# The Transportation Planning Process Key Issues

## A Briefing Book for Transportation Decisionmakers, Officials, and Staff

A Publication of the Transportation Planning Capacity Building Program
Federal Highway Administration
Federal Transit Administration

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# INTRODUCTION

Transportation helps shape an area's economic health and quality of life. Not only does the transportation system provide for the mobility of people and goods, it also influences patterns of growth and economic activity by providing access to land. The performance of the system affects public policy concerns like air quality, environmental resource consumption, social equity, land use, urban growth, economic development, safety, and security. Transportation planning recognizes the critical links between transportation and other societal goals. The planning process is more than merely listing highway and transit capital projects. It requires developing strategies for operating, managing, maintaining, and financing the area's transportation system in such a way as to advance the area's long-term goals.

This book provides government officials, transportation decisionmakers, planning board members, and transportation service providers with an overview of transportation planning. It contains a basic understanding of key concepts in statewide and metropolitan transportation planning, along with references for additional information. Part I discusses transportation planning and its relationship to decisionmaking. This section is general, and provides a broad introduction to the planning process. Part II presents short descriptions of important policy and planning topics. This section includes more technical information than Part I, but is not intended to provide details of each policy issue. This report is available electronically on the Transportation Planning Capacity Building website at **www.planning.dot.gov** and is updated periodically to include additional topics or information.

This book has been updated to reflect changes in legislation that affect statewide and metropolitan transportation planning requirements. It is an informational publication that replaces its predecessor, the 2004 "The Metropolitan Transportation Planning Process: Key Issues, A Briefing Notebook for Transportation Decisionmakers, Officials, and Staff" (Publication FHWA-EP-03-041 5/04).

Previous version of Briefing Notebook for Transportation Decisionmakers, Officials, and Staff

For additional information about any of the topics discussed in this book, contact your local Federal Highway Administration (FHWA) division or Federal Transit Administration (FTA) regional office. For information on how to reach FHWA or FTA staff, visit the FHWA and FTA websites at **www.fhwa.dot.gov** and **www.fta.dot.gov,** or the Transportation Planning Capacity Building website at **www.planning.dot.gov.**

# PART I: OVERVIEW OF TRANSPORTATION PLANNING

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

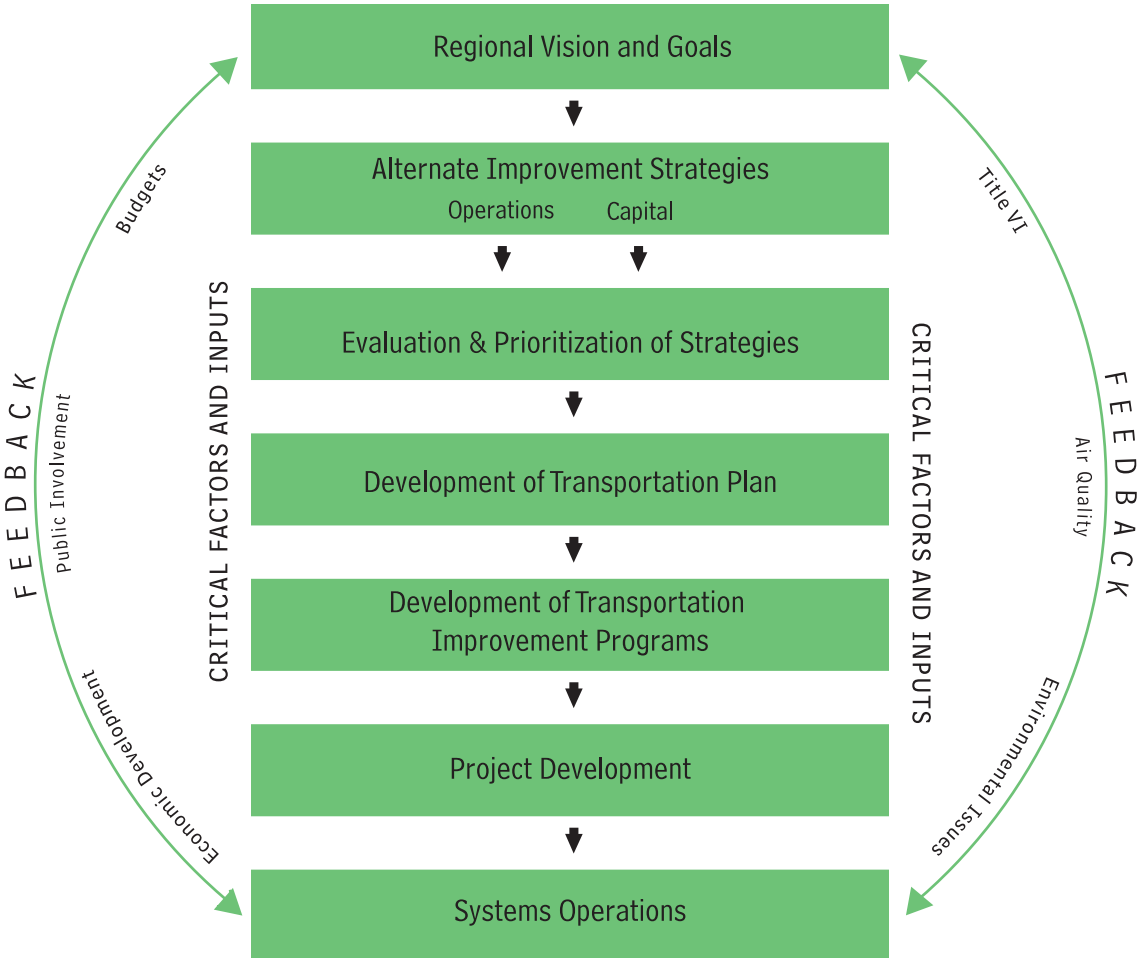


Figure 1: Transportation planning process

# What is the transportation planning process?

Transportation planning is a cooperative process designed to foster involvement by all users of the system, such as the business community, community groups, environmental organizations, the traveling public, freight operators, and the general public, through a proactive public participation process conducted by the Metropolitan Planning Organization (MPO), state Department of Transportation (state DOT), and transit operators.

**A METROPOLITAN PLANNING AREA** may include the urbanized area (UA), areas expected to become urbanized within the next 20 years, and additional areas determined by political boundaries (e.g., a county) or geographic boundaries (e.g., an air basin).

Figure 1 illustrates the transportation planning process.

Transportation planning includes a number of steps:

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

**URBANIZED AREA (UA):** an area that contains a city of 50,000 or more in population plus the incorporated surrounding areas meeting size or density criteria as defined by the U.S. Census Bureau.

## What is a Metropolitan Planning Organization and what are its typical functions?

A Metropolitan Planning Organization (MPO) is a transportation policy-making body made up of representatives from local government and transportation agencies with authority and responsibility in metropolitan planning areas. Federal legislation passed in the early 1970s required the formation of an MPO for any urbanized area (UA) with a population greater than 50,000. MPOs were created in order to ensure that existing and future expenditures for transportation projects and programs were based on a continuing, cooperative, and comprehensive (3-C) planning process. Federal

funding for transportation projects and programs is channeled through the MPO. Note that some MPOs are found within agencies such as Regional Planning Organizations (RPOs), Councils of Governments (COGs), and others.

There are five core functions of an MPO:

**Establish a setting:** Establish and manage a fair and impartial setting for effective regional decisionmaking in the metropolitan area.

**Identify and evaluate alternative transportation improvement options:** Use data and planning methods to generate and evaluate alternatives. Planning studies and evaluations are included in the Unified Planning Work Program or UPWP (see page 8).

**Prepare and maintain a Metropolitan Transportation Plan (MTP):** Develop and update a long-range transportation plan for the metropolitan area covering a planning horizon of at least twenty years that fosters (1) mobility and access for people and goods, (2) efficient system performance and preservation, and (3) good quality of life.

**Develop a Transportation Improvement Program (TIP):** Develop a short-range (four-year) program of transportation improvements based on the long-range transportation plan; the TIP should be designed to achieve the area's goals, using spending, regulating, operating, management, and financial tools.

**Involve the public:** Involve the general public and other affected constituencies in the four essential functions listed above.

