohio***, project, the Fort to Port Organization was a major project champion. This organization formed after an Indiana state representative called a meeting to address safety concerns along the corridor. The representative invited Ohio legislators, local mayors, county commissioners, and other local elected officials. Also invited were chambers of commerce, economic development organizations, regional planning organizations, and interested citizens. The various stakeholders coalesced to form the Fort to Port Organization. The group gained momentum, engaged other citizens, businesses, trucking organizations, economic development planners, and others across the corridor, and became a significant driving force to move the project forward.

Similarly, in both the ***Utah I-15 NOW*** project and the ***Maricopa Regional Transportation Plan (RTP)*** project, the respective state legislatures closely monitored the project and provided influential support. In Utah, the legislature saw the need for the project and pushed it into the planning process. It wanted I-15 NOW done quickly and efficiently, repeatedly funding the work. In Arizona, transportation planning in Maricopa County had always been highly politicized,

with heavy involvement from both the state legislature and governors. This trend continued during development of the Maricopa RTP.

In the ***Washington I-405 corridor study***, the project was supported by an executive committee made up of local elected officials. The executive committee members focused on what they believed to be reasonable alternatives consistent with local land-use planning, which also helped get through the process in a timely manner. The executive committee took ownership of the decisions, and its members became advocates for the selected alternative. In turn, it publicly supported the project in front of regional constituents, the Washington State Legislature, and the Office of the Governor.

Partner with the Business Community

Case studies indicated that numerous leaders and project champions are found in the business community.

In Arizona's ***Maricopa RTP*** development, involvement of the business community was essential to the success of the transportation plan and area tax increase. Business leaders served as liaisons between the Maricopa County Association of Governments (MAG), area lawmakers, and the public. They were the glue that held the collaborative framework together. Representing diverse transportation, land-use, and business development interests, business leaders were the key to the success of local taxing initiatives. They demonstrated a strong respect for the technical ability of the MAG staff, the planning process, and the criteria used to establish transportation needs. Their official public leadership role on MAG task forces provided credibility to decision making and inhibited alliances toward special interests.

In addition, the business community had the ability to act outside of the constraints of elected officials to assess public interests and support for different plan structures. During development of the Maricopa RTP, the business community took polls and other measures to gauge public sentiment toward particular plan options. They were able to present a realistic perspective on those plan attributes that would lead to success.

In the ***Washington I-405 corridor study***, business leaders were invited to sit on the Citizen Committee, one of three committees crucial to the decision-making process. Far from being surprising, this was expected because key Seattle-area employers—such as Boeing, Microsoft, and PACCAR—regularly have influence in the transportation planning process. Business community leaders in the I-405 corridor were extremely well-informed and well organized. In fact, these leaders weighed in on almost every transportation or transit measure floated in the area. The foresight of the Washington State DOT (WSDOT) in including them from the beginning was vital to the program's success.

General Strategies for Working with Decision-Making Partners

The primary decision-making partnership in transportation is between U.S. DOT, state DOTs, metropolitan planning organizations (MPOs), and the resource agencies that grant permits. Each of these entities has a mandated role to play when any capacity improvement is realized using federal funds. U.S. DOT guidance documents have supported a collaborative effort between these groups for many years. State DOTs have wrestled with various avenues to achieve buy-in from both partners and stakeholders on major investment studies, pre–transportation improvement program (TIP) efforts, and phased environmental studies to name a few.

Consultation with state and local agencies responsible for land-use management, natural resources, environmental protection, conservation, and historic preservation is now mandated in SAFETEA-LU. Federal and state resource agencies are eager to act as early as possible to protect the human and natural environment from potentially harmful decisions made regarding transportation improvements.

Many of the case studies noted successful strategies for bringing partners into the transportation decision-making process.

Fund Liaison Positions at Resource Agencies

Resource agencies continue to experience demands on staff to respond to the public and stakeholders as well as to ensure the protection of the natural and human environment as transportation projects are planned, funded, and designed. The early and ongoing involvement of these agencies is so essential that many state DOTs provide funding for staff positions within the agencies to ensure their participation in decision making for transportation improvement projects.

Conduct Field Trips

The involvement of resource agencies was not particularly innovative or high-tech in the corridor study for ***Colorado US-285***. It simply involved field trips. The consultant team arranged for representatives from the U.S. Army Corps of Engineers (USACE), EPA, the state historic preservation office (SHPO), and Colorado DOT to visit specific locations together to discuss potential solutions. Consensus solutions evolved from there.

> The wetlands biologist had the SHPO representative looking over his shoulder, so each knew why he had to budge one way or the other. We were able to chat about whether resources might be [significant] or not. The designers had 12-foot underpasses for the elk migrations, which impacted wetlands, but the Corps guys agreed it was the best trade-off and the wildlife underpasses should be built.

Establish Forums for Stakeholder Discussions

In the ***Colorado US-285*** case, forums allowed the project team to meet with representatives from USACE and SHPO. Together, they discussed how best to balance impacts to and trade-offs among wetlands and historic resources.

Similarly, the ***US-24*** team in Ohio met with USACE and U.S. Fish and Wildlife Service (USFWS) to discuss how to reduce impacts to high-quality wetlands and endangered species habitat. Though the design change resulted in more impacts to low-quality wetlands, the change became the preferred alternative.

In ***Utah I-15 NOW***, the project team used a steering committee as an effective forum for mediating among the different stakeholders. Each person had the opportunity to hear the other's perspective and understand his or her motivations. Competing interests revolved around not only traffic solutions but also the socioeconomic concerns of funding and spending. The forum helped balance competing interests.

Collaboration before major design decisions enables many community and resource issues to be worked out ahead of time, minimizing impacts that might otherwise be significant. This approach was effective in parts of the ***Colorado US-285*** case, in which wetlands and historic properties were also a concern. USACE and SHPO reached agreement on these areas, facilitated by meetings in the field (*1*).

Have Appropriate Experts Available to Answer Questions

As illustrated by the ***North Carolina US-64*** case, having the right people in the room is a must. One of the major goals in the merger process in North Carolina was to achieve consensus at each specified concurrence point. Consequently, whenever a team meeting was set up for the specific purpose of reaching a consensus, the agencies carefully planned the meeting to ensure that appropriate experts were present. If resource agencies were being asked to balance their resource concerns against highway safety and other design requirements, they wanted the opportunity to hear directly from the hydraulics expert. As the merger process developed, North Carolina DOT (NCDOT) recognized this need and made a stronger effort to have the appropriate experts available at concurrence point meetings.

Involve Partners in the Design and Implementation of the Decision-Making Process

The creation of ***Florida's Efficient Transportation Decision Making (ETDM) Process*** was collaborative in that it was developed to support transportation decision-making procedures for the state of Florida, not just the Florida DOT (FDOT). It came into being through a joint effort among FDOT, FHWA, and other state, federal, and local governments and led the agencies to reexamine the entire transportation planning and project development processes within their respective agencies. First, agency heads agreed to participate in the development of the process. Then, through a series of interagency work groups and task teams, the new process was developed for Florida. Under the leadership of FDOT's Central Environmental Management Office, process refinements have been ongoing since the ETDM Process began. Regularly scheduled ETDM coordinator meetings are conducted to identify and address issues that arise during ETDM implementation. If necessary, special interagency task teams are formed to address these issues. Every agency, as well as FDOT, adjusted its business practices to accommodate the new ETDM Process and the workload requirements to support the new process. FDOT reorganized staff and management positions to accommodate the responsibilities, while other agencies opted to create new positions or sections within their existing structure. The roles, responsibilities, and expectations for agency participation throughout the ETDM Process are codified in agency agreements. As needed, funding for dedicated staff is made available through funding agreements.

Beyond development of the process, early and continuous agency involvement is a key component to the success of the implementation of the ETDM Process. Agency interaction occurs throughout the life of a project to ensure that transportation decisions are balanced with effects on natural, cultural, and community resources; land-use decisions; and other agency goals or objectives. This is accomplished through an environmental technical advisory team (ETAT). An ETAT, consisting of planning, regulatory, and resource agencies, has been established for each of the seven geographic FDOT districts. Each agency appoints a representative or representatives who are responsible for coordinating and performing all actions to satisfy their responsibility with respect to the planning and development of transportation projects. The ETAT representatives have authority and responsibility to coordinate internally and represent their agency's positions. The role of the ETAT representatives changes from advisory during the planning and programming phases to coordination during environmental review and permitting. Through the ETAT, the ETDM Process fosters a team approach to identifying transportation solutions that are responsive to environmental and cultural preservation goals and to community livability objectives. Early coordination and consultation among the FDOT, MPOs, and resource agencies improves the mutual awareness and understanding of mobility needs and environmental protection, which continues through each phase of the ETDM Process. It is important to note that early involvement in the ETDM Process begins during project planning, before significant resources have been spent on technical studies and project design.

Provide Training

Training and the availability of support were found to be essential for the successful implementation of the ***ETDM Process***. Through regular training events, ETDM participants are taught about the ETDM Process and use of the technology and tasks within the ETDM Process. These training opportunities are also used to inform participants of successful practices used throughout Florida. The ETDM training program includes the following courses: ETDM Process Overview, Overview of Sociocultural Effects Evaluations and Public Involvement, the Project Development Process, and Using the Environmental Screening Tool (EST). Training is provided through a number of innovative mediums, including hands-on workshops, web-based conferences, a staffed ETDM help desk, and training conferences. Online materials, including documents in the ETDM library, are accessible from the Help menu on the EST. The ETDM library includes manuals, handouts, and other documentation supporting the ETDM Process.

A lack of understanding of the process is typical when processes are highly technical or are different from traditional methods. For example, in the development of ***Caltrans's corridor system management plan (CSMP)*** for the I-880 corridor in Alameda County, Caltrans based performance measures on traffic operations data. Given the technical nature of the data components used to develop performance measures, many of the local jurisdictions and elected officials participating in the process had to go through a learning process to develop an understanding of traffic operations strategies and the effectiveness of traffic operations measures. To help participating agencies understand the methods that were used to develop the performance measures used in the screening process, Caltrans and the Metropolitan Transportation Commission (MTC) provided a series of workshops that gave participants the required technical background to move forward.

General Strategies for Working with Public Stakeholders

Establish Clear Roles for Stakeholders

One of the first steps in creating an environment of trust is to identify affected stakeholders and clearly establish their roles. For instance, in the ***Woodrow Wilson Bridge*** case, FHWA formed stakeholder participation panels. FHWA proposed and organized four panels: the Telegraph Road Interchange Panel, Jones Point Park Panel, Route 1/Washington Street/Urban Deck Panel, and Maryland Interchanges Panel. FHWA defined stakeholders as those individuals and groups directly affected by the project, including bridge users. The purpose of the panels was to identify valued community characteristics, define community goals and guidelines for the final design, and work with designers and planners to codevelop concepts and proposed designs that enhanced and preserved the natural environment, the built environment, and the social environment of the community. The project team made clear to prospective panel members, however, that alternatives would not be revisited and that the preferred alternative was the focus of the panel's work.

Give Stakeholders Some Influence

On the ***I-5 Beltline Interchange*** project, Oregon DOT developed a planning study (the Interstate 5/Beltline Interchange Facility Plan) for the interchange, recommending five alternatives for further evaluation. However, despite Oregon DOT's coordination with local stakeholders, considerable disagreement remained with regard to the best solution. Oregon DOT recognized that a new approach was needed to complete the next step in the process, an EA. The department used a highly structured decision-making process to engage a stakeholder working group (SWG) made up of technical experts and representatives of businesses, neighborhood associations, special interests, and elected officials.

One of the most unusual aspects was the shared authority of the decision team. Decision team members signed a formal agreement that established protocols for communications and decision making among a wide range of stakeholder interests, including individual property owners, neighborhoods, interest groups, business representatives, and local jurisdictions. The roles and responsibilities were spelled out in protocols agreed to in writing by each member of a SWG. The protocols for communications included requirements for meeting attendance, clearly defined roles and responsibilities, agreement to keep an open mind and be respectful of others' views, and accord to include minority opinions when unanimity was unattained. Decisions were made by majority vote with the team reaching consensus at each decision point.

The local governments—Eugene, Springfield, and Lane County—had great say in the process. It was unusual for local governments to have this much influence in the process when they are relying on outside funding. In fact, at one point, FHWA and Oregon DOT were outvoted by local officials. Per the process, the two agencies ended up submitting a minority report. Statutorily, FHWA and Oregon DOT had final decision-making authority regarding the preferred alternative, but without local support, the project would not have moved forward.

Although not everyone was happy with the final decision, all agreed the process was excellent. Many stakeholders believed this was a more transparent decision-making process. Some noted that, had Oregon DOT started this process with the development of the facility plan, the entire project would have gone much faster and the opportunity for distrust and confusion would have been significantly reduced.

Foster Excellent Communication with the Public and Stakeholders

Time and time again, participants in the case studies attributed success to early, open, and honest communication with stakeholders. A transparent decision-making process seemed to be central to any successful collaboration. Agencies were able to achieve this transparency through a variety of means.

Be Flexible and Responsive

Successful project teams were responsive to the public and demonstrated flexibility. One of the first key decisions points for the ***Oregon I-5 Beltline Interchange*** SWG was to understand the transportation problem that would later become the basis for the purpose and need statement. SWG members disagreed about how well the traffic model represented actual site conditions. To fully appreciate the traffic problems and community concerns, the SWG embarked on a field trip to the intersection. They witnessed firsthand the interplay between actual traffic volumes, signal timing, left-hand turn opportunities, signage, and pedestrian access, as well as how changes in the alignment would affect private and commercial properties.

Public involvement and collaboration does not always have to be cutting edge; it just needs to be effective. Effectiveness requires exploration of what will enhance communication. At the start of the ***US-24*** project, Ohio DOT decided to implement a new public involvement process that was different from past practice, including use of open-house sessions. Ohio DOT added overview presentations and sit-down question-and-answer sessions. The latter allowed everyone to hear the same questions and answers before moving into an open-house format, with stations for more personal or small group question-and-answer discussions. These informal meetings allowed the department to establish more personal relationships with the stakeholders and to gain public trust. Ohio DOT found this format to be popular and effective in the small rural communities. Meetings often drew over 100 participants. Ohio DOT was able to sustain this high level of public involvement throughout the project.

NJDOT showed its flexibility and responsiveness when the ***Route 31*** project team undertook a fiscal impact analysis to resolve residents' concerns that zoning changes in Raritan Township would overwhelm the township's ability to provide public services. This analysis mollified concerns that certain land-use changes would create fiscal burdens. With the information from this analysis, Raritan Township was able to develop a mix of land uses that addressed community needs while having a minimal net impact on public budgets. Local leaders said that the township would not have purchased such a study on its own, and members of the project team had seen few examples of this type of study being used in this context.

In the ***I-405 corridor study***, WSDOT focused on key strategies of public involvement, including staying on message about the transportation problems, instilling confidence in the program, giving special interest groups the opportunity for meaningful dialogue, and providing project information in a timely and responsive manner. The program was awarded multiple regional and national awards for its outstanding community outreach program.

Don't Let Language Be a Barrier

Differences in language and culture were common barriers in the case studies. For example, in the ***North Carolina US-64*** case, four of the most feasible alternative routes for the bypass project would have adversely affected a predominantly Hispanic community. Language barriers initially prevented NCDOT from obtaining the input of area residents or explaining the available relocation benefits of the bypass. The agency decided to seek out the advice of the Hispanic community, talking to leaders there about how best to tailor its outreach.

NCDOT ended up working with the local school district to distribute bilingual project information. This unique idea worked. NCDOT was able to reach residents it previously could not and inform them of the pending project. The process gave the community opportunities to participate and included financial assistance for displacements.

Based on this collaboration, NCDOT added a new bridge to the bypass that carried subdivision traffic over it and prevented the bypass from fully dividing the Hispanic community.