In accordance with federal regulations, the MPO is required to carry out metropolitan transportation planning in cooperation with the state and with operators of publicly owned transit services. The MPO approves the metropolitan transportation plan. Both the governor and the MPO approve the TIP.

Most MPOs will not take the lead in implementing transportation projects, but will provide an overall coordination role in planning and programming funds for projects and operations. The MPO must involve local transportation providers in the planning process by including transit agencies, state and local highway departments, airport authorities, maritime operators, rail-freight operators, Amtrak, port operators, private providers of public transportation, and others within the MPO region.

From an organizational perspective, there is no required structure for an MPO; as a decisionmaking policy body, an MPO may be composed of:

- A policy or executive board
- Technical and citizen advisory committees
- A director and staff

MPO staff assists the MPO board by preparing documents, fostering interagency coordination, facilitating public input and feedback, and managing the planning

process. The MPO staff may also provide committees with technical assessments and evaluations of proposed transportation initiatives. The MPO staff may also engage consultants to generate needed data.

A technical advisory committee may then provide recommendations to the board on specific strategies or projects. An advisory committee may also provide technical analysis, specialized knowledge, and citizen input on specific issues. It is common for an MPO to have a Technical Advisory Committee and Citizen Advisory Committee, and to have subcommittees on specific issues such as environmental justice, bicycle issues, or travel demand modeling.

Those involved in metropolitan transportation planning should reach out to stakeholders to inform them of critical issues facing their regions and provide them with opportunities to contribute ideas and offer input. This is especially important in the early and middle stages of the process, while the plan and the TIP are being developed. Special attention should be paid to those groups that are underrepresented or have been underserved in terms of the expenditure of transportation dollars (see Part II section on Title VI/Environmental Justice).

**Air Quality Nonattainment Area (NAA):** A geographic region of the United States that the EPA has designated as not meeting the air quality standards.

## What are other responsibilities for some MPOs?

A metropolitan area's designation as an air quality nonattainment area (NAA) or maintenance area creates additional requirements for transportation planning. Transportation plans, programs, and projects must conform to the state's air quality plan, known as the State Implementation Plan (SIP). In nonattainment or maintenance areas for air quality, the MPO is responsible for coordinating transportation and air quality planning.

**Air Quality Maintenance Area:** A geographic region of the United States previously designated nonattainment pursuant to the CAA Amendments of 1990 and subsequently redesignated to attainment subject to the requirement to develop a maintenance plan under section 175A of the CAA, as amended.

Areas with populations greater than 200,000 are designated transportation management areas (TMAs). TMAs must have a congestion management process (CMP) that identifies actions and strategies to reduce congestion and increase mobility (see Part II section on CMP). In addition, TMAs have the ability to select Surface Transportation Program (STP) funded projects in consultation with the state; in other MPOs and rural areas the STP projects are selected by the state in cooperation with the MPO or local government.

In addition to meeting federal mandates, MPOs often have extra responsibilities under state law. For example, California's MPOs are responsible for allocating some non-federal transportation funds in their regions, while other states give MPOs a shared role in growth management and land use planning.

## What is a state DOT and what are its typical functions?

Each of the U.S. states, Puerto Rico, and the District of Columbia have an agency or department with official transportation planning, programming, and project implementation responsibility for that state or territory, referred to as the state DOT. In addition to transportation planning responsibilities, these agencies may have responsibility for the design, construction, operation, or maintenance of state facilities for multiple modes of transportation (including air, water, and surface transportation). State departments of transportation also work cooperatively with tolling authorities, ports, local agencies, and special districts that own, operate, or maintain different portions of the transportation network, or individual facilities.

Primary transportation planning functions of the state DOT:

**Prepare and Maintain a Long-Range Statewide Transportation Plan:** Develop and update a long-range transportation plan for the state. Plans vary from state to state and may be broad and policy-oriented, or may contain a specific list of projects.

**Develop a Statewide Transportation Improvement Program (STIP):** Develop a program of transportation projects based on the state's long-range transportation plan and designed to serve the state's goals, using spending, regulating, operating, management, and financial tools. For metropolitan areas, the STIP incorporates the TIP developed by the MPO.

**Involve the public:** Involve the general public and all of the other affected constituencies in the essential functions listed above.

## What are the relationships among the MPO, the state DOT, and other agencies involved in transportation planning and project implementation?

Transportation planning must be cooperative because no single agency has responsibility for the entire transportation system. For example, some roads that are part of the Interstate Highway System (IHS) are subject to certain standards and are usually maintained by a state DOT. Others are county arterials or city streets which are designed, operated, and maintained by counties or local municipalities. Transit systems are often built, operated, and maintained by a separate entity.

In metropolitan areas, the MPO is responsible for actively seeking the participation of all relevant agencies and stakeholders in the planning process; similarly, the state DOT is responsible for activities outside metropolitan areas. The MPO and

state DOT also work together. For example, a state DOT staff person may sit on the MPO board.

The state DOT follows special requirements to document its process for consulting with officials from local governments located outside the metropolitan area. This process is separate and distinct from the broad public involvement process and must be documented separately. It provides an opportunity for local officials to participate in the development of the long-range statewide transportation plan and the Statewide Transportation Improvement Program (STIP).

The federal government has a special government-to-government relationship with Indian Tribal governments that is affirmed in treaties, Supreme Court decisions, and executive orders. Federal agencies are required to consult with Indian Tribal Governments regarding policy and regulatory matters.

State DOTs consider the needs of Indian Tribal Governments when carrying out transportation planning, and consult with Indian Tribal Governments in development of the long-range statewide transportation plan and the Statewide Transportation Improvement Program.

MPOs also may consider the needs of, and consult with, Indian Tribal Governments in the development of long-range transportation plans and TIPs when the metropolitan planning area includes Indian Tribal Lands.

Outside of the statewide and metropolitan planning processes, state DOTs and MPOs may consult with Indian Tribal Governments when, for example, a project may affect Indian Tribal archeological resources. For information on FTA's Tribal Transit Program, see **www.fta.dot.gov/funding/grants/grants_financing_3553.html.**

For more information on Tribal planning, see **www.planning.dot.gov/tribal.asp.**

## What are key documents produced by the metropolitan and statewide planning processes?

As illustrated in Figure 2, there are five key documents produced by the transportation planning process:

| | Who Develops? | Who Approves? | Time Horizon | Content | Update Requirements |
|---|---|---|---|---|---|
| UPWP | MPO | MPO | 1 or 2 Years | Planning Studies and Tasks | Annually |
| MTP | MPO | MPO | 20 Years | Future Goals, Strategies, and Projects | Every 5 Years<br>4 years for nonattainment and manintenance areas |
| TIP | MPO | MPO/ Governor | 4 Years | Transportation Investments | Every 4 Years |
| LRSTP | State DOT | State DOT | 20 Years | Future Goals, Strategies, and Projects | Not Specified |
| STIP | State DOT | US DOT | 4 Years | Transportation Investments | Every 4 Years |

Figure 2: Key planning products

**The Unified Planning Work Program (UPWP):** The UPWP lists the transportation studies and tasks to be performed by the MPO staff or a member agency. Because the UPWP reflects local issues and strategic priorities, the contents of UPWPs differ from one metropolitan area to another.

The UPWP covers a one- to two-year period. It typically contains several elements:

- The planning tasks (e.g., data collection and analysis, public outreach, and preparation of the plan and TIP), the supporting studies, and the products that will result from these activities;
- All federally funded studies as well as all relevant state and local planning activities conducted without federal funds;

- Funding sources identified for each project;
- A schedule of activities; and
- The agency responsible for each task or study.

**The Metropolitan Transportation Plan (MTP) or Long-Range Transportation Plan (LRTP):** In metropolitan areas, the transportation plan is the statement of the ways the region plans to invest in the transportation system. Per the federal regulations, the plan shall "include both long-range and short-range program strategies/actions that lead to the development of an integrated intermodal transportation system that facilitates the efficient movement of people and goods."

The plan addresses, for example:

- Policies, strategies, and projects for the future;
- A systems level approach by considering roadways, transit, nonmotorized transportation, and intermodal connections;
- Projected demand for transportation services over 20 years;
- Regional land use, development, housing, and employment goals and plans;
- Cost estimates and reasonably available financial sources for operation, maintenance, and capital investments (see Part II section on Financial Planning and Programming); and
- Ways to preserve existing roads and facilities and make efficient use of the existing system.