Use Public Relations and Mass Media

In many cases, the proactive use of the media is the only reasonable means to keep the public informed. Most members of the public do not attend screening or project meetings. Few people, if any, read project mailings. But the public regularly tunes in to television, radio, and newspaper reports. Recognizing upfront that the media is critical to the success of a project is crucial. If the public is better educated about a project, the chance of unknown risks diminishes and the potential for success increases.

In the ***US-131 S-curve replacement*** project, Michigan DOT met with the local media early to explain its plans and elicit feedback. The media was regularly taken on project tours. Communication with the media was coordinated through a single DOT spokesperson, who was dedicated to providing information on construction plans, detour planning, and alternative commuting options.

In the ***Woodrow Wilson Bridge*** project, the project team had dedicated staff to field media requests and questions. The project team regularly contacted the media to communicate driver alerts and announce major project milestones. In addition, this project illustrated how some nontraditional uses of

the media can be a means to educate the public. In one instance, the project team used the media to advertise its Toughest Bridge Commute contest, recognizing the sacrifice of regular bridge crossers both before and during construction by honoring the commuter who endured the worst. The driver who endured the toughest commute over the old bridge earned the right to trigger detonation charges that brought it down. Media outlets covered the implosion at length (*2*). In another instance, when a pair of bald eagles took up refuge near the bridge during construction, the project team leapfrogged on their popularity by naming them and providing regular media updates on their progress. All the while, the team highlighted the project's attention to the environment.

In the ***I-15 NOW*** case, Utah DOT hired a public relations firm to handle external communications. This was essential because, although the project had the advantage of being well funded, it had a major disadvantage, too. Its prominence shined light on other projects in the state that were short on funding. In fact, I-15 NOW received well over half of Centennial Highway Fund (CHF) monies. Other municipalities demanded a more balanced division of CHF funds—they wanted their share. Thus, the I-15 project team needed additional public relations support to handle this thorny issue.

Take Advantage of Opportunities to Colocate

Locating operations in the same place creates trust and facilitates communication. On the ***Woodrow Wilson Bridge*** project, FHWA faced a complex task in coordinating project planning between two states, the District of Columbia, all of the jurisdictional components, and several major federal agencies. To reduce the communication problems that could arise with so many parties involved, FHWA assigned key environmental, legal, and project management staff to the two project offices. The resource agencies noted that this colocation was critical in simplifying communications and obtaining timely guidance.

Keep It Simple

In many of the case studies, simpler was better. The ***Prairie Parkway study in Illinois*** is an example of a process in which basic methods carried out in an effective manner were found to be successful. The purpose of the Prairie Parkway study was to take an in-depth look at current and future transportation needs in an area that was experiencing growing regional development demand and increasing traffic congestion. The study also identified a transportation system improvement to enhance north-south mobility between Interstate 80 and Interstate 88 in Illinois, which addressed project needs. Information was provided to stakeholders through newsletters, handouts, PowerPoint presentations, and graphic displays at workshops. The information prepared was simple, easy to read, and graphically clear. The PowerPoint presentations were well prepared, and the associated voiceovers included clear explanations of the study methodologies employed. Information was effectively conveyed by all of the media developed. Handouts were colorful, concise, and easy to understand.

A key innovation affecting the implementation of ***Idaho's Transportation Vision 2033*** was that the vision document was to be no more than 15 pages. Project leaders set the goal at the beginning of the process and maintained it to the end. They wanted something that was digestible in one sitting, was easy to read and understand, and could be adopted by the Idaho Transportation Department (ITD) and agencies throughout the state and used to ensure better cohesion in decision making within and between agencies.

Use Visualization

SAFETEA-LU promotes greater use of visualization techniques in envisioning future solutions and their implications. The power of visualizations, from simple to sophisticated, was a success factor in some of the cases.

For instance, in the ***New Jersey Route 31*** case, the project team turned stakeholder input into maps or other visualizations practically overnight. Those who had been involved in similar studies said that they expected to wait several weeks to see stakeholder input fashioned this way. Workshop participants asserted that this rapid production of visual aids was very important to the development of consensus around a preferred alternative.

In the ***Oregon I-5 Beltline Interchange*** case, one technique the state DOT used was switching from line sketches to full aerial pictures with markers. Overlaying the alternatives on the aerial photos helped all of the SWG participants visualize the community impacts of the project.

In the ***North Carolina US-64*** case, although NCDOT and the North Carolina Zoo had established an effective working relationship, zoo officials had a continuing question about how the final design would meet its aesthetic and land-use concerns. Zoo officials wanted a design that was consistent with the natural setting of the zoo as well as the environmental features of the surrounding area. NCDOT resolved this issue by creating a video visualization. The visualization showed the natural design of a connecting bridge as well as the parkway-like appearance of the connector road as it ran from the bridge to the entrance of the zoo.

References

1. Gaskill, C. Cost-Benefit Study of Applying Context-Sensitive Solutions to US-285 West of Denver, Colorado. Presented at the 86th Annual Meeting of the Transportation Research Board, Washington, D.C., 2007.
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APPENDIX B

Technology and Transportation Decision Making

The use of technology contributed to the success of many of the case studies examined—most notably, as a tool to foster collaboration and integrate land-use and transportation planning. A key focus of the eight in-depth solution screening case studies was the use of technology to support solution screening. An overview of the different types of technologies used in these case studies is presented in this appendix.

Overview of Technologies by Case Study

Information technology (IT) was found to be an effective tool to aid in the transportation solution screening process. The technologies used in each of the case studies are summarized in Table B.1. Further details about the tools are provided in this section.

Caltrans's Corridor System Management Plan

Caltrans's CSMPs focus transportation planning efforts on the use of all facilities within an urban corridor. The CSMP is based on a series of performance measures in three key areas: mobility, reliability, and safety.

Three separate tools are used to calculate mobility: probe vehicles, PeMS, and 511. In addition, data from the statewide Highway Congestion Monitoring Program (HICOMP) provides information on congestion levels for heavily-traveled freeways throughout California. The data are gathered through probe vehicles, which make trips over predetermined segments and measure the time needed to complete a route. HICOMP also uses loop detectors to gather data for the comprehensive reports.

Caltrans's Performance Measurement System (PeMS) is a web-based tool designed by the University of California, Berkeley, to host, process, retrieve, and analyze road traffic condition information. PeMS receives data from California freeway traffic detectors, as well as incident-related data from the California Highway Patrol and Caltrans. These data are entered into some of the performance measures used in the CSMP process, such as vehicle miles traveled and annual average daily traffic, from real-time and historical freeway detector data.

Another system, 511, gives commuters access to real-time travel time information. This is meant to assist commuters with planning their trips around accidents and bottlenecks. Over the years, these data have been archived and are available to study historical travel patterns and issues.

Subregional models and a microsimulation model simulate the movement of individual vehicles, based on the dynamic variables of car following and lane changing. These tools help identify deficiencies and alternatives. Additionally, cost-benefit tools identify the most cost-effective measures for mitigation strategies. The travel model outputs show how different corridor management strategies affect the performance measures.

Florida's Efficient Transportation Decision-Making Process

Florida's Efficient Transportation Decision-Making (ETDM) Process is the transportation planning process Florida uses to accomplish early agency participation, efficient environmental review, and meaningful dispute resolution. It is supported by an Internet-accessible interactive database and mapping application called the environmental screening tool (EST). The EST brings together resource and project data from multiple sources into one standard format. It uses GIS to provide standardized analyses of the effects of a proposed project on natural, cultural, and community resources. It also includes tools to input and update information about transportation projects and community characteristics, as well as report comments by the environmental technical advisory team (ETAT) representatives. Information from the secure website is published on a nightly basis to a read-only public access site. The

Table B.1. Summary of Technologies by Case Study

Case Study	Technology	General Description
Caltrans's Corridor System Management Plan (CSMP)	Probe vehicles	Collect data by measuring the time needed to complete a predetermined route
	Performance Measurement System (PeMS)	Web-based tool designed to host, process, retrieve, and analyze road traffic condition information
	511	System that gives commuters access to real-time travel time information
Florida's Efficient Transportation Decision-Making (ETDM) Process	Environmental screening tool (EST)	Internet-accessible interactive database and mapping application that brings together resource and project data from multiple sources into one standard format
Idaho's Transportation Vision 2033	MetroQuest	Interactive regional scenario analysis software used to create and evaluate alternative scenarios in real time based on input from stakeholders
Puget Sound Regional Council's (PSRC's) VISION 2020	Paint the Region (PTR)	Software intended to allow analysis and comparison of land-use and transportation scenarios
	Comment Management and Response Tool (CMART)	Web-based tool used to manage public input
Sacramento Region Blueprint	I-PLACE3S	Land-use projection visualization tool
I-69 Trans-Texas Corridor Study	Geographic Information System (GIS) Screening Tool	GIS-driven environmental assessment and data management tool for environmental streamlining
	Texas Ecological Assessment Protocol (TEAP)	Planning- and screening-level assessment tool that uses existing data available from the statewide GIS grid to identify ecologically important resources
	Quantm System	Alignment optimization tool
Wasatch Front Regional Council's (WFRC) 2030 Regional Transportation Plan (RTP)	Travel Model	Software that determines trip generation, trip distribution, mode choice, and trip assignments from a source of population distribution and employment information
	UrbanSim	Software-based demographic and employment modeling tool for integrated planning and analysis

EST database maintains the project record throughout the life cycle of the project.

The EST is a Java-based web application that uses open-source software when feasible. It depends on Apache and Tomcat to support web services. Various open-source tool kits (Hibernate, Velocity, UJAC, and DOJO) are used to support application development. Hibernate software creates a relationship between a Java application and the data that it is to access. Velocity provides tools for creating fast and easy templates to display data in HTML or PDF formats. Hibernate is paired with Velocity to retrieve data which can be readily passed directly to a Velocity template. UJAC and DOJO contain libraries of functions used to develop web-based forms and reports. The EST also uses Oracle 9i as the database management system, and Esri products for the GIS analysis and mapping. ArcIMS 9.0.1 serves the interactive maps. ArcGIS 9.1 receives calls from the web application to perform GIS analysis and generate PDF maps in a batch mode. Esri's SDE software is used to manage the geodatabase.

The combination of Internet and GIS technologies in the EST allows multiple parties to simultaneously view and process large amounts of information about a project, its context, and potential effects in a much more efficient and timely manner. The EST contains GIS data for each of the 23 resource and regulatory agencies participating in the ETDM Process. This information traditionally would not be available to all the agencies. Furthermore, each agency is able to see the comments of the other participants, which leads to more collaborative decision making. The EST provides a comprehensive view of agency reviews, issues, and concerns for other agencies to consider and build on. The ETDM Project Diary allows ETDM participants to access specific information about each project, including class of action, dispute resolution logs, permits, summary of public involvement, and project managers. The EST maintains the project record from planning through project development, ensuring access to commitments and recommendations about the project as it moves forward in the project life cycle.

Idaho's Transportation Vision 2033

The Idaho Transportation Department (ITD) initiated an extensive dialogue and strategy process to create Idaho's transportation vision through 2033. The visioning process brought together academia, public- and private-sector participants, and resource agencies. It transformed a fragmented decision-making process into a more integrated and systems-based transportation planning approach. An important objective for the project was to unite stakeholders around a shared vision to enhance coordination and cooperation between agencies with roles that affect transportation systems. This technique has gone on to be successfully employed in 10 other regions. For example, the city of Calgary expanded the process significantly.

In the visioning process, an interactive regional scenario analysis software (MetroQuest) was used to create and evaluate alternative scenarios in real time, based on input from stakeholders. MetroQuest was developed as a joint effort between the University of British Columbia's Sustainable Development Research Institute and Envision Sustainability Tools, a private company based in Vancouver, British Columbia. The MetroQuest software operates either over the Internet or on a stand-alone Windows-based personal computer (PC).

The stand-alone, PC-based version of MetroQuest is designed to be projected on a screen in a town-hall style workshop in which participants use wireless keypads to develop and evaluate future scenarios. The Idaho visioning process was the first time that these technologies were combined to allow the participants to create and evaluate 30-year alternatives in workshops. To accommodate this process, software designers developed the capacity for MetroQuest to create scenarios in seconds—a process that previously required hours or days, making interactivity impossible in a workshop.

Using MetroQuest, stakeholders explored and understood the synergies between land use, transportation, housing, environmental management, and economic development in a workshop setting. The MetroQuest software showed users the long-term outcomes of different choices by examining a wide range of indicators. It presented an array of questions concerning population growth, public and private transportation infrastructure and policies, housing, land use, economic growth, energy, air pollution, solid waste, and water conservation. Using wireless keypads, participants answered these questions to create their preferred scenario in an iterative process.

In the visioning process, planners used MetroQuest to provide outputs on more than 100 performance measures in a wide range of areas, including transportation (congestion, safety, vehicle miles traveled, modal split, travel times, and others), land use, air quality, infrastructure costs, taxation, greenhouse gas emissions, ecological preservation, waste, water, energy, housing demographics, and economic growth. MetroQuest displayed performance measures for scenarios using maps, visualizations, photos, and graphs illustrated over four future decades.

Workshop participants used the tool to experiment with policy combinations in land use, housing, transportation, and resource conservation and to see the performance of the resulting scenario instantly. Trained facilitators guided them through this process of experimenting, learning, collaborating, and reaching consensus. The result was a preferred scenario that best met common priorities.

While the Idaho and Calgary visioning processes focused on live workshops, a recent release of the MetroQuest tool also allows web-based visioning so that citizens can experiment with policy options and results on their own. This lets workshop participants stay engaged with the issues afterward and also reaches citizens who are not inclined to attend workshops.

Puget Sound Regional Council's Regional TIP Policy Framework and VISION 2020

The Puget Sound Regional Council (PSRC) establishes regional policy direction. It ensures that transportation projects selected to receive federal funding are consistent with the regional long-range growth management and transportation plans. The Regional Transportation Improvement Program (TIP) Policy Framework and VISION 2020 are important elements of this effort.

The first step in the development of VISION 2020 was selecting a preferred growth scenario. The supporting technology used in this effort was the INDEX–Paint the Region (PTR) tool. INDEX is an integrated suite of interactive GIS planning support tools. PTR is one of those tools, used for regional growth planning and visioning. INDEX-PTR software allows users to explore various land-use and transportation scenarios. The software is available in custom PC and secured web versions. Users can add new metropolitan, community, and town centers; create new express, rail, and water corridors; identify important green areas; and place notes on the canvas. These new features are instantly viewable by other website users. The site uses ArcIMS, ArcSDE, and Microsoft SQL Server. Key project features include the following:

- Software: ArcIMS, ArcSDE, MS SQL Server;
- Custom tools that allow multiple users to simultaneously edit points, lines, and polygons via the ArcIMS site;
- Geodatabase design and installation;
- Customized ArcIMS, ArcSDE, and MS SQL Server; and
- Ability for users to add MapNotes (digital post-it notes) to the web map site.

PSRC used INDEX-PTR internally to identify future land uses in the region. The software is intended to allow analysis and comparison of land-use and transportation scenarios, and provide a better understanding of possible long-term benefits and cumulative impacts of growth patterns. Up to 26 environmental, land-use, demographic, and transportation indicators can be analyzed. PSRC chose not to use the software to determine transportation demand and air quality because the INDEX-PTR models for these two indicators were oversimplified. Instead, PSRC used in-house transportation and air quality models typically used by MPOs around the country.

Originally, the INDEX-PTR tool was also intended to be used in an interactive public involvement situation. However, PSRC decided to use simplified graphics in its workshops to convey information derived from INDEX-PTR. (It should be noted that INDEX-PTR was used successfully in interactive public workshops by the Northeastern Illinois Planning Commission while developing its 2040 Regional Framework Plan. This project was reviewed in the preliminary research stage but not selected as a case study for more detailed research.)