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

MPOs should make special efforts to engage interested parties in the development of the plan. Finally, in cases where a metropolitan area is designated as a nonattainment or maintenance area, the plan must conform to the SIP for air quality (see Part II section on Air Quality).

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

**RURAL TRANSPORTATION:** Information and resources for rural transportation policy-makers, planners, and stakeholders is available from the National Association of Development Organizations (NADO) and the NADO Research Foundation at **www.ruraltransportation.org.**

Under federal law, the TIP:

- Covers a minimum four-year period of investment;
- Is updated at least every four years;
- Is realistic in terms of available funding and is not just a "wish list" of projects. This concept is known as fiscal constraint (see Part II for more information);
- Conforms with the SIP for air quality in nonattainment and maintenance areas;
- Is approved by the MPO and the governor; and
- Is incorporated directly, without change, into the Statewide Transportation Improvement Program (STIP).

**The State Planning and Research (SPR) Program** is similar to the UPWP in that it lists the transportation studies, research and tasks to be performed by the state DOT staff or its consultants. The SPR Program contains several elements:

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

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

The statewide plan also addresses:

- Policies and strategies, or future projects;
- Projected demand for transportation services over 20 or more years;
- A systems-level approach by considering roadways, transit, nonmotorized transportation, and intermodal connections;
- Statewide and regional land use, development, housing, natural environmental resource and employment goals and plans;
- Cost estimates and reasonably available financial sources for operation, maintenance, and capital investments (see Part II section on Financial Planning); and
- Ways to preserve existing roads and facilities and make efficient use of the existing system.

**Statewide Transportation Improvement Program (STIP):** The STIP is similar to the TIP in that it identifies statewide priorities for transportation projects and must be fiscally constrained. Through an established process, the state DOT solicits or identifies projects from rural, small urban, and urbanized areas of the state. Projects are selected for inclusion in the STIP based on adopted procedures and criteria. As noted above, TIPs that have been developed by MPOs must be incorporated directly, without change, into the STIP.

Under federal law and regulation, the STIP:

- Must be fiscally constrained and may include a financial plan.
- Must be approved by FHWA and FTA, along with an overall determination that planning requirements are being met. STIP approval must be granted before projects can proceed from the planning stage to the implementation stage.

## How is federal transportation funding provided to states and metropolitan areas?

The funding for transportation plans and projects comes from a variety of sources including the federal government, state governments, special authorities, public or private tolls, local assessment districts, local government general fund contributions (such as local property and sales taxes) and impact fees.

However, federal funding—transferred to the state and later distributed to metropolitan areas—is typically the primary funding source for major plans and projects. (See appendix for a description of important federally aided transportation programs.) Federal transportation funding is made available through the Federal Highway Trust Fund and is supplemented by general funds. It is important to remember that most FHWA sources of funding are administered by the state DOTs. The state DOT then allocates the money to urban and rural areas based on state and local priorities and needs. Most transit funds for urban areas are sent directly from the FTA to the transit operator. Transit funds for rural areas are administered by the state DOT.

Federal funds are made available through a specific process:

- **Authorizing Legislation:** Congress enacts legislation that establishes or continues the existing operation of a federal program or agency, including the amount of money it anticipates to be available to spend or grant to states, MPOs, and transit operators. Congress generally reauthorizes federal surface transportation programs over multiple years. The amount authorized, however, is not always the amount that ends up actually being available to spend.
- **Appropriations:** Each year, Congress decides on the federal budget for the next fiscal year. As a result of the appropriation process, the amount appropriated to

a federal program is often less than the amount authorized for a given year and is the actual amount available to federal agencies to spend or grant.

- **Apportionment:** The distribution of program funds among states and metropolitan areas (for most transit funds) using a formula provided in law is called an apportionment. An apportionment is usually made on the first day of the federal fiscal year (October 1) for which the funds are authorized. At that time, the funds are available for obligation (spending) by a state, in accordance with an approved STIP. In many cases, the state is the designated recipient for federal transportation funds; in some cases, transit operators are the recipient.
- **Determining Eligibility:** Only certain projects and activities are eligible to receive federal transportation funding. Criteria depend on the funding source.
- **Match:** Most federal transportation programs require a non-federal match. State or local governments must contribute some portion of the project cost. This matching level is established by legislation. For many programs, the amount the state or local governments have to contribute is 20 percent of the capital cost for most highway and transit projects.

## How is federal funding used?

There are many federal-aid transportation programs that support transportation activities in states and metropolitan areas, each having different requirements and program characteristics. These programs are not "cash up front" programs; rather, eligible expenditures are reimbursed. That is, even though the authorized amounts are "distributed" to the states, no cash is actually disbursed at this point. Instead, states are notified that they have federal funds available for their use. Projects are approved and work is started; then the federal government reimburses the states, MPOs, and transit operators for costs as they are incurred, reimbursing up to the limit of the federal share.

The federal government holds funding recipients accountable for complying with all applicable federal laws. When local governments directly oversee a federally funded project, the state DOTs are responsible for monitoring local governments' compliance with federal laws.

## What are flexible funds?

One important provision in federal transportation legislation allows for the use of certain federal-aid highway program and federal transit program funds for either highway or transit projects. This is referred to as flexible funding. "Flexible funding" provisions were a radical departure from traditional transportation policy; federal

transit, highway, and safety programs formerly had very strict eligibility requirements, and funds could not be transferred between the programs. The ability to transfer funds (with certain restrictions) between highway and transit programs was introduced so metropolitan areas could apply federal transportation funds to their highest priority transportation projects.

The funds are not actually transferred from one bank account to another; rather, FHWA and FTA confirm program-eligible expenditures and reimburse accordingly. In urbanized areas (UAs) with populations greater than 200,000, MPOs are responsible for considering "flexing" funds to meet local planning priorities. In areas with populations less than 200,000, flexible funding decisions are made jointly by the MPO and the state DOT, and the state DOT makes the flexible funding decisions in rural areas. Flexible funding is most commonly used for FHWA's Surface Transportation Program (STP) and Congestion Mitigation and Air Quality Improvement (CMAQ) program, and FTA's Urbanized Area Formula Funds, though flexing in other programs is possible.

# PART II: MAJOR POLICY AND PLANNING ISSUES

Although the transportation planning process is concerned primarily with the issues facing a particular metropolitan area or state, there are many issues common to all parts of the country. This section addresses these common transportation topics, and provides details on several important issues facing MPOs and states engaged in transportation planning.

Each section provides a basic understanding of the topic, discusses the role of the MPO and state DOT as appropriate, answers questions about how the topic is addressed in the transportation planning process, and provides resources for additional information.


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# Air Quality

## What is the relationship between transportation and air quality?

Usage of the transportation system is an influential factor in a region's air quality. Therefore, the estimated emission of pollutants from motor vehicles is a key consideration in transportation planning. Regions that have nonattainment or maintenance air quality status are required to ensure that emissions from transportation investments are consistent, or in conformity with, levels set forth in state air quality plans. Therefore, state DOTs and MPOs need to have a clear understanding of the air quality-related transportation planning requirements.

## What are the major sources of air pollution?

The air quality of an area is affected by the emission of pollutants and their interaction with sunlight, topography, and weather patterns. Pollutants are emitted by motor vehicle operation and a variety of other activities, including manufacturing, use of petroleum-based products like gasoline, and even small business activities such as dry cleaning.

Sources of air pollutant emissions can be classified as stationary, area, or mobile sources, as shown in Figure 3.

**Stationary sources** include relatively large, fixed facilities such as power plants, chemical process industries, and petroleum refineries.

**Area sources** are small, stationary, non-transportation sources that collectively contribute to air pollution such as dry cleaners, gas stations, landfills, wastewater treatment plants, and others.

**Mobile sources** include on-road vehicles such as cars, trucks, and buses; and off-road sources such as trains, ships, airplanes, boats, lawnmowers, and construction equipment.

The key transportation-related pollutants are ozone and its precursors hydrocarbons (HC) and nitrogen oxides (NOx), carbon monoxides (CO), and particulates (PM-10 or PM-2.5, particles that are smaller than 10 micros or 2.5 micron, respectively). These pollutants emanate in part from on-road mobile sources and cannot exceed certain specified levels in a given region.

The Clean Air Act (CAA), Title 23 and Title 49 U.S.C. requires that transportation and air quality planning be integrated in areas designated by the U.S. Environmental Protection Agency (EPA) as air quality nonattainment or maintenance areas. In fact,

| Current | | Future* |
|---|---|---|
| 125 Tons | Stationary Sources | 100 Tons |
| 50 Tons | Area Sources | 30 Tons |
| 150 Tons | On-Road Mobile Sources | 100 Tons |
| 100 Tons | Off-Road Mobile Sources | 50 Tons |
| 425 Tons | → | 280 Tons |

Total Reduction: 145 Tons

* Emissions reductions targets developed by a state environmental agency

Figure 3: All sources of pollution can be looked at for ways to reduce emissions and improve air quality

in nonattainment and maintenance areas, federal funding and approval for transportation projects is only available if transportation activities are consistent with air quality goals through the transportation conformity process. The transportation conformity process includes a number of requirements that MPOs must meet (see section below on transportation conformity).

The CAA requires that each state environmental agency develop a plan called a State Implementation Plan (SIP). The SIP shows how the state will implement measures designed to improve air quality enough to meet National Ambient Air Quality Standards (NAAQS) for each type of air pollutant, according to the schedules

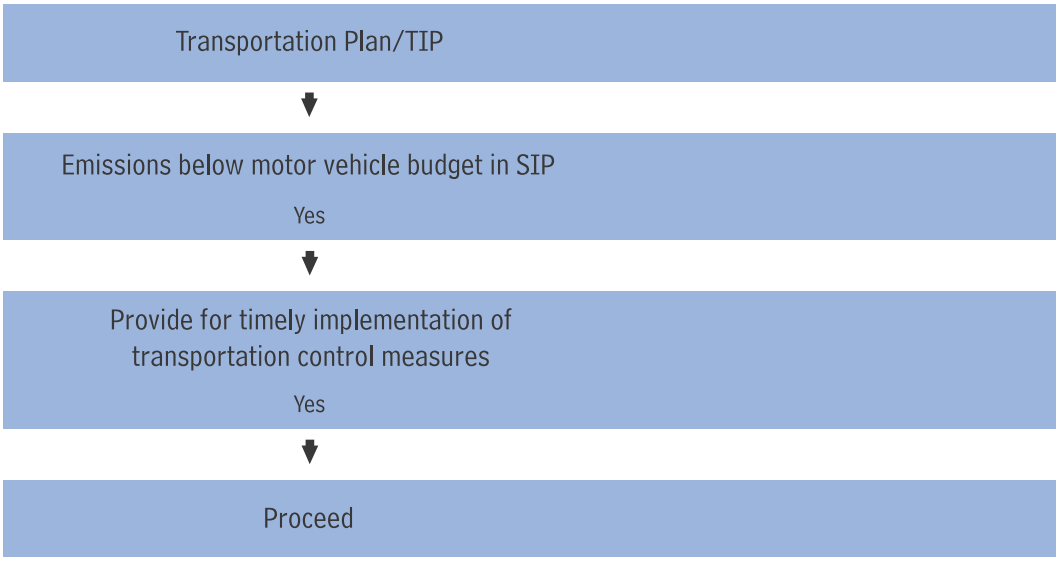


Figure 4: Transportation conformity process

included in the CAA. Pollutants are usually measured in parts per million (PPM) of ambient air, and standards vary by type of pollutant.

For each source category (stationary, area, or mobile), the SIP assigns emission reduction targets of the pollutant. For on-road mobile sources, the emission reduction target is further refined into a motor vehicle emissions "budget"—emissions limits for motor vehicle emissions sources.

Vehicle emissions reductions programs (e.g., the use of reformulated gasoline or implementation of Inspection and Maintenance [I/M] programs), changing how we travel (e.g., ride sharing or use of transit), or transportation projects that reduce congestion (e.g., signal synchronization programs) can all help areas meet emission reduction targets for on-road mobile sources. MPOs should be actively involved with the state in setting the motor vehicle emissions budgets. Transportation officials need to educate themselves about the options and trade-offs available to them, so they can balance the need for transportation investment with the need to achieve healthful air.

Motor vehicle emissions budgets can be revised. However, doing so requires revising the SIP, which can be a complicated and lengthy process. MPOs should participate in the SIP revision process if it is undertaken.

## What is the role of the MPO in air quality planning?

"Nonattainment" areas (NAA) are geographic areas that do not meet the federal air quality standards, and maintenance areas are areas that formerly violated but currently meet the federal air quality standards. If no violations of air quality standards have been found, the area is considered to be in compliance or attainment with federal air quality standards.

An area can be designated "nonattainment" for one pollutant and in attainment for another. Transportation conformity is required for all ozone, carbon monoxide, nitrogen dioxide, and particulate matter nonattainment or maintenance areas.

The Clean Air Act (CAA) of 1990 identifies the actions states and MPOs must take to reduce emissions from on-road mobile sources in nonattainment or maintenance areas.

The challenge for MPOs in nonattainment or maintenance areas is to decide on a mix of transit and highway investments that, combined with measures such as Inspection and Maintenance (I/M) programs or reformulated gasoline, will keep emissions within the allowable limits for emissions from motor vehicles.

**Inspection and Maintenance Programs:** State programs that require vehicles to be inspected and repaired to comply with specific Clean Air Act requirements.

**Reformulated gasoline:** Gasoline blended to burn more completely and evaporate less easily. Fewer volatile organic compounds (VOCs) are released into the air, thus reducing ozone.

According to the CAA, transportation plans, TIPs, and projects cannot:

- Create new violations of the National Ambient Air Quality Standards (NAAQS);
- Increase the frequency or severity of existing violations of the standards; or
- Delay attainment of the standards.

MPOs are encouraged to participate in air quality planning and to identify transportation strategies that will help reduce emissions from on-road mobile sources of pollution.

Though not required, many MPOs have developed public education and communications campaigns about the connection between transportation and air quality; these encourage the public to make travel choices that will benefit air quality.

## What is transportation conformity and how does it relate to the NAAQS?

The transportation conformity process, as illustrated in Figure 4, is a way to ensure that transportation plans and programs meet air quality goals in order to be eligible for federal funding and approval. Whenever a metropolitan transportation plan or TIP is amended or updated, the MPO must comply with the conformity requirements.

## What is a conformity determination and who is responsible?

**Transportation Control Measures (TCMs):** Transportation strategies that affect traffic patterns or reduce vehicle use to reduce air pollutant emissions. These may include high-occupancy vehicle (HOV) lanes, provision of bicycle facilities, ridesharing, telecommuting, etc. Such actions may be included in a SIP if needed to demonstrate attainment of the NAAQS.

Transportation conformity on transportation plans and TIPs is demonstrated when projected regional emissions for the plan and TIP do not exceed the region's motor vehicle emissions budgets. A conformity determination is a finding by the MPO policy board, and subsequently by FHWA and FTA, that the transportation plan and TIP meet the conformity requirements. While the MPO is ultimately responsible for making sure a conformity determination is made, the conformity process depends on federal, state, and local transportation and air quality agencies working together to meet the transportation conformity requirements.

If transportation control measures (TCMs) are included in an approved SIP, the MPO must provide an assurance that TCMs are being implemented on schedule each time it updates its plan and TIP conformity. Those TCMs must be programmed for timely implementation in the TIP.

A necessary part of the transportation and air quality planning process is consulting with other involved agencies on critical issues and providing opportunities for public participation. MPOs must inform the public that they are going to make a conformity determination, make all relevant documents reasonably available, and give adequate time to review the documents and supporting materials.

## What plans, programs, and projects are subject to transportation conformity requirements?

The MPO's long-range transportation plan and TIP must meet the conformity requirements. This includes all projects that are expected to be funded or that will require an approval by FHWA/FTA at any point during the life of the plan or TIP.

Also, any regionally significant projects (as defined by the conformity rule), even those that are not federally funded or approved, must be included in the regional emissions analysis of the transportation plan and TIP. Regionally significant projects include, at a minimum, all principal arterial highways and all fixed-guideway transit facilities.