Other tools used in the VISION 2020 development process included UrbanSim and Comment Management and Response Tool (CMART). UrbanSim is a planning and analysis simulation model that can integrate with transportation demand models. UrbanSim is licensed under the GNU General Public License and is available free of cost (UrbanSim website: http://www.urbansim.org/). It is intended to be platform-independent and has been successfully installed on Windows, Linux, and Macintosh operating systems. UrbanSim relies on open-source software such as Python and Traits.

CMART is a proprietary web-based tool used to manage public input. The software manages documents and comments. It creates a response and review chain, maintains response history, queries comments and responses, provides status of responses, develops summary comments and responses, and produces the typical EIS output reports.

Sacramento Region Blueprint Project

The Sacramento Area Council of Governments (SACOG) linked transportation planning with land use to create a vision, or blueprint, for future land use in the region. The blueprint was used to prepare a plan that would serve regional transportation needs. First, a "base case study" scenario was built to illustrate how the area would grow if current local government land-use plans and zoning guidelines are followed through to 2050. Next, the blueprint team used a land-use projection visualization tool, I-PLACE3S, to develop different growth scenarios. The different growth scenarios were then compared to one another based on how well they met smart growth principles. Individual communities evaluated the different growth scenarios through public workshops. Following the visioning process at the community level, regional workshops were held to create the preferred blueprint scenario. This led to the development of a metropolitan transportation plan (MTP) that would serve the populations and land uses as envisioned in the preferred scenario.

I-PLACE3S enables users to apply a variety of zoning or land-use designations to potential development areas. These different classifications have different characteristics, such as the number of dwelling units per acre, how many employees commercial areas can handle, and how many parking spaces will be needed. As the users make changes to the zoning, I-PLACE3S shows the users how quality of life indicators—such as traffic congestion, open space, and housing availability—will be affected. The changes are shown to the users through a variety of maps, graphs, and charts. Additionally, the models can be manipulated and changed in an interactive format at public workshops. This allows the workshop participants to see and realize the impacts of the suggested changes firsthand, helping them decide what they would like their communities to become.

I-PLACE3S software is a web-based application that uses Oracle for data management and analysis. Information is presented on the website through ASP. Results of the scenarios are presented on web pages and maps. Some tables of results may also be downloaded to Excel spreadsheets.

The ability of SACOG to use a modeling and simulation tool at its public workshops during the Blueprint Project helped make the planning process interactive. The approach of using I-PLACE3S helped the citizens, stakeholders, and participating agencies see the consequences of changes in land use firsthand. The use of technology with an in-depth public involvement process helped create grassroots support and a sustainable level of credibility for the final preferred scenario.

I-69 Trans-Texas Corridor Study

The national I-69 corridor was established in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). In 1998, the Transportation Equity Act for the 21st Century (TEA-21) amended the I-69 corridor to include corridor 20, which extended through Laredo, the lower Rio Grande Valley, and Texarkana in Texas. As a result, 15 separate sections of independent utility (SIUs) for I-69 were located in Texas, and an alignment-level National Environmental Policy Act (NEPA) evaluation was needed on each. Several technologies were employed during the course of this project. The most notable and heavily used are described in this summary.

GIS Screening Tool

Environmental Protection Agency (EPA) Region 6 developed the GIS Screening Tool (GISST), which is a GIS-driven

environmental assessment (EA) and data management tool for environmental streamlining. GISST provides a systematic approach to considering environmental impacts. It is designed to better understand the potential significance of single and cumulative effects and to facilitate communication of technical and regulatory data with industry, the public, and other stakeholders. The scoring structure consists of criteria, using 1 as low concern and 5 as high concern, based on available data sets and expert input (see the GISST User Manual for more details). GISST uses ArcGIS to identify and map environmental concerns and to screen potential projects. EPA Region 6 and Texas DOT have found the GISST to be an excellent tool for decreasing NEPA review time.

Texas Ecological Assessment Protocol

The Texas Ecological Assessment Protocol (TEAP) is a planning- and screening-level assessment tool that uses existing data available from the statewide GIS grid to identify ecologically important resources throughout Texas. The TEAP resulted in a composite map and underlying data layers which describe the state of Texas by ecoregion and identify the optimum ecological areas for protection and mitigation. The results of the TEAP are used in project planning (i.e., scoping, alternatives analysis) to determine appropriate areas to conduct detailed field investigations, and in mitigation discussions to avoid ecologically important areas, minimize impacts to those areas, and compensate for unavoidable impacts.

Quantm System (Quantm)

Quantm is an alignment optimization technology and methodology that is used to generate potential routes using a digital terrain model, engineering design criteria (e.g., cut/fill side slopes, maximum grades), and defined constraints. The constraints definitions used in the I-69 Trans-Texas Corridor Study included certain GISST data sets (population density, wetlands, managed lands, and TEAP composite map), city boundaries, and airports. In addition, other constraints were used in specific locations.

Quantm generated potential routes that planners, environmental scientists, and engineers used to determine corridors. This was accomplished by plotting the representative results of millions of potential routes on maps, which also contained geographical features and features that routes should avoid (i.e., route constraints). The representative results were chosen from those alignments that successfully avoided the constraints. These were areas in which groups of routes concentrated together in bandlike formations or grouped patterns indicating likely corridor locations.

Statewide Analysis Model

Texas DOT developed the Texas Statewide Analysis Model (SAM) to provide analysis and forecasting capabilities of passenger and commodity/freight movements in Texas. The SAM provides data and results at a level that is more aggregate than that typically accomplished within urban areas in their travel demand models. The project team used the SAM for quantitative analysis at a conceptual level to measure operational efficiency based on routing and location efficiency of preliminary corridors.

The SAM is integrated with over two dozen Texas urban area models and provides consistent and accurate analysis of the following general types of projects:

- Forecasting accurate statewide traffic volumes by mode for passengers and freight;
- Forecasting mode shifts for passengers and freight;
- Analyzing state-level, multimodal alternatives for each mode that should be accurate enough to support analysis for project selection;
- Analyzing concurrent modal and multimodal network alternatives; and
- Analyzing the relative impacts of domestic and through traffic for passengers and freight at the statewide and individual urban area levels.

ProjectSolve

The I-69 Trans-Texas streamlining process used ProjectSolve2, a proprietary technology that provides secure Internet-based collaboration through a website (http://www.projectsolve2.com), to facilitate communication and project information review. ProjectSolve2 is built on EMC's Documentum eRoom collaboration platform. ProjectSolve2 was used to facilitate the project deliverables review process. Once project deliverables were available, they were posted on ProjectSolve2. The technical advisory committee/steering committee members were notified when the deliverables were available for review and comment. ProjectSolve2 website functions include

- GIS data set transfer and collection;
- Deliberation over concurrence points through a message board;
- Concurrence documentation;
- Issues identification and tracking;
- Project contacts database;
- Significant meetings and public involvement events calendar;
- New information alerts; and
- Related web links.

Illinois Prairie Parkway

This project used typical analyses, such as traffic forecasting, land-use/growth projections, and travel surveys. No specialized technology was used, so further assessment is not included in this section.

Wasatch Front Regional Transportation Plan: 2007–2030

The Wasatch Front Regional Council (WFRC) is responsible for the transportation planning in the Salt Lake and Ogden–Layton urbanized areas. WFRC developed the Wasatch Front Regional Transportation Plan: 2007–2030 (2030 RTP) to identify, plan, finance, and implement a coordinated system of transportation improvements to serve existing and expected growth throughout the region through the year 2030.

WFRC used three software tools, an in-house Esri-based GIS, UrbanSim, and Travel Model. The three tools were used concurrently—for example, GIS layers were provided to UrbanSim, which in turn could modify the layer and port it back into the GIS as a new layer depicting a specific urban scenario. This powerful and flexible technology package, fairly common in the practice, allowed planners to model future land-use patterns and populations, create a travel model for the future community, and depict the results in tables and maps. Thus, alternative solutions were created and evaluated during the selection process.

The GIS is a core technology used throughout the planning process and provides geographic products, including maps, analysis, and processed data, to internal users, other agencies, and the public on request. The GIS is routinely used to create maps, detailed GIS analysis, and visuals for presentations, reports, meetings, redline discussions, and so forth. GIS is used to develop and present the cartographic and data representation of the urban and traffic-demand model runs on common base maps. In addition to graphically depicting the alternatives, the GIS can produce reports of the data for the alternatives, and can run any number of analysis exercises for any of the alternative solutions under study.

UrbanSim is a software-based demographic and employment modeling tool for integrated planning and analysis of urban development, incorporating the interactions between land use, transportation, and public policy with demographic information. It is intended for use by MPOs and others needing to interface existing travel models with new land-use forecasting and analysis capabilities. UrbanSim has many built-in GIS functions and exchanges information with the GIS. The use of UrbanSim early in WFRC's process was a unique feature that allowed consideration of land-use principles before determination of transportation needs.

Travel Model is software that determines trip generation, trip distribution, mode choice, and trip assignments from a source of population distribution and employment information. Trip-based models typically represent each trip—such as an employee's trip from home to work or from work to home—so that projected demands on a transportation network can be estimated. WFRC uses Travel Model with UrbanSim and relies on GIS layers for the map data.

Summary of Case Study Technologies by Phase

The IT used among the case studies to support the transportation solution screening process can be grouped into four main components or types: GIS, modeling and visualization, web-based collaboration, and data framework. These technologies contribute to the success of the project by supporting the activities needed in a collaborative solution screening process, including project management, stakeholder involvement, ongoing communication, and visioning exercises. In the cases reviewed, the four types of technologies were used to screen different types of solutions, including those at the scenario or transportation system level and corridor level and route selection. They were deployed in a variety of settings, from project-specific applications hosted by a university or consultant to enterprisewide solutions hosted by a DOT information department. The matrix provided in Table B.2 shows the types of activities supported by each technology used in the case studies and at what point in the transportation decision-making process they were used. Each case study tool is also cross-referenced to the technology component(s) used in the tool. For example, the EST used GIS to support ongoing communication by determining who should receive project notifications based on geographic jurisdiction. In another example, MetroQuest supported scenario planning by using modeling and visualization technology.

Characteristics of Key Technology Components

Four core technology components identified in the case studies were (1) GIS, (2) modeling and visualization technologies, (3) web-based collaboration tools, and (4) data framework for collaborative decision making. These technologies have been used successfully in the case studies to benefit collaborative decision making by

- *Integrating data from multiple sources.* For example, departments of transportation (DOTs) and local transportation planning organizations can provide information about proposed transportation projects. Regulatory and resource management agencies provide information

Table B.2. Case Study Tools Used in Transportation Solution Screening Organized by Technology Component and Phase

Key Technology Component	Solution Screening Support Activities				Stages of Solution Screening		
	Project Management	Stakeholder Involvement	Ongoing Communication	Visioning	Scenario and Long-Range Planning	Corridor Planning	Environmental Review
GIS		EST	EST	MetroQuest	I-69	EST	EST
		MetroQuest	I-69	I-PLACE3S	MetroQuest	I-69	I-69
		I-PLACE3S		UrbanSim	PTR	CSMP	
		I-69					
Modeling and visualization technology		MetroQuest	MetroQuest	MetroQuest	MetroQuest	I-69	I-69
		I-PLACE3S		I-PLACE3S	UrbanSim	CSMP	
				UrbanSim	Travel Model		
				Travel Model	PTR		
Web-based collaboration tool	EST	EST	EST	MetroQuest	MetroQuest	EST	EST
	I-69	MetroQuest	I-69	I-PLACE3S	I-PLACE3S	CSMP	I-69
		I-PLACE3S					
		I-69					
		CMART					
Data framework	EST	EST	EST	EST	I-69	EST	EST
		MetroQuest		MetroQuest	MetroQuest	I-69	I-69
		I-PLACE3S		I-PLACE3S	UrbanSim	CSMP	
				UrbanSim			

Note: **CMART**—Software used by PSRC to record and respond to public input; **CSMP**—Technology tools used to develop Caltrans's CSMP; **EST**—Florida's ETDM Process EST; **I-PLACE3S**—Software used by SACOG for the Blueprint Project; **I-69**—Technology tools used to support the I-69 Trans-Texas Corridor Study; **MetroQuest**—Software used for interactive regional scenario analysis in Idaho and Calgary; **PTR**—INDEX–Paint the Region software used by PSRC; **Travel Model**—Software used in the 2030 RTP by WFRC; **UrbanSim**—Software used by the WFRC and PSRC.

about environmental resources. Using these technologies, the disparate information can be pulled together and made available for analysis and review.

- *Analyzing the effects of proposed projects on the human and natural environment.* These technologies enable screening of alternatives by comparing the locations of the alternatives with locations of environmental resources (e.g., calculating the acreage of wetlands within various distances from an alternative corridor centerline, and counting the number of known historical and archaeological sites). Potential effects can be modeled and assessed to compare potential alternatives.
- *Communicating information effectively among collaborating agencies and with the public.* These technologies enable access to information by all interested parties. They can facilitate notification when project information is available or has been updated. They provide easy access to information and enable participants to submit comments and participate more fully in the decision-making process throughout solution screening and the life cycle of the project.
- *Storing and reporting results of alternative screenings.* Not only do the technologies enable analysis and visualization, they enable the results to be stored and reported.
- *Maintaining project records, including commitments and responses, throughout the project life cycle.* As the project moves through subsequent phases, the project information can be updated and maintained. Analysis results, comments received from participants, and the results of public involvement can be maintained as part of the project record and continue to be available.

The core technology components are described in more detail below. Each section includes a discussion of the current state of practice and future trends in the development of the technology. The technology is addressed from a broad transportation community perspective, not limited to the internal enterprisewide DOT computing environment. Emphasis is

given to trends that will expand the technologies beyond a few case studies, enabling the transportation community to build and share interoperable tools that support common tasks within the Collaborative Decision-Making Framework (Framework).

Geographic Information Systems

Current State of Practice

Over the past 20 years GIS technologies have grown from highly specialized project-based tools to become an enterprise framework within some agencies. Much of the growth has been fueled by the need to combine data and analyze problems in a geographic context. However, GIS is much more than a digital way to make maps and manage data. Transportation agencies have embraced the entire spectrum of a GIS implementation, particularly using GIS as a collaborative decision-making tool. Lower costs, ease of use, accessibility, and availability of data have all contributed to this growth. Much like modeling and visualization tools, GIS has benefited from the same improvements in technology—faster processing, increased bandwidth, greater storage capacity, mobile technologies, and real-time networks—that have advanced mainstream IT. As GIS software has evolved, it now supports many different platforms. From its beginning on mainframe computers, it has moved to minicomputers, then workstations and PCs, and now the web.

As is evident from the case studies investigated during the research portion of this project and other relevant examples beyond this study, GIS can be used to set up a framework for bringing information processes together. These processes range from measuring and analyzing to modeling, planning, decision making, and taking action. The knowledge produced by information processes can also be effectively disseminated using GIS. This results in better communication and allows for improved collaboration and coordination of efforts.

Future Directions

The future for GIS to support collaborative decision making is bright. The trend toward rapid advancements in GIS and IT remains steady. Enabling technologies continue to evolve rapidly with faster computers, increased bandwidth, larger storage, web services standards, mobile technologies, real-time server networks, and GIS software that is designed to work on the web. Web-based GIS represents a whole new generation of technology that will dramatically change GIS professionals' ability to share and integrate their geo-information.

Popular websites such as Google Earth and Microsoft Virtual Earth have introduced more people to the world of mapping and visualization, but the public and consumers are interested in seeing more. In the future, GIS knowledge will increasingly be available as web services for both internal and external use. This new platform will extend the reach of GIS technology and reinforce the importance of organizations that support this infrastructure. Many of these organizations, such as transportation, land management, environmental, and planning agencies, have already invested heavily in the development of GIS tools and data. This infrastructure can be leveraged by the new framework.