Finally, certain projects in carbon monoxide and particulates nonattainment and maintenance areas must be assessed for expected localized concentrations ("hot spots") of carbon monoxide and particulates and for comparison to the natural ambient air quality standards.

**REGIONALLY SIGNIFICANT PROJECTS:** Regionally significant projects serve regional transportation needs such as access to and from the major activity centers in the region, and would normally be included in the modeling of a metropolitan area's transportation network. These projects include, at a minimum, all principal arterial highways and all fixed-guideway transit facilities.

## How frequently must a transportation conformity determination be made and what happens if the MPO cannot make a conformity determination on time?

A conformity determination must be made on the transportation plan and TIP at least once every four years. Each time the MPO updates or amends its transportation plan or its TIP (except for administrative modifications), a conformity determination is required. A conformity determination is also required not more than 24 months after a SIP or a SIP revision is approved or found adequate by EPA.

## What happens if the MPO cannot make a conformity determination on time?

If an MPO cannot make a conformity determination according to applicable deadlines, it will have a grace period of 12 months after the deadline is missed before conformity will lapse. During the grace period transportation projects from the previously conforming plan and TIP may continue to be eligible for funding. However, no changes may be made to those documents without re-establishing conformity. If conformity has not been re-established after the 12 month grace period, the transportation conformity status for the area goes into "lapse." During a conformity lapse, FTA and FHWA funds can only be spent on exempt projects, such as safety projects and certain public transportation projects, TCMs from an approved SIP, and project phases that were authorized by FHWA and FTA prior to the lapse.

**Conformity in Non-Metropolitan Areas:** A number of non-metropolitan areas are also being included in the urban area designation or being designated by themselves. Generally, MPOs and the state DOT work cooperatively on the regional emissions analysis in areas that are included in an urban area designation. Isolated rural areas often lack professional air quality and transportation planning staff and may rely on the expertise of state DOT staff in addressing conformity issues.

## What funding is available for air quality improvement programs and projects?

Many types of federal-aid funding may be used to improve air quality. One type of funding, the Congestion Mitigation and Air Quality Improvement(CMAQ) program funds, are designated specifically for this purpose. Under the CMAQ program, state DOTs receive funding based on the severity of pollution and their population in ozone and carbon monoxide nonattainment or maintenance areas though all states receive some funding. State DOTs and MPOs can use CMAQ funds for transportation projects that reduce emissions in nonattainment and maintenance areas.

## What types of projects are funded by the CMAQ program?

CMAQ programs fund transportation projects that reduce emissions of ozone precursors, carbon monoxide, and particulate matter. Many projects also help to reduce congestion, which is another key goal of the program. Typical projects include support for transit, traffic flow improvements (including high-occupancy vehicle [HOV] lanes, intelligent transportation systems [ITS], and signal timing), shared ride and carpooling services, and diesel engine retrofits.

## Who decides which projects receive CMAQ funding?

Decisions must be coordinated through the MPO planning process, and are made collaboratively by the state DOT and MPO subject to federal eligibility guidelines. These guidelines are quite flexible, in order to promote innovation.

## Additional sources of information:

For basic information about transportation conformity, see **www.fhwa.dot.gov/environment/conform.htm**

For FHWA's Transportation Conformity Reference Guide, see **www.fhwa.dot.gov/environment/conformity**

For a basic explanation of CMAQ, policy guidance, and brochures about the CMAQ program, see **www.fhwa.dot.gov/environment/cmaqpgs**

For consumer-oriented tips from the U.S. Department of Energy on energy efficiency and renewable energy, see **www.eere.energy.gov/cleancities**

# Congestion Management Process (CMP)

## What is the CMP?

The congestion management process (CMP) is a way of systematically considering congestion-related issues using a set of technical tools, and basing evaluations on a discrete set of locally determined performance measures. A CMP provides for the systematic review of performance of multimodal transportation systems in larger metropolitan areas and identification of strategies to address congestion through the use of "management" strategies focused on both the use and operation of facilities and services.

## What are the requirements for the CMP?

A CMP is required in metropolitan areas with a population greater than 200,000, or Transportation Management Areas (TMAs), as well as in urbanized areas that have requested designation as a TMA. The CMP is intended to address congestion through a process that provides for effective management and operations (M&O), based on cooperatively developed travel demand reduction and operational management strategies. Even if a metropolitan area is not a TMA or in nonattainment status, the CMP represents good practice in monitoring, assessing, and resolving congestion issues in any MPO. The CMP establishes a rigorous method of identifying and evaluating transportation improvement strategies, including both operations and capital projects.

## How is the CMP valuable to the MPO?

A well-designed CMP should help the MPO to:

- Develop alternative strategies to mitigate congestion;
- Determine the cause of congestion;
- Identify congested locations;
- Evaluate the potential of different strategies;
- Evaluate the impacts of previously implemented strategies; and
- Propose alternative strategies that best address the causes and impacts of congestion.

## Benefits of the CMP

The congestion management process helps MPOs and partner agencies achieve regional operations performance objectives, and can deliver a number of collateral

benefits as well. By addressing congestion through a comprehensive process, the CMP provides a framework for responding to congestion and other operational issues in a consistent, coordinated fashion.

The CMP enables MPOs and their operating agency partners to measure performance, manage data, and analyze alternative strategies in a systematic manner. The CMP also enables MPOs to base congestion management strategies on defined objectives; this process allows regions to focus on the most congested areas and achieve maximum benefit by targeting their investments.

## How does Transportation Demand Management (TDM) relate to the CMP?

Transportation Demand Management (TDM) is any action or set of actions designed to influence the intensity, timing, and distribution of transportation demand, in order to reduce traffic congestion or enhance mobility. Such actions can include offering commuters alternative transportation modes or services, providing incentives to travel on these modes or at non-congested hours, providing opportunities to link or "chain" trips together, and incorporating growth management or traffic impact policies into local development decisions.

TDM strategies are part of the toolbox of actions available to transportation planners for solving transportation problems. As part of the congestion management process, TDM actions are among the strategies that can reduce congestion or enhance mobility.

## Additional sources of information:

For more in the relationship between the congestion management process and planning, see **http://plan4operations.dot.gov/congestion.htm**

# Financial Planning and Programming

## What are the sources of transportation funds?

Transportation funds are generated from a number of sources, including income tax, sales tax, tolls, bonds, and state, local, and federal excise taxes on various fuels, state infrastructure banks (SIBs), and credit assistance sources. Each state decides which mix of funds is best suited to carry out particular projects.

Federal funds are authorized by Congress for the U.S. Department of Transportation (DOT), which allocates funds into various programs before redirecting those funds to the states. Some primary examples of these programs include the Surface Transportation Program (STP) (which includes enhancement and safety funds), the Federal Lands Highway Program and the Congestion Mitigation and Air Quality Improvement (CMAQ) Program. FTA oversees the allocation of federal transit funds, which generally fall into two major categories: capital grants for transit operators that are apportioned to areas by national formula, and transit capital investment grants that are awarded on a "discretionary" basis, as determined by DOT on the basis of a series of evaluation criteria. Each of these programs has specific eligibility requirements, although there is quite a bit of flexibility in legislation that allows funds to be shifted among some programs, or expands eligibility requirements (see Part I for more information).

Federal legislation also provides formula funds to support planning studies and report preparation for the transportation planning process through FHWA's State Planning and Research Funds (SPR) and Metropolitan Planning Funds (PL), and through FTA's Section 5305. These planning funds generally make up a large portion of the state or MPO budget for conducting necessary studies and for developing transportation plans, STIPs, TIPs and other planning documents.

## What is financial planning?

Financial planning takes a long-range look at how transportation investments are funded, and at the possible sources of funds. State DOTs, MPOs, and public transportation operators must consider funding needs over both the 20-year period of the long-range transportation plan and the 4-year period of TIPs and STIPs. In the LRSTP and the MTP, state DOTs may and MPOs must develop a financial plan that identifies funding sources for needed investments, and demonstrates the reasonably reliable means to maintain and operate the existing federally funded transportation system.

## What is financial programming?

Financial programming is different from financial planning because programming involves identifying fund sources and implementation timing for specific projects in the Statewide Transportation Improvement Program (STIP) and metropolitan Transportation Improvement Program (TIP), which must cover a period of at least four years and be updated at least every four years. Programming also includes notifying FHWA and FTA of the sources of the funds that will likely be used to support each individual transportation project.

## How does financial planning support preparation of transportation plans?

"**Fiscal Contraint:** A demonstration of sufficient funds (federal, state, local, and private) to implement proposed transportation system improvements, as well as to operate and maintain the entire system, through the comparison of revenues and costs." Source: *Overview Of Current Practices In Revenue Forecasting And Cost Estimation For Transportation Plans And Programs.*

The metropolitan transportation plan, which has a 20-year planning horizon, must include a financial plan that estimates how much funding will be needed to implement recommended improvements, as well as operate and maintain the system as a whole, over the life of the plan. This includes information on how the MPO reasonably expects to fund the projects included in the plan, including anticipated revenues from FHWA and FTA, state government, regional or local sources, the private sector, and user charges. The metropolitan transportation plan must demonstrate that there is a balance between the expected revenue sources for transportation investments and the estimated costs of the projects and programs described in the plan. In other words, a metropolitan plan must be fiscally (or financially) constrained.

The long-range statewide plan, under federal requirements, may be a "strategic plan that may or may not contain a listing of recommended projects"; a financial plan is optional. The long-range statewide transportation plan may include some or all of the financial elements commonly found in a typical metropolitan transportation financial plan (as the state DOT finds appropriate or necessary.) It does not need to demonstrate fiscal constraint.

## How do state DOTs, MPOs and public transportation operators know how much money is going to be available?

**Proposed funding sources** must be "reasonably" expected to be available. For example, if voters approved a sales tax increase three times in a row, anticipated funding from a future vote may be reasonable.

Federal surface transportation legislation requires that the MPO, the state DOT, and the public transit agency cooperatively develop revenue forecasts. These forecasts help agencies determine how much funding is likely to be available for transportation projects in their respective areas. Forecasts are based on trends from existing and potential funding sources such as the gas tax or bond measures.

A financial plan could assume that the amount of available federal funding will remain constant over the first five years of the plan, and then escalate at a rate equal to inflation or the Consumer Price Index (CPI). It could also assume that state gasoline taxes dedicated to transportation will be increased every five years by a certain amount based on past trends. Further, the transportation plan might assume

a new revenue source, such as a local sales tax within an MPO region; in such a case, the MPO must demonstrate that there is reason to believe such a new source will be available, and should identify strategies it can use to help achieve that goal.

Regardless of how financial assumptions and forecasts are developed, all forecasts in the financial plan must be shown in "year of expenditure" dollars based on reasonable inflation factors. In addition, the outer years of the financial plan may consist of ranges for both revenues and total project costs. As always, the high and low end of the ranges must be based on reasonable assumptions.

## How are funds programmed?

Each state must submit a STIP to FHWA and FTA for review and approval at least every four years for review and approval. The STIP includes all the projects planned for implementation with the funds expected from FHWA and FTA for a four-year period, as well as all regionally significant projects which require action by FHWA or FTA or that are located in a nonattainment or maintenance area, regardless of the funding source. The STIP also includes each MPO's TIP, and all of the projects included in the first four years of that TIP. Both the STIP and the TIP must be fiscally constrained.

## Programming a project for funding in the STIP

- Through an established process, the state solicits or identifies projects from rural, small urban, and urbanized areas of the state.
- The state selects projects for inclusion in the STIP based on adopted procedures and criteria.
- The STIP must be fiscally constrained; however, a financial plan is optional.
- The FHWA/FTA must approve the STIP before STIP projects can proceed to implementation.
- Amendments to the TIP can be common given the frequent changes in engineering practices, environmental issues, contracting issues, project readiness, and other factors that can require adjustments to project schedules and budgets.

## Additional sources of information:

For a handy overview of the FHWA's activities, including a guide to the agency's programs, core business units, and service business units, see **www.fhwa.dot.gov/programs.html**

**Amendments and Administrative Modifications:**
There are many factors that can require adjustments in transportation project schedules and budgets, such as changes in engineering practices, environmental issues, contracting issues, and project readiness. Thus, it is common to make revisions to the STIP or TIP; these revisions can include amendments or administrative modifications.

If an MPO wants to amend a project in its TIP, this will also necessitate amendment of the STIP. A major revision is an "amendment," while a minor revision is an "administrative modification." Amendments require public review and comment, demonstration of fiscal constraint (except for long-range statewide transportation plans), and a conformity determination (for metropolitan transportation plans and TIPs in non-attainment and maintenance areas)." Administrative modifications allow minor changes without such actions.

For useful links and information about all of FTA's funding programs and activities, see **www.fta.dot.gov/funding**

For a complete list of federally aided transportation programs, see **www.fhwa.dot.gov/federalaid/projects.cfm**

For a complete list of FHWA discretionary programs, see **www.fhwa.dot.gov/discretionary/proginfo.cfm**

For FHWA and FTA flexible funding guidance, see **www.fhwa.dot.gov/hep/flexfund.htm**

# Freight Movement

## What is the role of freight movement in transportation?

The movement of freight is an important part of a fully functioning transportation system. The efficient movement of freight within and through a region is critically important to industry, retail, agriculture, international trade, and terminal operators. Metropolitan areas (especially ports), with their air cargo airports, intermodal freight yards, large trucking terminals, and shipyards, are especially affected by freight movement issues.

Examples of intermodal freight projects include bridge replacements, road widening, port and rail access improvements, terminal facility enhancements, grade separations for highway and rail, and providing connections to air cargo and new infrastructure.

## What is the role of the MPO and the state DOT in freight transportation planning?

The state DOT and the MPO are responsible for making sure that freight movement is considered in the transportation planning process. Federal legislation calls for the statewide and metropolitan planning processes to include reasonable opportunity for the public and interested parties, including specifically "freight shippers" and "providers of freight transportation services," to participate in the development of plans and programs.

Many state DOTs and MPOs have systematically incorporated freight movement issues into their planning activities, for example by:

- Defining those elements of a metropolitan area's transportation system that are critical for efficient movement of freight.
- Identifying ways to measure system performance in terms of freight movement.
- Developing freight-oriented data collection and modeling to identify problems and potential solutions.
- Creating freight movement advisory committees to identify important bottlenecks in the freight network.

## What funding is available for freight planning and project implementation?

State DOTs and MPOs can use planning funds for freight planning, and can dedicate funds for specific project implementation. Funding of specific freight projects must

meet federal eligibility requirements for the specific funding source used. Projects that provide improved access to terminals or ports can be included in the federally funded transportation improvement program.

In those cases where freight investment projects can directly bring about reductions in pollutant emissions, Congestion Mitigation and Air Quality Improvement (CMAQ) program funds can also be used to support those projects.

## What are some freight-transport tactics that transportation decisionmakers might consider?

- Truck restrictions (such as peak period bans, route diversions, noise ordinances, and hazardous materials route restrictions)
- Road design and construction (such as improved entry/exit ramps and merges, and capacity or safety improvements)
- Road pricing (such as peak period permits, freeway permits, and peak period tolls)
- Fleet management (such as automatic vehicle location/routing, voluntary off-peak operations, and driver training and management)
- Traffic engineering (such as lane design restrictions, wider lanes, variable message signs, and speed restrictions)
- Shipper/receiver actions (such as voluntary and mandatory off-peak operations)
- Incident management (such as automated detection and site and area surveillance/communications)
- Inspection/enforcement (such as automated surveillance, urban truck inspections/enforcement)
- Information management (such as highway advisory radio, traffic information)

## Additional sources of information:

For FHWA's guide to freight planning, including guidelines, case studies, and a manual, see **www.fhwa.dot.gov/freightplanning**

For a guide to financing freight transportation improvements, see **www.ops.fhwa.dot.gov/freight/freight_analysis/financing.htm**

# Land Use and Transportation

## What is the relationship between land use and transportation?

Transportation's purpose is moving people and goods from one place to another, but transportation systems also affect community character, the natural and human environment, and economic development patterns. A transportation system can improve the economy, shape development patterns, and influence quality of life and the natural environment.