Industry professionals have started to refer to future trends in GIS as the "GeoWeb." The GeoWeb is a vision that can be realized only through the participation of GIS professionals. Currently, the GIS community creates libraries of specialized content or specific geographies that can be accessed through portals such as Geospatial One-Stop. Instead of providing wide access to a single source of data, the GeoWeb can bring together vast stores of transactionally maintained data (i.e., real-time and historically archived) of many types along with geospatial services that can interact and be used to create new information (Figure B.1). These combined services will provide a new distributed GIS that is open, interoperable, and dynamic. It is envisioned that individual systems and communities will use each other's services, breaking down the various geospatial data sets into components and allowing the dynamic integration of knowledge. The management of this knowledge will be distributed. Services will be interconnected to create new services; and as a result, various parts of organizations will become increasingly collaborative and interdependent.

Eventually, these services will provide a global network of geographic knowledge that is widely accessible and reflects the dynamic changes occurring. Common services that will increasingly be made available (published) will range from data, mapping, spatial analysis models, and 3-D visualizations as services for others to access and use.

Modeling and Visualization Technologies

Current State of Practice

Microsimulation and travel demand modeling has existed for some time. It is fairly mature and has been advancing. Similarly, many tools allow for scenarios to be modeled by experts and the static results prepared for presentation to decision makers and stakeholders. Trends in recent years have had a great impact on the state of technology to support modeling and visioning. Focusing on technology to support collaborative processes, the following trends have been observed:

- *Data standardization and availability.* Increasingly, data required to support modeling and visioning (e.g., GIS layers, census data, satellite imagery, and transportation surveys) have become standardized and more freely available, facilitating integrated modeling approaches and interagency collaborations.

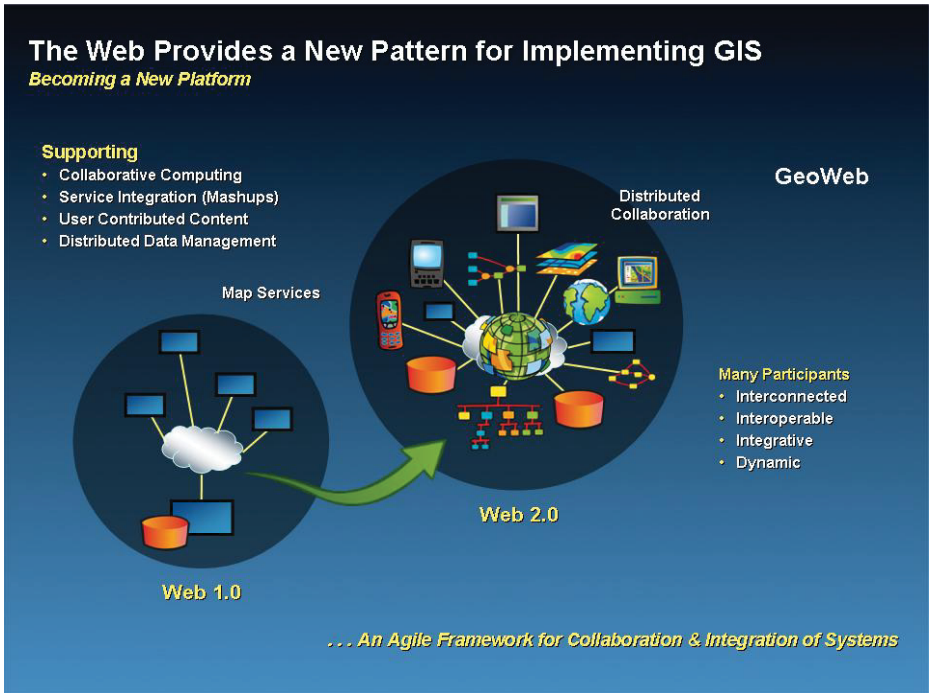

Figure B.1. GeoWeb framework for collaboration and integration of systems.

- *Computing power.* As expected, improvements in the computing capabilities of typical computers have facilitated modeling that is more central processing unit (CPU) intensive. In particular, land-use scenario modeling is now possible on an average PC. In most cases, hours or days are still required to run scenarios, limiting interactivity. Similarly, CPU-intensive visualizations such as 3-D rendering are increasingly accessible though, in most cases, interactivity is still limited. Highly skilled programmers and technicians are required for this work.
- *Land-use and transportation integration.* In recent years, efforts to connect land-use and transportation policy making have affected the development of technology to support those activities. Models that allow both land-use and transportation alternatives to be tested and evaluated in real time were first pilot tested in 2004 and have been refined in several case studies since then.
- *Web access.* Recent years have seen an unprecedented emphasis on the development of web-based collaborative technology. This movement has led to increased accessibility to decision-making processes by stakeholders, agencies, and the public. The movement has also accelerated improvements in modeling capability by allowing web users to share high-powered centralized servers for CPU-intensive modeling.
- *Legislation changes.* Recent legislation at the state and federal levels (e.g., SAFETEA-LU) has increased requirements for the use of visualizations and community participation in transportation planning processes. While specific guidelines have been slower to emerge, increasingly, agencies are experimenting with leading-edge approaches to using technology to support community participation in planning.
- *Longer time horizons.* Recently, planning projects have emphasized longer time horizons, many looking 20–40 years into the future. With such extended time horizons, the need for collaboration between resource agencies, land-use policy makers, and transportation planning agencies intensifies. Shorter-term planning is more likely to be reactive and limited in scope, while longer-term planning often forces practitioners to recognize the dynamics between sectors. For example, in longer time horizons, demographic shifts or housing development patterns can dramatically affect future transportation capacity analysis, while in short-term projects, these can be assumed to be static.

These changes have resulted in dramatic developments in the state of technology. The most recent advances have been toward more integrated modeling, improved visualization, and development of the capability to allow community stakeholders to create and explore their own visions or scenarios in workshops or over the web. Table B.3 highlights these tasks and lists a few leading technology tools that were investigated in the case studies.

Table B.3. Modeling and Visualization Tasks and Associated Technologies

Task	Examples of Technology Tools from Case Studies
Integrated land-use and transportation modeling	INDEX (through exporting to Travel Model)
	I-PLACE3S (through exporting to Travel Model)
	MetroQuest
	UrbanSim (through exporting to Travel Model)
Interactive scenario creation in public workshops (i.e., visioning)	I-PLACE3S
	MetroQuest
3-D visualization	ArcGIS Spatial and 3D Analyst
	Quantm (for corridor planning)
Web-based collaboration	MetroQuest
	Various web GIS applications

Future Directions

While the state of the practice in modeling and visioning has advanced considerably in recent years, each case study uncovered several areas in which improvement was needed. Each of the trends noted above can realistically be expected to continue to some extent and many of these trends will serve to address the shortcomings identified in the case studies. Specifically, the following themes were repeatedly heard:

- *Onerous data collection process.* As models become more sophisticated and broaden in scope, the list of data required to populate them grows rapidly. The task of populating and calibrating these models can be a significant barrier. While data standardization has helped in this capacity, the barrier still exists for most technologies. One example examined used an automated process for collecting and formatting standardized data to populate the model. Further advances in this area will significantly improve the accessibility of these technologies.
- *Many scenario models are still too slow.* While computing power is improving, the demands seem to be increasing at a similar rate, often resulting in models that take hours or days to run. With the increasing demand for collaboration and interactive scenario exploration, models that run in seconds, either in workshops or over the web, are needed. Only two examples could be found that allowed this kind of interactivity. More widespread development of this capability is needed.
- *Land-use and transportation modeling integration can be limited.* While a few successful examples of integrated modeling were found, most involved taking the outputs from a land-use model and feeding them into a transportation model, thus cutting off the possibility of exploring feedback and secondary interactions between the two areas. Both fields of analysis are sufficiently complicated to result in significant barriers for deep analytical integration. Some level of simplification may be needed in each area to facilitate the integration process in a way that is interactive for participants.

The fields of modeling and visioning seem to be merging to some extent with models more routinely being used in collaborative visioning exercises. While this combination has proven to be successful in several case studies examined, there is also a hazard in the merger. Visioning is a task oriented to community and public involvement and requires a broad, comprehensive, and highly visual approach. Modeling can be broad and comprehensive but is often best used to explore detailed analytical questions. The interface, visualization capability, speed, and comprehensiveness needed to be successful in visioning applications can be at odds with the requirements of decision makers during more analytical parts of the decision-making process. A more sophisticated understanding of the requirements for these very different applications is needed to optimize the technologies toward those goals.

Web-Based Collaboration Tools

Current State of Practice

Work-group collaboration tools, such as online meetings, digital whiteboards, and video-conferencing, are a common part of the modern office IT infrastructure. These collaborative technologies, also known as "groupware," support the information and idea exchange that accompanies teamwork. Groupware presents new possibilities for collaboration, such as capturing the outputs of activities, tracking their progress, and analyzing their consequences via an interactive knowledge base, adding a new level of value to the collaboration. Combined with the ability to index, search, and sort through these systems remotely in a near-instant fashion, practitioners now have the power to extend collaborative workflows practically whenever, wherever, and to whomever is needed. In the context of tracking major transportation capacity improvement projects, these tools have been used effectively to facilitate and augment a deliberative decision-making process that can span decades and the gamut of stakeholders.

Of course, there are barriers and inefficiencies in the application of these tools across the board. Disparate systems may not be interoperable, and a lack of established protocols for information exchange and a resistance to change can hamper

the realization of progress. Market forces, however, have a way of overcoming such obstacles. One example of this is the vast success and ubiquity of the Internet and web browser technology, which opened up new channels of communication for nearly all sectors of society. Similarly, there are emerging frontrunners in the field of web-based collaboration technologies. A software constituency composed of stakeholders, from designers to end users, demands improved features of the best software and rejects the worst (except when the market is cornered). In particular, the most successful web-based collaboration tools tend to be software products with open architectures that by their very nature are the easiest to use and adapt by all constituents; scale to the greatest number of users; and provide the most value to all parties. The purpose of this section is to highlight some leading-edge trends in the web-based collaboration technology arena that, when harnessed, will have an immediate and high-value impact on collaborative decision-making processes in the realm of transportation capacity improvement.

The web-based collaboration trends of note in the current environment are content management systems (CMSs), cloud computing, and social networking. As evidenced by the ascendance of the blogosphere, rich Internet applications (RIAs), and reputation-based networks, demand for network-accessible software and online content is driving the development of ever more convenient and useful means of interacting with the software itself and a network of other users. Collaborative decision makers have needs that are often aligned with these communication technologies, such as information exchange, analysis of options, and soliciting feedback. The remainder of this section is devoted to exploring how these trends are playing out.

Content Management Systems

A CMS is a software package that manages the creation, revision, cataloging, and dissemination of electronic content. These systems can scale from the management of web content for small groups to large enterprises and beyond, such as entire online communities. Typical services of these software packages include web-page design and layout, blogging, syndication and aggregation of content, and productivity tools (calendaring, contacts, e-mail, instant messaging, and the like). The maturation of CMS products, especially in the free and open-source software (FOSS) community, means that even nonexperts can get a well-designed, multifeatured, and manageable web-based collaboration website up and running without extensive system administration effort or software development/licensing expense. A full-featured CMS is extensible, meaning that a content provider can easily plug in new modules, widgets, or services (created via both community-oriented and proprietary software development efforts) that implement the CMS's well-defined interfaces. Increasingly, CMS implementations have become a portal to web-interfaces for software designed in a service-oriented architecture (SOA). As an example, events on an electronic calendar can be published as a web service and integrated with other remote calendars. The versatility and flexibility of CMSs in organizing and presenting online content makes them ideal web-collaboration frameworks.

Cloud Computing

Web-based collaboration has also benefited from the trend toward cloud computing, which is another term for distributed computing over the Internet (often represented as a cloud on network diagrams). Some notable forms of cloud computing are

- *Software as a service (SaaS).* Software, such as word processing, is accessible remotely on-demand via a client (often a web browser).
- *Grid computing.* Networked computers perform parallel computation to increase computing power.

SaaS implementations include RIAs that are enabled by Web 2.0, a collection of techniques and frameworks for making network-based applications behave more like traditional desktop applications. Such applications can themselves be modularized for consumption by a CMS, increasing their value. Cloud computing lowers the burden on users for gaining access to powerful computing resources. For example, grid computing can offer the average user access to supercomputer-level computational ability by using the idle CPU time of computers networked over the Internet. Cloud computing uses the network to provide users with more convenient access to software and potentially greater computing power, a natural advantage for web-based collaboration tools.

Social Networking

Internet-accessible tools for forming and maintaining interpersonal relationships are known collectively as social networking tools, and they have fomented a new paradigm in communication. As people become familiar with these systems and increase their usage, the value of the network increases (as first observed by Robert Metcalfe in a comment on *Metcalfe's Law and Legacy* by George Glider). This is due in part to the ability to connect and communicate with more people and also to the leveraging of information that these software systems capture about a user's reputation and affinity for other users. Some practical applications of this technology are group editing of documents and improved information search and retrieval, which harness collective intelligence. Much like the telephone and Internet, people will adopt and adapt these new communication conduits to group-oriented tasks.

Future Directions

CMS, cloud computing, and social networking concepts incorporate well-known and long-understood principles of computer science and IT. The Internet and web have allowed these concepts to be realized in practical ways, as standard modes of computation and communication are reengineered for the web. This has allowed groupware technology to spread, which in turn creates new evolutionary demands for the software. In particular, transportation planning can benefit as it incorporates more of these state-of-the-art web-collaboration tools into the next-generation planning process.

While not solution screening tools per se, groupware's communication, archiving, and search-and-retrieval capabilities, along with the trend toward open standards and interoperability, mean that the technologies discussed here are suited for application to decision making and other collaborative processes. A CMS can interface with and add value to other software typically used in decision-support processes, such as databases, GIS, and Electronic Document Management Services. Built-in CMS features, such as publishing calendar events as a web service, can be applied to notify stakeholders of events and milestones in project planning and development. Other CMS-bundled tools for social networking (such as instant messaging, discussion forums, and blogging) can be tailored to serve the needs of transportation project stakeholders, opening up lines of communication and documenting knowledge and decision making for posterity.

The extensibility of the CMS itself means it can serve as a consistent, stable portal to nearly any kind of web application functionality imaginable. These could include modeling tools that apply grid computing to drastically accelerate the real-time analysis of alternatives for capacity improvement, and visualization software that applies SaaS techniques to deliver data, graphs, maps, and analysis tools in a universally accessible format over the web, effectively democratizing this part of the planning process. Even the advent of digital worlds and avatars in social networks may one day allow for public outreach and visioning in immersive technologies that today are reserved for the military and movie and gaming industries. As is often the case in computing, trends that begin as entertainment or play can evolve and be repurposed in innovative ways.

What all of these trends have in common is distribution of the information and computing channels, providing maximum accessibility and utility for the most number of users. As web-based technology evolves and is commoditized, creating custom representations or views of collaborative processes which can be combined and analyzed as needed becomes a reality for the average user. The downside to all of this knowledge capture and sharing is an information glut. Efficiencies are lost when the proliferation of data overwhelms the ability to quickly access, search, and process the data in an ad-hoc fashion. Promising work is being done to mitigate this situation. For example, the semantic web is a framework that has the potential to bring to all data what the web brought to hypertext documents. By tagging information in a machine-readable format and using data-mining and artificial intelligence techniques, it will be possible to find and combine information in new, semantically driven ways. As with transportation capacity improvement itself, innovative modes and solutions will emerge in IT to meet the needs and challenges presented by the steady increase in the traffic of information.

Web-collaboration tools continue to advance in the number of available features and the power of those features to support collaborative processes. The software systems that make up these tools are becoming more sophisticated and easier to use, from both an end-user and application developer perspective. This process has no end in sight, to the benefit of all constituents. The key to progress of these tools is an open, market-based system (not necessarily commercial) in which well-designed standards allow software to both collaborate and compete for the most utility. When applied to decision-support for transportation projects, these tools have the potential to increase involvement, understanding, and acceptance of outcomes.

Data Framework for Collaborative Decision Making

Current State of Practice

At the foundation of each of these technologies lies data, organized to support modeling, analysis, mapping, and visioning tasks. Data development presents a challenge for the collaborative decision-making process because it can be costly and time-consuming, especially for GIS tools. Problems such as lack of data, incompleteness of data, out-of-date data, and incompatibility of data were reoccurring themes among the case studies (see Appendix C).

Several factors contribute to the challenge:

- *Large quantities of disparate data must be collected to support transportation planning activities.* Transportation modeling, analysis, mapping, and visualization activities require current and accurate data from a broad range of themes such as transportation, environmental, demographic, urban planning, and other related data. More accurate, site-specific data are generally more expensive to compile than generalized, regional data.
- *Projects often need data that cross various jurisdictional and organizational boundaries.* The data needed to assess community, natural, and cultural impacts are often gathered from other organizations that are responsible for managing those resources. This information may be difficult to locate.

- *Data collected by different organizations are often incompatible.* They may use different geographic references, different standards, or different classification rationale. Cross-referencing these different data schemas to make them compatible can be very costly and time-consuming.

In the case studies, these issues were minimized when common data frameworks existed to establish policies, standards, and procedures for organizations to cooperatively produce and share data. Common data frameworks enabled collaborative data acquisition, reducing costs and producing data that can be used in multiple applications.

Several initiatives are currently under way to promote the coordinated development, use, sharing, and dissemination of geospatial data on a national basis. These include the following:

- *National Spatial Data Infrastructure (NSDI).* This nationwide data-publishing effort sponsored by the Federal Geographic Data Committee (FGDC) is a physical, organizational, and virtual network designed to enable the development and sharing of the nation's digital geographic information resources. The FGDC is developing the NSDI in cooperation with organizations from state, local, and tribal governments; the academic community; and the private sector.
- *FGDC National Digital Geospatial Data Framework.* This is a collaborative effort to create a widely available source of basic geographic data. It focuses on seven of the most common data themes: (1) geodetic control, (2) orthoimagery, (3) elevation, (4) transportation, (5) hydrography, (6) governmental units, and (7) cadastral information. At its foundation is the development of open standards, which define common features, attributes, and relationships for these data themes.
- *Geospatial One-Stop.* This public website provides access to geospatial information and data under the Geospatial One-Stop E-Government initiative. Geospatial One-Stop is one of 24 E-Government initiatives sponsored by the federal Office of Management and Budget (OMB) to enhance government efficiency and to improve citizen services. It provides a catalog of geospatial information containing thousands of metadata records (information about the data) and links to live maps, features, catalog services, downloadable data sets, images, clearinghouses, and map files. The metadata records were submitted to the portal by government agencies, individuals, and companies, or gathered from geospatial clearinghouses.
- *The National Map.* This nationally consistent database and topological map series was developed by the U.S. Geological Survey (USGS). The National Map is the product of a consortium of federal, state, and local partners who provide geospatial data. It focuses on structures, transportation, government units, and the National Hydrography Dataset.
- *Esri Transportation Data Model.* This model provides a database design template to help implement GIS projects. The Transportation Data Model was developed by a group of Esri transportation industry users, consultants, Esri business partners, and academics in a collaborative environment.

These national efforts are all ongoing and will take many years to be fully operational. In the meanwhile, many state and local governments are creating data repositories or libraries to facilitate data sharing. For example, in the case studies, both the Florida ETDM Process and the Texas I-69 corridor project benefited from this type of initiative.

APPENDIX C

Project Methodology

Introduction

The methods used to carry out SHRP 2 Capacity Project C01 are summarized in this appendix.

SHRP 2

SHRP 2 was created to address the challenges of moving people and goods efficiently and safely on the nation's highways. It is a targeted, short-term research program that addresses four strategic focus areas: the role of human behavior in highway safety (Safety); rapid highway renewal (Renewal); congestion reduction through improved travel time reliability (Reliability); and transportation planning that better integrates community, economic, and environmental considerations into new highway capacity (Capacity).

Capacity Focus Area

The overall goal of the Capacity focus area is to develop approaches for systematically integrating environmental, economic, and community requirements into the analysis, planning, and design of new highway capacity. The scope of the SHRP 2 Capacity focus area extends from the early stages of the transportation planning process, when many potential alternatives are being considered, through project development. When decisions include a major highway component, further development of the highway option is within the scope of the program.

SHRP 2 Capacity Project C01

The first project in the Capacity focus area, Project C01, Framework for Collaborative Decision Making on Additions to Highway Capacity, was designed to develop an integrated, systems-based framework that transportation practitioners can use to reach decisions regarding highway capacity expansion projects as a joint effort with stakeholders. A systems-based approach takes into consideration the transportation network as a whole and its relationship with the community, environment, and economy. The result of this effort is a collaborative business process that goes beyond incremental improvements of existing processes and supports a substantially better way to approach, develop, and manage complex highway capacity enhancement projects.

The project was divided into four phases. As stated in the request for proposal, the objectives of each of the phases were as follows:

- *Phase 1:* Identify key decision points in the project approval process, identify the elements common to successful outcomes, and prepare insightful case studies from which others can learn.
- *Phase 2:* Identify the critical barriers to a better analytical process grounded in the principals of environmental stewardship for screening transportation solutions. Recommend products appropriate for SHRP 2 that will have a maximum positive impact on the state of the practice.
- *Phase 3:* Develop a framework or frameworks that support collaborative decision making in transportation and address system-level integration of transportation, protection of the human and natural environment, land development policy, and economic development strategies (called the Collaborative Decision-Making Framework, or CDMF or Framework).
- *Phase 4:* Disseminate the results of the project and encourage their adoption into practice.

This appendix includes a description of the methods used in each of these phases and a summary of the resulting products. The project culminated in a stand-alone web tool, Transportation for Communities—Advancing Projects through Partnership (TCAPP), which is described in Chapter 6 of this report. (Note that since the writing of this report, TCAPP has been renamed PlanWorks.)

Research Approach

Phase 1

In Phase 1, the research team conducted 15 detailed, in-depth case studies of transportation decision making that involved highway capacity projects. The purposes of these case studies were to provide insights into key factors that contribute to delivering successful highway capacity improvements, to identify key decision points in the transportation decision-making process to support development of a collaborative decision-making framework, and to provide lessons from which others can learn. The products resulting from Phase 1 included the 15 individual case studies, a summary report describing the process used to select and develop the case studies, and the key success factors and lessons learned from the case studies that would inform the development of the CDMF in Phase 3 of the project.

Identification of Case Studies

Thousands of highway capacity projects implemented across the United States could serve as potential case studies on project decision making. The goal of Phase 1, however, was to conduct very detailed case studies to examine in depth the decision-making process, institutional structures, time frames, and issues faced. Consequently, the focus of this effort was to conduct a limited set of case studies, rather than a broad scan.

The research team used a systematic process to identify case studies for detailed analysis, beginning with the identification of over 400 potential case studies addressing projects, planning, and programming processes, drawn from literature and contacts with Federal Highway Administration (FHWA) and state department of transportation (DOT) staff. These potential cases were screened using the following criteria:

- Potential contribution to advance state of the practice, including potential to provide lessons learned about factors that led to success in developing highway capacity projects, while meeting community, social, economic, and environmental considerations;
- Incorporation of context-sensitive solutions (CSS), sound project management principles, and high levels of collaboration;
- Ability to contribute to the identification of key decision points that will form a basis for developing a more collaborative decision-making framework; and
- Availability of information, as well as potential transferability of lessons learned.

In addition, cases were selected to ensure an overall diversity of geography, urban/rural setting, passenger/freight focus, and other contextual considerations, as well as to address topics of special interest to the committee overseeing C01, including at least one project with a multistate setting and at least one design-build project.

To capture detailed information that would help in developing the collaborative decision-making framework, the case studies were divided into comprehensive and phase case studies.

- Comprehensive case studies examine the entire transportation decision-making process starting with concept development in a planning study (long-range, corridor, and/or subarea) through project planning, design, and permitting.
- Phase case studies focus on just one phase of the overall process, to better extract detailed information on key decision points. Specifically, planning phase case studies focus on long-range planning, corridor planning, or visioning processes. Project development/permitting case studies focus on the National Environmental Policy Act (NEPA) process, design, and permitting. Phase case studies were intended to help gather in-depth information about the data, analyses, processes, and tools that supported technical and policy decisions and to yield detailed information for each decision point.

Ultimately, 15 case studies were selected and developed:

- Four comprehensive case studies.
- Seven planning phase case studies, including
  - Three corridor studies;
  - One visioning process study; and
  - Three metropolitan transportation plans (MTPs).
- Four project development/permitting phase case studies.

Development of Case Studies

The process for developing the case studies involved interviews with stakeholders, including transportation agency staff, resource agency staff, local officials, representatives of interest groups, and others. To guide case study development, the team developed a detailed research plan, which contained comprehensive questions for the interview process and a "straw man" key decision point framework. The straw man was intended to serve as a baseline reference point for data collection. It represented common key decision points in the transportation decision-making process that could be modified (added to, subtracted from, and rearranged) to represent the specific key decision points for each case.

Interviews were conducted primarily by phone, though some were performed in person, usually with two interviewers present to record information, ask questions, and facilitate follow-up. All interview guides and questionnaires met the requirements of the federal Policy for Protection of Human Subjects, 45 CFR 46. This policy worked against the inclusion

of directly attributable quotes in the case studies but it likely encouraged candor and greater comfort among the interviewees.

Each case study also involved a review of public record information, such as transportation plans and programs, NEPA documents, and resource agency plans. Special care was taken throughout the data gathering to understand "bumps in the road" and stumbling blocks, as well as how these issues were addressed, to dig deeper into issues that are not typically reported in short, best-practice case studies.

Case studies underwent a lengthy review process, both by the research team and by independent reviewers. They will be made available on TCAPP. In addition, the methods used to select and develop the case studies and the key success factors, lessons learned about transportation decision making, and guidance for the development of a collaborative process gained from the case studies were summarized in the Phase 1 Case Study Summary Report (unpublished) and informed the development of the CDMF in Phase 3.

Phase 2

Solution screening is the most complex and difficult component of transportation decision making. A collaborative, systems-based approach to solution screening must draw a substantial number of partners into a process that (1) considers a broad range of potential solutions, including operational improvements, transit, demand management, nonhighway freight options, and highway construction; and (2) evaluates community, economic, and environmental effects. Balancing the multiple and potentially unrelated goals can be extremely challenging. To fulfill the ultimate goal of the C01 project, the CDMF designed in Phase 3 must incorporate the "best of the best" in solution screening processes and support technology.

In Phase 2, the research team conducted nine detailed, in-depth case studies of solution screening in transportation decision making. The purposes of these case studies were to assess the state of the practice in solution screening, including a specific focus on technology; identify the barriers and success factors in solution screening; identify areas that are ripe for future research; and provide lessons from which others can learn by informing the Framework. Four reports (unpublished) were submitted in Phase 2 to document methods and provide recommendations as the phase progressed. In this section, these reports are described along with a summary of the methods used in Phase 2.

Identification of Solution Screening Processes

As a first step, more than 100 solution screening processes were identified for potential inclusion as a case study. To identify processes, literature and case studies related to improving delivery of transportation projects were reviewed, and solution screening processes documented in this research were identified. Sources included documentation from metropolitan planning organizations (MPOs) and state departments of transportation (DOTs), the American Association of State Highway and Transportation Officials (AASHTO) Center for Environmental Excellence, the Federal Highway Administration (FHWA) Environmental Review Toolkit, and National Cooperative Highway Research Program (NCHRP) research efforts. Solution screening processes that were included among the extensive list of case studies identified in Phase 1 of the project were also identified in this step.

The initial process list was vetted with the project team to ensure that the 100-plus screening processes identified captured the diversity of project types, processes, geography, issues, and approaches encountered in capacity improvement projects nationwide and internationally. This approach ensured that the initial pool of potential processes for study was sufficiently broad to reflect the spectrum of diversity in context and practice across the country and abroad.

Initial Screening of Solution Screening Processes

After identifying the 100-plus list of solution screening processes, the list was narrowed to a more manageable number for inclusion in the preliminary assessment. Two separate scoring approaches were used to rank the long list of processes based on their relevance and their use of elements considered key to a viable system-based solution screening process.

The project team reviewed the rankings and made a final determination as to whether the processes should be included in the preliminary assessment. The team ensured that the recommended processes represented the following requirements:

- Use performance measures;
- Use technology;
- Use early/joint agency coordination;
- Use public involvement;
- Integrate land use with transportation;
- Integrate community values with transportation; and
- Are used in the planning, programming, and project development phases.

The final summary evaluation of the two ranking methods resulted in a total of 26 processes that were recommended for inclusion in the preliminary assessment.

Preliminary Assessment and Selection of Processes for In-Depth Study

A preliminary assessment of the 26 processes was conducted to ensure that each identified process is truly used for

solution screening and that enough information would be available to perform an in-depth study. Team members gathered basic information for each of the 26 processes using available literature and telephone interviews. Another ranking process was used to determine how well each of the cases included in the preliminary assessment met the following criteria:

- Transferability;
- Agency coordination;
- Integration of the process with other planning processes (e.g., land-use planning);
- Integration of the process with other phases of transportation decision making;
- Range of alternatives;
- Use of metrics/performance measures;
- Data quality;
- Communications support;
- Success in practice; and
- Innovative use of technology.

The recommended processes along with the rankings and documented answers to the preliminary assessment questions were shared with the project team. The project team discussed each recommended process to be sure it warranted inclusion in the in-depth study. The team also reviewed the processes that were eliminated from further study to ensure that they should be eliminated. The resulting list of recommendations was reviewed by team leaders to ensure that several were selected at the project development, planning, and programming levels. A total of nine solution screening processes were recommended for the in-depth study. One was later dropped due to the inability of key individuals to participate in the study. This approach and the resulting recommendations were described in detail in the first interim report of Phase 2, Summary of Preliminary Assessment and Recommendations of Solution Screening Processes for In-Depth Evaluation (unpublished).

In-Depth Study and Development of Case Studies

The in-depth study began with a kick-off meeting on July 30, 2007. During the meeting, the in-depth study team became familiar with the purposes of the project, the purposes of Phase 2, and the methods and materials that would be used to conduct the study. The in-depth study was carried forward in teams of two. Each team consisted of one individual with experience in technology and decision support tools and one individual with experience in planning and NEPA. In almost all cases, the individual who conducted the preliminary assessment for each process was part of the team conducting the in-depth study.

Generalized interview questions were developed for use during the study. Teams were responsible for tailoring the generalized interview questions for their process. Before interviews, the team members reviewed pertinent available documentation related to the process and answered the interview questions to the extent possible using that information. During interviews, the team members sought answers to the remaining questions and verified the information they had gathered through documentation. At least one response was sought for every question. Some questions were asked of multiple interviewees to gain perspective. In most cases, individuals interviewed included the main user or owner of the process with the transportation or planning agency. When the use of a decision support tool or technology was a main component of the process, someone knowledgeable about the technology was interviewed. If public involvement or agency collaboration was a key component, a public stakeholder and/or representative of a stakeholder agency was interviewed. When possible, interviews were conducted on-site with both team members present. Telephone interviews were used for follow-up questions and clarification.

Team members recorded their findings in case study summaries and data collection forms. The case studies will be available on TCAPP and focus on aspects of the solution screening processes considered key for this project: (1) scope, or how the screening process is integrated with other planning activities (e.g., land use, economic development, and growth management), at what stage (planning, programming, project development) the screening process occurs, and the types of solutions or alternatives screened; (2) communications, including agency and public involvement; (3) technology; and (4) metrics and data. The summaries also provide a brief context of the solution screening process and summarize lessons learned, barriers and solutions, and recommendations for disseminating a similar process to other users. The methods used in the in-depth study and the case study summaries were documented in the second interim report for Phase 2, Findings from the In-Depth Study of Solution Screening Processes (unpublished).