Land use and transportation are symbiotic: development density and location influence regional travel patterns, and, in turn, the degree of access provided by the transportation system can influence land use and development trends. Urban or community design can facilitate alternative travel modes. For example, a connected system of streets with higher residential densities and a mix of land uses can facilitate travel by foot, bicycle, and public transportation, in addition to automobile. Conversely, dispersed land development patterns may facilitate vehicular travel and reduce the viability of other travel modes.

## What is the role of the state DOT and the MPO in land use and transportation?

The state DOT and MPO role and level of involvement in land use decisionmaking varies according to state and local legislation and policies. However, state DOTs and MPOs are responsible for consultation with state and local agencies responsible for land use management; comparing transportation planning efforts with land use plans, maps and inventories; and using current land use estimates and assumptions when updating planning products.

The metropolitan and statewide transportation planning processes are designed to promote consistency between transportation improvements and state and local planned growth and economic development patterns.

## What are the requirements for considering land use and economic development in the transportation planning process?

Updates to long-range statewide and metropolitan transportation plans must be reviewed for validity and consistency with current and forecasted transportation and land use conditions and trends. The transportation plan updates should be based on the latest available estimates and assumptions for population, land use and development, travel, employment, congestion, and economic activity. And, to promote the highest level of consistency between land use and transportation plans, it is advisable for the planning staff responsible for that planning to hold meetings and share information on a continuing basis.

Activities intended to stimulate economic development can affect the transportation network, and, in turn, the transportation network can affect economic development. Transportation decisionmakers can ensure the continued economic vitality of the region, state, and nation by appropriately planning for the many different uses of the transportation system, such as freight movement.

Policymakers should ask what effects proposed investments would have on economic development and on future transportation needs:

- Can the transportation system accommodate the increased growth that proposed development might bring?
- How can transportation funding support economic growth while balancing other transportation priorities?

## What are some innovative approaches for better integrating land use and transportation?

Increasing recognition of the importance of integrating land use and transportation has led to the development of new approaches in planning. Two of the many possibilities include context sensitive solutions (CSS) and Transit-Oriented Development (TOD).

## What are context sensitive solutions (CSS)?

CSS is an approach that considers the total context within which a transportation improvement project will exist. A CSS approach requires that transportation planning take a broad view and consider the interactions between transportation systems and facilities, and tailor them to local area human and natural environments. The goal is to develop solutions that are acceptable to a variety of parties, relevant to their needs and perspectives—consistent with the "context" of the setting. CSS is a collaborative, interdisciplinary approach that involves all stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic, and environmental resources, while maintaining safety and mobility.

## What are Transit-Oriented Development and joint development?

**Transit-Oriented Development (TOD)** is defined as compact, mixed-use development near transit facilities and high-quality walking environments, typically leveraging transit infrastructure to promote economic development. By enhancing the attractiveness of transportation alternatives, TOD boosts transit ridership and reduces traffic congestion, while creating a sense of community and place.

**Joint Development** is a project-specific application of TOD, taking place on, above, or adjacent to transit agency property. It involves the common use of property for transit and non-transit, typically private sector commercial, purposes. Typical joint develop-

ment arrangements are ground leases and operation-cost sharing, usually occurring at transit stations or terminals surrounded by a mix of office, commercial, and institutional land uses. To be eligible for federal funding, joint development projects must be related physically or functionally to public transportation, and must dedicate a fair share of the commercially derived revenue for public transportation.

Both TOD and joint development projects may be planned, designed, and implemented by local government, transit operators, Metropolitan Planning Organizations, and states.

## What is the role of the MPO in Transit-Oriented Development and joint development?

All joint development and transit-oriented development projects with components involving federal funds must have those components approved by the MPO for inclusion in the metropolitan transportation plan and the fiscally constrained TIP and STIP. MPOs can play lead roles in developing and promoting transit-supportive land use policies, as well as disseminating information on these policies to the public and private sector. In addition, a growing number of MPOs have a TOD expert on staff and have policies and programs that support these projects.

## Additional sources of information:

For FHWA's Planning Tools for Linking Land Use and Transportation, see **www.fhwa.dot.gov/planning/ppasg.htm**

"Transit-Oriented Development: State of the Practice, and Future Benefits; Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects" provides a comprehensive assessment of the state of the practice and the benefits of transit-oriented development (TOD) and joint development throughout the United States. TCRP H-27 TRB's Transit Cooperative Research Program (TCRP) Report 102 see **onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_102.pdf**

For FTA's overview of the TCRP study, "Transit-Oriented Development: State of the Practice, and Future Benefits; Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects," see **www.fta.dot.gov/planning/programs/planning_environment_6932.html**

For "lessons learned" and successful practices in Transit-oriented Development, see **www.fta.dot.gov/documents/TOD_Lessons_Learned_12_21.pdf**

For information on how FTA grantees may use FTA financial assistance for joint development activities that incorporate private investment or enhance economic development, see **www.fta.dot.gov/planning/programs/planning_environment_6935.html**

# Performance Measures

## What are performance measures?

Performance measures demonstrate how well the transportation system is doing its job of meeting public goals and expectations of the transportation network. Some methods used to measure performance include tracking average speeds and crash rates. Many states and metropolitan areas monitor how close they are to achieving specific goals, such as accessibility to key regional population, employment, cultural, and recreational centers, the mobility of disadvantaged populations, levels of air quality, and the health of the economy, by using performance measures.

Measuring performance is a way to gauge the impacts of the decisionmaking process on the transportation system. Performance measures aim to answer questions about whether the performance of the transportation system (or economy, air quality, etc.) is getting better or worse over time; and whether transportation investments are correlated or linked to stated goals and outcomes.

Examples of performance measures include:

- Accessibility: Percent population within "x" minutes of "y" percent of employment sites; whether special populations such as the elderly are able to use transportation; whether transportation services provide access for underserved populations to employment sites; also, whether services are ADA compliant.
- Mobility: Average travel time from origin to destination; change in average travel time for specific origin-destination points; average trip length; percentage of trips per mode (known as mode split); time lost to congestion; transfer time between modes; percent on-time transit performance.
- Economic development: Jobs created and new housing starts in an area as a result of new transportation facilities; new businesses opening along major routes; percent of region's unemployed who cite lack of transportation as principal barrier to employment; economic cost of time lost to congestion.
- Quality of life: Environmental and resource consumption; tons of pollution generated; fuel consumption per vehicle mile traveled; decrease in wetlands; changes in air quality, land use, etc.
- Safety: Number of crash incidents or economic costs of crashes.

## What is the role of the state DOT and MPO in defining and using performance measures?

Through the statewide and metropolitan transportation planning process, the state DOT and the MPO, respectively, can each take a leadership role in creating performance measures that provide information critical to regional and local decisionmakers. This can begin through interaction with stakeholders and the public for the purpose of identifying vision(s) of the community for its future, followed by translation of those visions into goals and measurable objectives. Then, performance measures are developed to use in tracking progress toward attainment of those goals.

Because performance measures strongly influence the goals and objectives of the planning process, their development and ongoing support can become part of ongoing planning activities. Development of transportation system performance measures should be coordinated with and informed by the public involvement program.

## Additional sources of information:

For *A Guidebook for Performance-Based Transportation Planning,* NCHRP Report 446. Transportation Research Board: Washington, D.C., 2000
see **www.trb.org/TRBNet/ProjectDisplay.asp?ProjectID=901**

For Transportation Research Board's *Conference Proceedings #36, Performance Measures to Improve Transportation Systems,* 2004
see **onlinepubs.trb.org/onlinepubs/conf/CP36.pdf**

For Transportation Research Board's *Transportation Research Circular E-C073 – Performance Measure to Improve Transportation Planning Practice, 2005*
see **onlinepubs.trb.org/onlinepubs/circulars/ec073.pdf**

# Planning and Environment Linkages

## Why link transportation planning to environmental processes?

State and local agencies can achieve significant benefits by incorporating environmental and community values into transportation decisions early in planning and carrying these considerations through project development and delivery. Benefits include:

- *Relationship-building:* By enhancing inter-agency participation and coordination efforts and procedures, transportation planning agencies can establish more positive working relationships with resource agencies and the public.
- *Process efficiencies:* Improvements to inter-agency relationships may help to resolve differences on key issues as transportation programs and projects move from planning to design and implementation. Conducting some analysis at the planning stage can reduce duplication of work, leading to reductions in costs and time requirements, thus moving through the project development process faster and with fewer issues.
- *On-the-ground outcomes:* When transportation agencies conduct planning activities equipped with information about resource considerations and in coordination with resource agencies and the public, they are better able to