Informing C01 and the SHRP 2 Program

In addition to the case study summaries, two capstone reports were prepared in Phase 2 to inform the development of the CDMF and the direction of future research in the SHRP 2 program.

The first report, Barriers and Recommendations to an Improved Decision-Making Process for Additions to Highway Capacity (unpublished), was developed to (1) provide an assessment of gaps in scientific knowledge, data shortfalls, weaknesses in analytical tools, problems with access to data, lack of connectivity with other planning activities, and other

barriers to transportation decision making; (2) recommend solutions to removing barriers; (3) prioritize solutions; and (4) develop problem statements as recommendations to guide future research and the allocation of SHRP 2 Capacity funds. This report drew on barriers and solutions identified through both the Phase 1 and Phase 2 case studies. Recommendations for future SHRP 2 research were in the form of short project statements and were presented to the Technical Coordinating Committee for the SHRP 2 Capacity program.

The second report, State of the Practice: Solution Screening Processes and Decision Support Tools for Transportation Capacity Planning (unpublished), is the culmination of work conducted under Phase 2. The purposes of this report were to (1) document the work conducted under Phase 2; (2) present the state of the practice in system-wide performance-based solution screening processes and decision support tools used in transportation capacity planning; and (3) provide guidance for future SHRP 2 work that supports the development of decision support tools. This report is divided into three main sections. A background of the research is provided in the first section. In the second section, the state of the practice in solution screening is presented through a synopsis of the main barriers and solutions identified in eight solution screening case studies. The third section presents guidance for future SHRP 2 work that supports the development of decision support tools.

Phase 3

The CDMF was developed in Phase 3 of the project. The CDMF was designed in a series of six workshops. The workshops consisted of facilitated discussions among transportation professionals on specific aspects of the CDMF. They were guided by a set of design goals established at the outset of Phase 3 and approved by the oversight committee. The case studies and reports developed in Phases 1 and 2 served as input for the workshops.

Defining Goals

The project team and the oversight committee jointly created a set of goals (design goals) for the CDMF. The design goals provided the vision of what the CDMF should achieve when completed and implemented. Each workshop commenced with an introduction to the design goals to ensure that each participant understood the ultimate vision for the CDMF. The design goals were reviewed again at the conclusion of each workshop in an exercise in which participants described how their efforts were consistent with and addressed the goals. In this way, the CDMF could be created by multiple teams in multiple settings because they were all working toward the same vision.

The design goals fall into five categories: collaboration, implementation, integration, project delivery, and systems based. The design goals by category are as follows:

1. Collaboration
   - Establish a *tiered decision-making approach* to capacity improvements which encourages *binding decisions* at the earliest possible point even when these decisions are only partial or qualified due to timing or level of information available to support them.
   - Establish a decision-making approach which is built on *early and ongoing involvement of formal decision makers and individuals in positions of authority* who have the potential to veto or significantly affect the timely and cost-effective delivery of transportation improvements.
   - Establish a decision-making approach which *identifies participant roles and responsibilities,* including the scope and extent of decision-making responsibility at each key decision point.
   - Establish *collaborative decision-making practices.*
2. Implementation
   - Establish a decision-making approach based on fulfilling the *intent of legal and regulatory requirements.*
   - Provide implementation flexibility and adaptability consistent with the design goals.
3. Integration
   - Encourage a decision-making approach which evaluates transportation needs within broader *community and natural contexts.*
   - Integrate land planning and development policy.
   - Integrate capital improvement planning.
   - Address sustainability issues to the greatest extent possible.
   - Integrate protection and enhancement of the human and natural environment.
   - Support community goals and visions.
4. Project delivery
   - Encourage early and comprehensive *agreement on data sources, level of detail, evaluation criteria, and performance measures* that will be used to support the decision-making process.
   - Ensure transfer of information and decisions between phases of the decision-making process.
   - Encourage timely and cost-effective project delivery.
   - Establish a comprehensive and proactive risk management strategy to minimize potential for legal challenge and/or failure to meet project delivery goals.
5. Systems based
   - Encourage consideration of a *wide range of options* to address capacity problems during the planning phase of decision making.

Table C.1. Overview of Phase 3 Workshops

Workshop	Date	Location	Topic
Workshop 1	Feb. 18–23, 2008	Raleigh, NC	Designing the base CDMF
Workshop 2	April 14–18, 2008	Raleigh, NC	Integrating sub- and influencing planning processes
Workshop 3	May 5–9, 2008	Raleigh, NC	Understanding solution screening and the dynamics of collaboration
Workshop 4	June 23–27, 2008	Raleigh, NC	Understanding the roles and relationships of the formal decision-making partners
Workshop 5	July 14–18, 2008	Raleigh, NC	Understanding the roles and relationships of stakeholders
Workshop 6	April 14–17, 2009	Washington, DC	Determining the tools and technologies needed to support the CDMF

- Encourage early and ongoing incorporation of operational elements as a part of the overall decision-making approach.

Designing the CDMF

Six workshops were held to design the different components of the CDMF. The focus of each workshop, along with the workshop date and location are shown in Table C.1. The workshops are described in further detail below.

Following the initial workshops, the consultant team produced a memo highlighting the major outcomes of the workshop and the ways in which these outcomes helped achieve the design goals for the project. These memos provided the basis for two conference calls with the Capacity Technical Coordinating Committee (TCC):

1. The first conference call was held on April 4, 2008, following the first workshop. This call covered the development of the original CDMF.
2. The second conference call was held on June 5, 2008, and covered the second and third workshops, which provided details on integrated planning and solution screening.

These conference calls provided the Capacity TCC the opportunity to comment on and critique the outcomes of each workshop and to provide additional guidance on the development of the CDMF to the consultant team.

Following Workshops 4 and 5, the Capacity TCC determined that the CDMF would be most useful for transportation professionals in a web-based format. The project team was asked to develop a concept for a web tool product and present this concept at the October 2008 TCC meeting. In lieu of a summary memo and conference call discussion, the principal investigator presented the information as it might appear in a web-based application. Following this presentation, the TCC targeted additional funding for development of a web tool and added requirements as a supplement to the existing project scope. The outcomes of Workshops 4–6 have been integrated into the web tool design and are not recorded in memorandum format.

Workshop 1: The Basic Design

The basic design of the CDMF (i.e., the individual key decision points and their order) was the focus of the first workshop. Workshop participants, shown in Table C.2, included representatives from MPOs, state DOTs, FHWA, and an advocacy group.

The workshop included four full days of discussions and decisions related to the design of the baseline CDMF. During this workshop the design team

- Identified all key decision points for the CDMF;
- Wrote a purpose statement that describes the activities or actions that should occur at each key decision point so that users can understand why the decision is made;
- Drafted an outcome statement that describes the results of the actions taken at each key decision point so that users know the products resulting from each decision;
- Identified the decisions made at every key decision point to illuminate the crucial information needed to move forward in the decision-making process; and
- Identified the vital linkages between key decision points within the phases of the CDMF to indicate where existing information should be pulled forward to enable tiered decision making, ensure consistency between phases, and minimize risk (or the risk of controversy).

Table C.2. Participants in Workshop 1

Title of Participant	Organization
Director	North Carolina DOT (NCDOT), Office of Environmental Quality
Assistant Division Administrator	FHWA, West Virginia Division
Cofounder	Envision Sustainability Tools
Principal Planner	Puget Sound Regional Council
Executive Director	North Carolina Metropolitan Coalition
Location Engineer	Mississippi DOT, Environmental Division

Using the case study information from Phases 1 and 2, as well as their own experiences and expertise, the workshop team updated and validated the key decision points identified in the straw man created in Phase 1 and sequenced and explained each key decision point. On completion of this workshop, the workshop team had developed the basic structure and underlying information to support the CDMF.

Workshop 2: Integrated Planning

Many agencies invest in comprehensive, data-driven planning. The outputs from these plans represent a substantial asset and data source for better transportation decision making. Integrated planning focuses on the interaction between sub- and influencing processes and the transportation decision-making process by identifying specifically where these outside processes link to the CDMF.

A subprocess is a process that contains a step that is critical to the transportation decision-making process and results in a key decision point for transportation decision making. One example of a subprocess is the land-use planning process. In contrast, an influencing process, such as conservation planning, affects transportation decision making but is not critical to advancing the transportation decision-making process.

The goal of integrating sub- and influencing planning processes into the CDMF was accomplished through the second workshop. The workshop participants identified at which key decision point each subprocess or influencing process intersects with the CDMF, and provided detailed information about what that interaction should involve. This information will allow decision makers to identify when engagement of an outside process is critical to the success of the transportation process. The second workshop included participants representing state DOT's, FHWA, MPOs, resource agencies, and consulting firms. The participants are included in Table C.3.

The workshop team identified seven subprocesses and influencing processes that were integrated into the CDMF:

1. Land-use planning;
2. Environmental resources/conservation planning (Eco-Logical);
3. Capital improvement planning;
4. Human environment;
5. Fiscal constraint;
6. Safety and security; and
7. Air quality.

The workshop team detailed the interactions between each of these processes and the CDMF. For environmental resource/conservation planning the team integrated the "Eco-Logical" process into the CDMF. Eco-Logical is an integrated transportation/conservation planning process developed by FHWA in partnership with representatives of all the federal resource agencies. These federal agencies have signed a memorandum of understanding to support implementation of Eco-Logical. Building the CDMF on this previous partnership will support existing streamlining and stewardship activities and advance implementation of both Eco-Logical and the CDMF.

Because of limited air-quality experience on the workshop team, the consultant team convened a separate panel of air-quality experts to detail the interactions between the air-quality subprocess and the CDMF. The consultant team, as well as participants in each of the remaining four workshops, validated this air-quality integration information.

Detailing the interaction between these subprocesses and influencing processes and the CDMF included indicating the key decision points at which decision makers should look to one of the subprocesses or influencing processes for information. The workshop team identified which key decision points require information from the specific sub- or influencing process as well as those that have output to a subprocess or influencing process. They also indicated the type of information decision makers need; that is, whether the information needed is data, analysis, or decision input (or output). "Bringing in data" signifies that the CDMF decision makers need data from the subprocess or influencing process; "analysis" indicates that decision makers are using an analysis that was conducted in the subprocess or influencing process as a part of transportation decision making; "decision" indicates that decision makers are accepting a decision made in the subprocess or influencing process.

Table C.3. Participants in Workshop 2

Title of Participant	Organization
Director, Office of Project Development	FHWA, Ohio Division
Regulatory Program Manager and National Transportation Liaison	U.S. Army Corps of Engineers (USACE)
Planning Program Manager	Piedmont Triad Council of Governments
Director of Research and Analysis	Sacramento Area Council of Governments (SACOG)
Transportation and Land Use Coordinator	Pennsylvania DOT
Director of Transportation Planning	HNTB Consulting
Team Leader, Planning Oversight and Stewardship	FHWA, Office of Planning, Environment and Realty

Workshop 3: Solution Screening

Solution screening involves refining potential solutions using both broad-based goals and established criteria at every phase of transportation decision making. The outcome of solution screening is a decision identifying the preferred solution(s) to address transportation deficiencies and opportunities. Solution screening occurs at the key decision points at which decision makers must balance dissimilar, and sometimes contradictory, goals or criteria to decide on the best option. Decision making at these key decision points generally requires trade-offs among transportation, environmental, and community values, goals, or criteria. Collaboration becomes especially challenging at these key decision points if decision makers are striving to maximize benefit for their agency's goal or mission as opposed to finding a solution that optimizes benefit across all criteria.

In the solution screening workshop, participants identified the key decision points at which solution screening is occurring, linked solution screening across decision-making processes to maintain coordination and consistency of decisions, and generated information and discussion around the potential risk to collaboration at these key decision points.

Participants in the solution screening workshop are listed in Table C.4.

Because of the risk that solution screening poses to collaboration, the consultant team invited an organizational development expert to discuss decision theory with the workshop team. This expert described three theories: contingency theory, game theory, and social network theory. These theories aid the understanding of the dynamics of decision making. By understanding these theories, the workshop participants better understood the environment in which collaboration occurs (contingency theory), the motivations and rationales of decision-making partners (game theory), and the role that relationships play in decision making (social network theory).

On the basis of this information, the workshop participants developed five scales relevant to transportation decision making; these scales, known as the dynamics of collaboration scales, provide a framework for understanding collaboration when making decisions about what are often incommensurable alternatives. The scales represent five characteristics which can be evaluated from low to high: decision-making authority, participant stability, role clarity, shared goals, and sense of ownership.

The dynamics of collaboration scales can be used at the initiation of the decision-making process or at any point in the decision making when collaboration is at risk, including solution screening. The scales cover five characteristics that potentially affect both the speed and quality of the decision-making process. The speed of a decision refers to the ability to reach a decision quickly, without revisiting issues or elevating decisions to a higher level of authority. A quality decision is one that all participants accept and agree to support through decisions made in other processes.

The dynamics of collaboration scales were further refined and built on in Workshops 4 and 5.

Table C.4. Participants in Workshop 3

Title of Participant	Organization
Fish and Wildlife Biologist	U.S. Fish and Wildlife Service
Program Manager	Puget Sound Regional Council
Transportation Policy Manager	The Louis Berger Group
Technical Services Unit Head	NCDOT, Transportation Planning Branch
Environmental Program Manager	FHWA, Pennsylvania Division
Research and Financial Service Team Leader	FHWA

Workshops 4 and 5: Roles and Responsibilities

Workshops 4 and 5 focused on roles, responsibilities, and relationships of the formal decision-making partners and stakeholders. Formal decision makers are those agencies that either act as the lead agency or are required to take legal action in the decision-making process. Four formal decision makers meet these criteria: FHWA, the MPO, the state DOT, and the resource agencies with jurisdiction (e.g., USACE and state historic preservation offices, or SHPOs). Stakeholders are all groups that may be affected by a transportation plan, program, or project. Stakeholders can include government agencies that are not part of the formal decision-making partnership, formal advocacy groups, and informal groups that come together around transportation decision making (e.g., neighborhood associations).

These workshops provided key decision point–level information on how the roles, relationships, and responsibilities of stakeholders and formal decision-making partners within the transportation decision-making process affect collaboration. Both workshops relied on the dynamics of collaboration scales created in the solution screening workshop to frame collaboration and interactions between decision makers and between decision makers and stakeholders.

In Workshop 4 (formal decision makers) participants identified

- The interests of formal participants in each phase of decision making;
- The questions asked at each key decision point by the formal decision makers to support their interests; and
- The role each formal partner plays at each key decision point.

In developing this information, the workshop team assumed an ideal decision-making environment, in which partners are committed to participating in the process and have high decision-making authority, shared goals, and a sense of ownership over the process. These assumptions define an *ideal* decision-making environment. Removing any or all of these assumptions creates an *acceptable* decision-making environment: one in which the risks inherent to transportation decision making, such as delay and budget overruns, increase.

Since an ideal environment does not always exist, the consultant team facilitated a discussion around how roles and responsibilities change in an acceptable decision-making environment. The acceptable decision-making environment still allows the planning, programming, and project development processes to proceed, but it introduces increased risks to the processes. Without shared goals, participant stability, and a high level of decision-making authority, the processes are at risk of delay, redo loops, and the likelihood that decisions made in one phase cannot be carried forward into the next phase of decision making. These risks highlight why shared goals, participant stability, and high decision-making authority are important to the transportation decision-making process.

In Workshop 5 (stakeholders) participants identified

- The key decision points at which stakeholders should be engaged;
- Questions about stakeholder interests that partners should ask; and
- Questions partners should ask stakeholders to understand/gather information about their interests.

Because there are many ways to involve stakeholders, both formally and informally, the original information obtained in Workshop 5 was premised on the assumption of an informal stakeholder involvement process; under an informal approach to stakeholder involvement, there is no formal group or committee responsible for representing stakeholder views. Thus, the formal decision makers neither invite individual stakeholders to formally participate in the process nor grant stakeholders an official role in the decision-making process. Referring to the dynamics of collaboration scales, informal stakeholder involvement inherently has low participant stability, most likely lacks shared goals, and has little reason to collaborate.

Conversely, formal stakeholder involvement entails having an organized group of individuals invited to participate in the process by the formal decision-making partners; these participants are expected to represent community interests larger than their own. This group is managed by the legally constituted decision-making body (or a project team) and assigned an official role by the agency to advise on one or more issues or projects.

Although these two styles of stakeholder involvement were originally developed using the same dynamics of collaboration scales created in the solution screening workshop, it became clear in Workshop 5 that modifications and an additional scale were necessary to capture specific stakeholder dynamics of collaboration to support the scales developed to understand collaboration among the formal decision-making partners.

The stakeholder dynamics of collaboration scales maintained the participant stability scale, but replaced the shared goals scale with common interests, and the sense of ownership scale with level of commitment. In addition, workshop participants added a new scale: informed participants. This scale incorporates the notion that access to information and a willingness by the decision maker to provide information are key enablers of stakeholder involvement. Workshop 5 participants identified a lack of information as a major stumbling block for many in the community. This scale identifies an opportunity to enhance the relationship with stakeholders and to help them decide why a project is good for their community. In addition to creating scales tailored to collaboration with stakeholders, the participants identified at what point on those scales the formal and informal stakeholder involvement would lie. After defining the differences between the two forms of stakeholder involvement, the participants discussed the pros and cons of each type. The workshop participants identified both advantages to formal stakeholder involvement as well as disadvantages.

The team for Workshop 4 (formal decision makers) included representatives from FHWA, two MPOs, a state DOT, and a resource agency. Participants are listed in Table C.5. The participant from URS Corporation provided NEPA practitioner experience.

Workshop 5 was set up differently than the prior workshops to accommodate volunteer stakeholders; their insights were important to provide a full understanding of stakeholder interests, but for the most part these participants were not available for the full length of the workshop. To accommodate the stakeholder representatives, the workshop was

Table C.5. Participants in Workshop 4

Title of Participant	Organization
Fish and Wildlife Biologist	U.S. Fish and Wildlife Service
Senior Transportation Planner	Grand Valley Metropolitan Council
Manager, Environmental Planning and Analysis Group	URS Corporation
Deputy Executive Director, Programming and Operations	Chicago Metropolitan Agency for Planning
Administrator, Planning and Programming	Idaho Transportation Department
Division Administrator	FHWA, Arkansas

Table C.6. Practitioner Participants in Workshop 5

Title of Participant	Organization
Public Involvement Program Manager	Atlanta Regional Council
Chief, Bureau of Public Involvement	Kansas DOT
Division Administrator	FHWA, Nevada Division
Principal	Planning Communities

divided into two parts: from Monday through Wednesday public involvement practitioners detailed the key decision point information, and on Thursday and Friday volunteer stakeholders joined them to validate and complete the data. The participants representing the practitioner perspective are listed in Table C.6. Workshop participants representing stakeholders are listed in Table C.7.

This group was joined by an experienced NEPA practitioner from ICF International to include the SHPO perspective. Although SHPO is one of the formal decision makers, the design team was unsuccessful in identifying a workshop participant in this role.

Workshop 6: Data, Tools, and Technology

The focus of Workshop 6 was to validate the data identified to support collaborative decision making at each key decision point and to determine the type of tool or technology necessary to support these data and aid in decision making. For this purpose the consultant team identified the need for two different participant groups: (1) practitioners heavily involved in the use and development of tools that support the technical process, and (2) former workshop participants who could bring a strong understanding of the CDMF to this final workshop. Along with previous participants, four representatives from the FHWA Resource Center were invited for their knowledge of the tools and technologies in the transportation industry. The participants in Workshop 6 are listed in Table C.8.

Because this workshop focused on tools to help decision making, the consultant team also invited an expert in group decision making. This expert presented the analytical hierarchy process (AHP), a quantitative method for successful and collaborative group decision making. This presentation helped the workshop participants understand all the aspects to consider when making a decision in a group setting. AHP was considered throughout the workshop as a supporting tool for collaborative decision making.

Before the workshop, the consultant team developed the list of data that should be presented to decision makers at each key decision point. During the workshop, the participants validated this list, adding and removing items as appropriate. Then, the participants determined what types of tools or technologies would be appropriate to use at each key decision point, based on the data that would be presented and the questions the decision makers would be considering. Fifteen tools and/or technology types were identified: demographic tool, stakeholder engagement tool, commenting tool, public survey technique, database tool, financial planning tool, technical analysis tool, synthesis tool, infrastructure management tool, GIS interface, visualization tool, sketch planning tool, decision support tool, documentation tool, and information search tool.

The workshop participants also categorized each tool type as a gathering, analyzing, or communication tool; the assigned category could be different from key decision point to key decision point depending on the purpose of the tool at each key decision point. Gathering tools present decision makers with raw data. Analyzing tools take raw data that is unusable to decision makers and evaluate the data in a way that is helpful to decision makers. Communication tools convey information

Table C.7. Stakeholder Participants in Workshop 5

Title of Participant	Organization
Senior Attorney	Southern Environmental Law Center
Urban Designer	Public Interest Projects, Inc.
President	Coalition of Asheville Neighborhood
Former Citizens Transportation Advisory Committee members	Charlottesville-Albemarle MPO
Coordinator, Housing Options	Livable Communities, AARP
Transportation Planner	City of Cambridge, MA
Executive Director	Livable Streets Alliance

Table C.8. Practitioner Participants in Workshop 6

Title of Participant	Organization
Principal Planner	Puget Sound Regional Council
Public Involvement Program Manager	Atlanta Regional Council
Director	NCDOT, Office of Environmental Quality
Environmental Program Manager	FHWA, Pennsylvania Division
Senior Transportation Planner	Parsons Brinckerhoff, Inc.
Fish and Wildlife Biologist	U.S. Fish and Wildlife Service
Metropolitan Planning Specialist	FHWA, Resource Center
Technical Analyst	FHWA, Resource Center
Modeling Technical Specialist	FHWA, Resource Center
Technical Analyst	FHWA, Resource Center

from decision makers to stakeholders and the public to build trust and collaboration. The tool categories provide additional understanding of the need for particular types of tools and how individual tools may be used to meet several needs. The products of Workshop 6 were the individual tool types needed to support each key decision point as well as more detailed information about types of tools and their uses.

Phase 4

Communication of both the need for collaboration in transportation decision making and the potential for the CDMF to meet this need was identified as an essential aspect of the project from the outset. Because the CDMF represents a new way of engaging in transportation decision making, change management support may be needed for those agencies willing to undertake this shift in business process. The product of Phase 4 is a Final Communication Plan. It provides for the communication and outreach of the project to develop interest in the CDMF, to disseminate the research outcomes, and to provide a high-level change management plan to support its use.

Communications Plan

An initial communication plan was drafted early in the project to serve as the backbone of the team's communication and outreach efforts. This plan was used to identify, define, and record the target audiences, key messages, and other information needs to ensure that the final products and outreach materials developed were designed and distributed to meet the needs of all anticipated audiences.

The communication approach followed a specific development process comprising the following components: communication goals and objectives, communication strategies, target audiences, key messages, outreach tactics and scope, and implementation timeline.

Communication Goals and Objectives

The overall goal of the communication plan is to describe the various outreach materials and mechanisms used to increase awareness among the target audiences about the availability and utility of the research results and the decision-making framework.

By implementing the various components in this communication plan, the following objectives were met:

- Raise awareness and enthusiasm about the CDMF and related project presentations to be conducted at various meetings and conferences.
- Increase the willingness of the transportation community to integrate the Framework into the core production processes of the formal decision-making partners, MPOs, state DOTs, FHWA, and federal permit-issuing resource agencies.

Communication Strategies

The primary communication strategy for the project was presentation format. Attendance at various conferences, work groups, and meetings over the 2-year period provided strong opportunities for outreach. Written materials provided support for these presentations as well as general requests for information. Individual conversations with interested practitioners and consultants also helped inform a small section of the target audience. In Phase 5 of the project, the communication will shift to focus primarily on Internet-based outreach led by engagement in the TCAPP web tool, the Google project website, and the associated blog forum.

Target Audiences

The following groups were identified as representing the full potential audience for the CDMF:

- *Executives*. The senior leaders of state and local transportation agencies who are charged with developing, implementing, and guiding the transportation planning and decision-making processes.
- *Managers*. Midlevel leaders at state and local transportation organizations who are charged with day-to-day oversight or support for capacity improvement projects and who are in a decision-making role at their respective agencies.
- *Supervisors and staff*. The personnel at state and local transportation agencies charged with day-to-day implementation or support of decisions made by managers and executives.
- *Staff at MPOs, resource agencies, and community groups*. These groups often play key roles in the transportation planning and project development process and often are charged with making decisions concerning land use, environmental or community issues, and economic development.

Key Messages

The goal of this project is to increase the use of collaborative decision making within transportation planning and project development for projects to increase highway capacity. To meet this goal, all outreach for this project includes the following key messages:

- This Collaborative Decision-Making Framework is intended to help agencies go beyond incremental improvements in how they do business, to support a substantially better way to approach, develop, and manage complex highway capacity enhancement projects.
- This Collaborative Decision-Making Framework is not just a concept but is implementation guidance that can be used by any transportation agency to improve decision making at a single decision point, a specific phase of the decision-making process, or over the entire transportation decision-making process.

Outreach Tactics and Scope

Presentations to a wide variety of audiences provided the centerpiece of communication efforts. The goal of the presentations was to target the key audiences that must understand and endorse the Collaborative Decision-Making Framework before it can be implemented successfully. The presentation content includes the goals of the project, the intent of the larger group of Capacity program research that will enhance the project, an understanding of the information that the CDMF will make available, and demonstration of the capabilities of the CDMF web tool under construction. A full list of presentations through 2009 is provided in Table C.9.

In addition to these formal opportunities to engage large groups of professionals, there were many other interactions with practitioners and consultants on an individual basis that further disseminated the intent and products of this research. This form of communication was supported by written materials developed at various stages of the project to provide both the intent and the status of development.

Table C.9. CDMF Outreach Presentations

Date	Outreach Activity	Location	Target Audience	Presentation Highlights
June 25–28, 2007	Presented SHRP 2 project overview to AASHTO Standing Committee on Environment	Asheville, NC	Managers, supervisors, and staff	• Overview of SHRP 2 Capacity projects (C01–C08)
January 2008	Provided status report to IT Committee at Transportation Research Board (TRB) Annual Meeting	Washington, DC	Managers, supervisors, and staff	• Summary of the interesting technology supports identified during Phase 2 case studies
January 2008	Conducted TRB Annual Meeting session on Phase 2 case studies	Washington, DC	Managers, supervisors, and staff	• Three PowerPoint presentations: ○ Overview and status of C01 project with particular focus on Phase 2 case studies ○ Case study 1: Texas Kelly Parkway (GIS application) ○ Idaho Visioning: MetroQuest
March 2008	Presented C01 project to Massachusetts Highways	Boston, MA	Managers and staff	• General overview and status of project
May 12–15, 2008	Attended Strategic Management and Management and Productivity Committees' Midyear Workshop and Joint Meeting	Woods Hole, MA	Executives and managers	• Discussion on applicability of C01 Framework to strategic initiatives under discussion by the committees
May 29–30, 2008	Attended AASHTO Mid-Country CSS Peer Exchange	Indianapolis, IN	Managers and staff	• Discussion of CSS integration into the C01 Framework
June 2–3, 2008	Attended AASHTO CSS Peer Exchange	Reno, NV	Managers and staff	• Discussion of CSS integration into the C01 Framework
September 3, 2008	Facilitated discussion of barriers and presented case study examples at TRB Conference for Statewide and Metropolitan Transportation Planning	Atlanta, GA	Managers and staff	• Sharing of key points captured from case studies, including examples of ○ Stakeholder involvement ○ Resource agency involvement ○ Project champions ○ Collaboration ○ Integration with other plans
October 2008	Presented to the TCC and demonstrated the intended web-tool application for the CDMF	Irvine, CA	Executives and managers	• Demonstration of CDMF web-tool flexibility in addressing transportation challenges • Review of draft User's Guide for streamlining a bottleneck project, case studies and best practices related to integrated planning, and a brief overview of the diagnostic tool
January 11–15, 2009	Presented at TRB Annual Meeting poster session	Washington, DC	Executives, managers, and staff	• Introduction of CDMF web tool, including screenshots of wireframe site to demonstrate the tool's draft functionality

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Table C.9. CDMF Outreach Presentations (continued)

Date	Outreach Activity	Location	Target Audience	Presentation Highlights
April 20, 2009	Presented project progress to the TCC	Woods Hole, Mass.	Executives and managers	• Overview of new design features of the web tool • Summary of project updates to date, including web-tool development, user interviews, communication plan, and project next steps
July 20, 2009	Presented at TRB Summer Conference	Seattle, WA	Executives, managers, and staff	• Overview of C01 modification contract (web tool and integration of other Capacity program research)
October 22, 2009	Presented at Association of Metropolitan Planning Organizations (AMPO) Annual Conference	Savannah, GA	Managers and staff	• Illustration of stakeholder support in transportation decision making

When the project scope was expanded to include development of the web tool, the outreach focus shifted to an Internet-based format. A Google website for the project was launched in 2009 with the intent to initiate a blog forum as the web tool became available. The blog will be a part of further communication efforts in Phase 5 of the project.

Outreach Timeline

Over the 2-year period between 2007 and 2009, 13 presentations were developed and delivered to a variety of audiences.

Additional Outreach Activities

There have been several unique opportunities during the initial project period to communicate the goals and potential of the CDMF. These were not envisioned within the communication plan but have further expanded the engaged audience toward the launch of the web tool.

User Interviews as Focus Group Representatives

The inclusion of a web-based application to support the CDMF has presented new opportunities for engaging members of the target audience. In advance of the design and development of the web tool, individuals representing each of the formal transportation decision makers were interviewed to identify how they might use the CDMF and how they would best engage with this information. Again following the design and preliminary development, additional individuals were interviewed to respond to the tool and what the CDMF could provide for their use. These individuals not only informed the design but helped identify the needs of and ways to engage similar potential users.

TR News Article

During 2008, the SHRP 2 Capacity program manager and the C01 project principal investigator were invited to submit a feature article for *TR News,* January–February 2009. This article, The Collaborative Decision-Making Framework: Evolving Product of SHRP 2 Capacity Research, has stimulated interest on the topic of collaboration and provides an advance look at what the CDMF will provide.

Exhibits and Displays at Conferences

Beginning with the poster session at the 2009 TRB Annual Meeting, opportunities to provide written materials/displays at conferences and meetings have provided additional outreach for the project. Examples include the 2009 AMPO and AASHTO annual conferences.

Continued Communication and Outreach

In October 2009, the Capacity TCC identified the need to more closely align the CDMF with the ability to advance transportation projects. As a result of this identified need, the SHRP 2 Capacity program staff developed a two-page brief to become an aspect of every form of outreach used. This included the Google website, the web tool, and any presentation or publication developed within the project.

High-Level Change Management Approach

The significant case study and practitioner experience–based research conducted during Phases 1, 2, and 3 provide insights into the benefits of collaboration and detailed guidance on how collaboration can be integrated into transportation decision making. However, the primary product of this research, the TCAPP website, is only a tool. To realize the intended benefit from TCAPP, transportation agencies and their partners must establish relationships that support collaborative decision making.

State DOTs, MPOs, and their partners are at varying levels of readiness to evolve their decision making to the level of collaboration described in TCAPP. Some agencies have a history of collaboration with their partners and stakeholders; others have a more hands-off or even adversarial relationship.

Moving along this spectrum to improve the level of collaboration needs more than the "how to" information that TCAPP provides. It requires institutional and relationship-building support so that the staff and policy decision makers come to the table with the right perspective and attitude to collaborate.

The C01 Change Management Approach provides transportation agency executives and managers with an understanding of the importance of change management for supporting implementation of collaboration; it also serves as a basic primer for developing a change management plan tailored to their specific circumstances. The Change Management Approach includes a summary of the rationale and benefits for implementing collaboration from the national perspective, as well as suggestions for tailoring this national case for change to the individual implementing agencies. In addition, the approach describes a four-step change management planning process that agencies can use to identify, prioritize, and manage the changes needed to support implementation of collaboration among partners and stakeholders throughout transportation decision making.

APPENDIX D

Supporting Material for the Collaboration Assessment Component of the Web Tool

Criteria Statements

For each category of assessment, several statements allow users to evaluate the existing process or team dynamics on a five-point scale: strongly disagree, disagree, neutral, strongly agree, agree, not applicable. A full list of criteria statements is provided in Table D.1.

Strategy Example: Organizational Support

Organizational support is the level of commitment received from individual agencies as represented by the availability of resources and required support. This relates to the degree of buy-in from the agency for a collaborative process.

Potential Risks

Several risks can arise when there is not an adequate level of organizational support from one or more agencies participating on a project team. Foremost among these is the potential for agencies to not "buy in" to the results of the plan or project team's work, potentially creating future delays and redo loops. Additionally, there is a risk that the team may not be aware of information or perspectives that would be brought to the process by an agency that is not providing adequate support. This could result in a decision being made that is not the most preferable outcome, having been made without all the relevant information and all the affected agencies involved.

Questions to Consider

- Are partner agencies demonstrating collaborative behaviors?
- Is this a more recent development, or has this been ongoing since the inception of the project?
- Does this agency perceive a reason to join a collaboration partnership? If not, why do you think it would be beneficial from the agency's point of view to join a collaboration (what is in it for them)?
- What level within the organization is demonstrating a lack of willingness to collaborate—executive, management, or staff?
- Does this agency have significant time or financial resource constraints that limit its ability to participate in a collaborative partnership? What strategies can you use as their partner to help overcome these restraints (e.g., supporting additional resources or stretching the timeline for the commitment of resources)?

Things You Can Do

Lack of organizational support often leads to an underresourced project, indecision on the part of the organization's decision makers, and the appearance of disengagement on the part of the organization's representatives. Without true support, key decisions can be held up indefinitely, and the uncommitted agency can begin to have a negative effect on other partner agencies.

There are many reasons why an organization fails to appropriately support collaborative teams, which are listed below. Solutions to these common issues are provided in the following sections.

- The organization's leadership does not see the value of the team's products or processes.
- The organization has competing values and/or priorities.
- The organization is experiencing significant resource constraints.
- The organization is experiencing significant change.

Organizational Leadership

Many new teams are established with a great deal of fanfare. But over time, the purpose and value of a team's work can

Table D.1. Criteria Statements

Category	Criteria Statements
Process steps	• Team members rarely voice disagreement with the documented process. • The process steps are clearly stated/documented. • The process steps are logically arranged. • The process steps are necessary and important. • The process steps can be adapted to our needs without sacrificing quality and consistency. • The process steps are easy to understand.
Data and information	• Key decisions are heavily influenced by the data and information that is presented by team members. • Team members rarely voice dissatisfaction with the data and information they are provided. • The data and information are appropriate for the task and the available technology. • The data and information are current, reliable, and valid. • The data and information are logically organized. • The data and information are accessible. • The data and information are in a “ready-to-use” format.
Tools and technology	• Team members agree that they have been provided the right tools and technology. • Tools and technology that the teams receive are supportive of decision making. • Tools and technology that the teams receive are reliable, helpful, and/or effective. • Tools and technology that the teams receive are compatible with other systems and tools that the team members use. • Team members understand how to use the tools and technology that are provided. • Tools and technology are available to team members.
Organizational support	• The leadership of all the partner organizations see the value of the team’s products and processes. • Partner organizations see the team and its work as a high priority. • Partner organizations have the resources that are necessary to support the team. • Partner organizations have a relatively stable environment.
Decision-making authority	• The team members assigned to the team hold the appropriate authority level to make required decisions on behalf of their agency. • Individual team members have a clear understanding of their level of decision-making authority. • Team members’ agencies accept the decisions made on behalf of their organization. • Team members accept the decisions made by other team representatives.
Participant stability	• Appropriate team members have been assigned to the team. • Team members agree that the project goals are important or a priority. • Team members’ other obligations do not prevent them from remaining or participating on the team. • Organizational turnover among team members is low. • Internal conflict exists among team members. • Teams are productive and members want to be associated with project team outcomes.
Role clarity	• Team members’ roles and expectations are clearly defined. • Team members accept their roles and responsibilities. • Team members respect the roles and responsibilities of other team members. • Team members’ assigned roles align with their strengths, interests, or level of authority in their organization. • Team members believe that carrying out their role has an impact on team success.

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Table D.1. Criteria Statements (continued)

Category	Criteria Statements
Shared goals	• The initial requirements of the project are clearly stated. • The team members have changed over time. • The project requirements have changed over time. • The initial goals were mandated, rather than developed in a collaborative fashion. • Team members have different agendas and priorities.
Sense of ownership	• Team members understand and/or agree with the processes, goals, and outcomes of the project. • Team members feel like they are a part of the process, goals, and outcome. • Team members feel their work contributes to the achievement of the project goals and outcomes. • Team members are clear on their role in the project and what they need to do to contribute.
Communication	• Key messages are clearly articulated. • There is an appropriate amount of communication, so that key messages clearly stand out. • The means for communication are effective. • A sound communication strategy has been developed.
Stakeholder communication	• I am able to clearly articulate key messages with decision makers. • I am able to communicate the appropriate messages at the appropriate times and to the appropriate people. • I understand the process required to communicate my message. • I have ample opportunity to make my voice heard. • The input I provide has an influence on the decisions made by formal decision-making partners.
Stakeholder understanding	• I understand the decision-making process, the proposed plans, and the purpose of the plans. • I have access to the information I need to make informed choices. • I understand the process I can use to influence the decision-making process. • I understand my role in the decision-making process. • I understand the roles of others (other stakeholders, decision makers) in the decision-making process. • I receive feedback on the decision-making team's status and decisions made. • I understand how the decisions made will affect my special interest.
Stakeholder commitment	• I have a high level of individual commitment to the process and the outcomes of the decision-making process. • I am able to consistently participate in the process and represent my interest throughout the decision-making process. • There is a formal group available to support my needs during the decision-making process. • I have been able to engage with others of similar interest throughout the process. • I am able to identify, recognize, and accept interests of others and work from common interests.

easily get lost in the shuffle. This is particularly the case as organizational leaders change. Several steps can be taken to ensure continued visibility of the team and to highlight the team's accomplishments.

The first step is to ensure that a clear and relevant partnering agreement is in place. By having such an agreement, organizational support for the team is less susceptible to changes in leadership. A partnership agreement is based on the understanding that comprehensive organizational support is fundamental to success. This support can take many forms, including financial, personnel, and agency advocacy for the project.

A partnering agreement must clearly state the roles, responsibilities, and actions that all parties will follow while they pursue a common goal. Partnering agreements are more of a social contract than a legal contract, and they allow all parties to capture their commitments to each other. The "partners" may be from different levels within an agency or may be a combination of internal and external people. The partners often have diverse

skills and talent and different stakes in the outcome of the process. The partnering agreement must include the following elements:

- *Mutual goals and identification of results*. Clear, measurable, and relevant goals must be established to move the partnership forward. The establishment of mutual goals provides all partners a sense of direction and ensures that all of their efforts support each other.
- *Role clarification*. Identifying who does what and according to what standard is a vital part of ensuring that work efforts do not conflict. Role clarification identifies roles, responsibilities, and authority of each partner agency (or organization) as they engage in the decision-making process.
- *Action plan and timeline*. An action plan identifies the cost, schedule, and performance that the partners must adhere to in order to meet the project goals. It includes both a forecast of the resources that will be required and contingency plans should the resources not be available.
- *Information-sharing arrangement*. Collaborative and effective decision making requires frequent, accurate, and timely sharing of information. To ensure the effective flow of information, partners should specifically state the manner of sharing information (e.g., databases, e-mail, web portals), as well as the level of access each party will have to the information.
- *Skill resources*. Each agency or organization identifies the types of skills its representatives will provide to the effort and how it will coordinate the talents of its representatives.
- *Resources*. The partners share resources and actively seek any additional resources needed to enhance the outcome. This is essential to efficiently use resources and to ensure that agency partners are able to provide those resources and support.
- *Results evaluation*. The partners should evaluate and monitor the effectiveness of their working relationship as well as the results of their efforts.

It may be necessary to develop a comprehensive partnering agreement in phases. It may be necessary to sign an initial executive- or management-endorsed agreement related to common goals and clear results, roles, and overall resources before the details of action plans and evaluation can be worked out. However, a comprehensive partnering agreement includes all of the components.

Once the partnering agreement is in place, good communication is essential to maintaining organizational support for the partnership. This communication includes regularly reporting back to organizational leaders and stakeholders on the progress of the team, using the metrics and indicators laid out in the partnering agreement. To be effective, a progress report should present a well-rounded view of the partnership, what is and what is not working, and a specific set of corrective actions that need to be implemented by the team or its management to rectify any problems. Progress reports provide feedback to all levels (executive, management, and staff) that need to support collaboration. In addition to official status reports, however, it is essential to use other formal and informal opportunities to keep the broad range of internal and external participants engaged. Hallway, elevator, and cafeteria conversations are vital to keeping stakeholders involved. Formal communication planning is essential.

Competing Values and Priorities

All projects that occur within and between organizations exist within a broader system. Each day new projects begin or current projects are reprioritized. In addition, organizations constantly wrestle with changing values based on the demands of their environment. Therefore, while support for a project may begin with a great deal of enthusiasm, it is essential that the value of the project be constantly evaluated and communicated back to organizational leaders. This is particularly true when organizational leadership changes. There are several steps to ensuring consistent and clear communication about a project's value.

Development of a formal communication plan is helpful. In communication planning the first step is to assess the level of communication necessary to get the right messages to the right people. Start by constructing a two-column table with the names of stakeholders in the left column, and a list of specific messages that they will be looking for from the team. Next consider the best means for relaying these messages to the stakeholder. Will reports, e-mails, and memos suffice? Do more meetings need to be held so that people can discuss ideas? Is a system for efficiently cascading information down to team members from their superiors needed?

Also consider that within every social network there are both formal and informal communication networks. In general, informal networks tend to have a lot more influence on organizational leaders and stakeholders than formal communication does. For example, a collaborative team may formally send out dozens of e-mails stating the team's official position on a topic, without getting much reaction from the partner agencies. Conversely, the team may be able to identify one influential person who has a personal relationship with the leader of an agency and convince that individual to represent the team's point of view during a 30-minute lunch conversation. Improving collaboration means focusing on the alignment between the formal and informal communication networks between agencies. Collaborative teams must build a robust communication system that allows them to get the resource needs out to the institutions that can fulfill these needs.

Organizational Resource Constraints

It is difficult to find an organization today that is not being asked to do more with less. Because of this, it is important to recognize that resource constraints may be beyond the control of an organization, even though in spirit the organization's leaders may truly value the collaborative team's efforts. In these situations, the best strategy is to make a compelling case for why the team's project is of significant importance. As discussed above, organizational leaders must constantly reprioritize projects and the resources needed to support them. It is important to note that when it comes to finding the right catalyst to gain organizational support, each organization is different. The case for additional resources is most compelling to leaders when it includes strong reasons why it is important to the success of their individual agency or mission. In addition, it should include a realistic assessment on the goals and implementation schedule included in the partnering agreement. The approach for requesting additional resources may be formal or informal, depending on the individual agency. It is important to identify the most effective and appropriate approach for each individual agency when additional resources are required.

If addition resources are not available, but the partnership is supported by the agencies, the team will need to rescope the overall partnership agenda and/or the timeline for implementing the action plan.

Organizational Change

Just as funding shortfalls may be out of an organization's control, significant changes in the political, economic, social, or technological environment may also be beyond an organization's control. While team members cannot typically change these realities, they can minimize the impact of these changes. To do so requires that team members anticipate and evaluate the changes that are likely to occur within their respective organizations. Teams should periodically meet to review these potential changes and discuss the impact that they would like have on the project. Doing so allows the team to be less reactive to changes, and to spend time planning an appropriate response. To cope with the changing environment, teams must develop specific strategies. These strategies should consider how the project could be adapted to meet the changing environment, and the specific internal strengths and resources the team has to help it adapt.

Challenges

Support describes both tangible assets and intangible advocacy for a team and a project. Dealing with intangibles is always more difficult. While a team may see a stakeholder verbally championing a team, it is nearly impossible to determine how an individual truly feels about the team or the project. It is essential, therefore, that the team use multiple methods for gauging the true level of support. In general, deeds speak louder than words. Look for the tangible manifestations of support, which include funding, public statements of support (written or verbal), and personal involvement. If these do not exist, take the extra time to sit down regularly with organizational leaders to assess their views and support for the team and its project.

How the Decision Guide Can Help

The Decision Guide provides detailed information on the interests of each partner within the transportation decision-making process, as well as the roles of each partner at each decision point in the process. This information can help agencies and organizations understand exactly how they fit into the process, the relative level of effort required, and the big picture of how individual decisions made by the project team affect the entire process. It will also help each agency understand the interests and expected roles of all the agencies that will be part of a collaborative partnership. This basic, "walking in each other's shoes" approach can help establish the foundation for initial discussions on mutual goals and roles.

APPENDIX E

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This report (1) documented the work conducted under Phase 2; (2) presented the state of the practice in systemwide performance-based solutions screening processes and decision support tools used in transportation capacity planning; and (3) provided guidance for future work that supports the development of decision support tools. This report was largely based on earlier project reports and case studies. In addition to those materials, the following sources were used.

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Related SHRP 2 Research

- Performance Measurement Framework for Highway Capacity Decision Making (C02)
- Interactions Between Transportation Capacity, Economic Systems, and Land Use (C03)
- An Ecological Approach to Integrating Conservation and Highway Planning (C06)
- Linking Community Visioning and Highway Capacity Planning (C08)
- Incorporating Greenhouse Gas Emissions into the Collaborative Decision-Making Process (C09)
- Effect of Public–Private Partnerships and Nontraditional Procurement Processes on Highway Planning, Environmental Review, and Collaborative Decision Making (C12)
- Integrating Freight Considerations into Collaborative Decision Making for Additions to Highway Capacity (C15)
- Effect of Smart Growth Policies on Travel Demand (C16)
- Pilot Test of the TCAPP Collaborative Decision-Making Framework Including a Self-Assessment Methodology: Washington State's SR 509 Project (C18A)
- Long-Range Transportation Planning Process: Puget Sound TCAPP Pilot Test (C18B)
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- Expedited Planning and Environmental Review of Highway Projects (C19)
- Pilot Testing of the TCAPP Decision Guide and Related Capacity Products: Hoopstick Creek, South Carolina (C39A1)
- Pilot Testing of the TCAPP Decision Guide and Related Capacity Products: Charlottesville-Albemarle Metropolitan Planning Organization, Virginia (C39A2)
- Pilot Testing of the TCAPP Decision Guide and Related Capacity Products: Oregon Metro Greenhouse Gas Planning (C39A3)
- Pilot Testing of the TCAPP Decision Guide and Related Capacity Products: Southeast Portland, Oregon (C39A4)