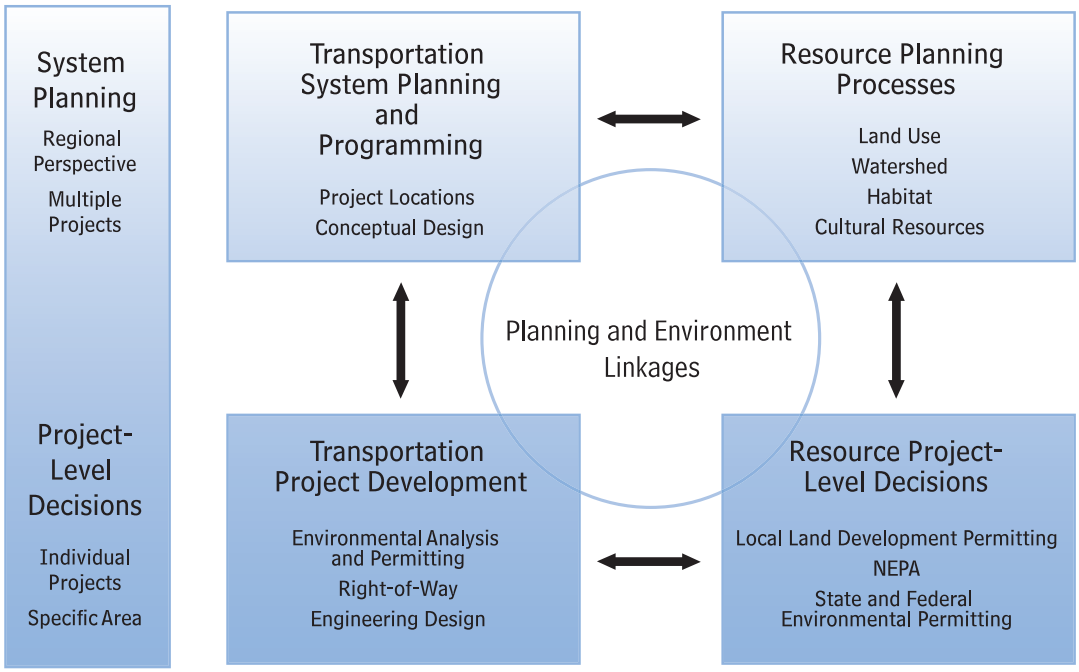


Figure 5: Planning and environmental linkages in decisionmaking processes are depicted by the arrows showing the relationship between transportation planning and environment planning, as well as the relationship between systems planning and project level decisions.

conceive transportation programs and projects that effectively serve the community's transportation needs. This can reduce negative impacts, and incorporates more effective environmental stewardship.

The first type concerns comparing transportation plans with natural and cultural resource information. For these comparisons, state DOTs and MPOs are to consult with state and local agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation. In addition, state DOTs must consult with tribal agencies. Consultations are to consist of the following, as appropriate:

- Comparison of transportation plans with state conservation plans or maps, if available; and
- Comparison of transportation plans to inventories of natural or historic resources, if available.

The second type of required consultation concerns mitigation activities. Federal law mandates that long-range transportation plans must include a discussion of types of potential environmental mitigation activities and potential areas to carry out these activities, including activities that may have the greatest potential to restore and maintain the environmental functions affected by the plan. This discussion is to be developed in consultation with federal, state, and tribal wildlife, land management, and regulatory agencies.

**Sustainability and Transportation:**

The concept of sustainability is accommodating the needs of the present population without compromising the ability of future generations to meet their own needs. As applied to the transportation sector, planning for sustainability can incorporate a variety of strategies to conserve natural resources (including use of clean fuels), encourage modes other than single-occupant vehicles, and promote travel reduction strategies.

Current trends in transportation contribute to unsustainable conditions, including greenhouse gas emissions, energy insecurity, congestion, and ecological impacts. Although widespread uncertainty exists about how to address the goal of a sustainable transportation system, transportation officials and stakeholders are now recognizing that their decisions have long-term implications and impacts and are working on how to prepare metropolitan and statewide transportation plans and programs accordingly. Attaining a sustainable transportation system will require action by the public sector, private companies, and individual citizens.

## How is NEPA related to the transportation planning process?

The NEPA process is designed to promote environmentally sound transportation decisions and cannot be used as a justification for decisions already made. Therefore, a coordinated approach between planning and project development contributes to the selection of transportation investments that reflect community needs, have benefited from an active public involvement process and are sensitive to the environment. The first stages of the NEPA process—development of project purpose and need—should build upon the transportation needs identified during planning and will be the basis for the final selection of an alternative for design and construction.

Another direct link between NEPA and transportation planning is the requirement that a project be included in a conforming plan and TIP before it can be advanced; a major change in the project scope and design as it evolves during the NEPA process triggers a conformity and plan reassessment. In addition, other information gathered during the planning process can inform the project development studies required under NEPA. Data collection related to environmental features, analysis of projected transportation system usage, and attendant impacts on environmental quality can provide important information to the NEPA process.

## How are transportation planning studies integrated into environmental and NEPA analysis?

FHWA and FTA must be able to stand behind the overall soundness and credibility of analysis conducted and decisions made during the transportation planning process if these decisions are incorporated into a NEPA document, directly or by reference. Transportation planning processes and their products are greatly improved when implemented through a comprehensive, cooperative, and continuous approach — the "3-C planning principles." The results of transportation studies or planning results should be: based on transportation planning factors established by federal law; reflected by a credible and clearly articulated planning rationale; founded in reliable data; and developed through planning processes that meet FHWA and FTA statutory and regulatory requirements.

At a minimum, a robust scoping and early coordination process (which explains to federal and state environmental, regulatory, and resource agencies and the public the information and analysis used to develop the planning products, how the purpose and need was developed and refined, and how the design concept and scope were determined) plays a critical role in leading to informed transportation decisions by FHWA and FTA on the suitability of transportation planning information, analysis, documents, and decisions for use in the NEPA process. Planning analysis needs to be up-to-date and should adequately support improvements in statewide and/or metropolitan long-range plans. Results from the planning process must be documented in a form that can be appended to the NEPA document or incorporated by reference to

materials that are readily available, and a clear connection between the decisions made in planning and those to be made during NEPA and project development must be explained to the public and other participants involved in scoping.

### What is NEPA and how does it apply to the transportation project development process?

The National Environmental Policy Act of 1969 (NEPA) established a national policy to promote the protection of the environment in the actions and programs of federal agencies.
The FHWA and FTA act as lead federal agencies, and are responsible for implementing the NEPA process and working with state and local project sponsors during transportation project development. The FHWA and FTA NEPA process is designed to assist transportation officials in making project decisions that balance engineering and transportation needs with the consideration of social, economic, and environmental factors. This process allows for involvement and input from the public, interest groups, resource agencies, and local governments. The FHWA and FTA NEPA process is used as an "umbrella" for compliance with over 40 environmental laws, regulations, and executive orders and provides an integrated approach to addressing impacts to the human and natural environment from transportation projects.

### What NEPA documentation is required?

A good decision based on an understanding of environmental impacts is the objective of the NEPA process and a thorough analysis of these impacts as presented in the NEPA document is essential in meeting that objective. NEPA documentation serves several purposes: to disclose the analysis of benefits and impacts to the human and natural environment; to get input from the public and other stakeholders on the proposed project and the environmental consequences; and to inform the final decision.

Different types of transportation projects will have varying degrees of complexity and potential to affect the environment. Under NEPA, the required environmental document depends on the degree of impact. FHWA and FTA, in coordination with the project sponsor, prepare one or more of the following documents for a proposed project:

- Notice of Intent (NOI) – a notice that an environmental impact statement (EIS) will be prepared and considered.
- Categorical Exclusions (CE) – apply to projects that do not have a significant impact on the human and natural environment.
- Environmental Assessment (EA) – prepared for projects where it is not clearly known if there will be significant environmental impacts. If the analysis in the EA indicates the proposed project will have significant environmental impacts, an EIS is prepared.
- Finding of No Significant Impact (FONSI) – if there is not a significant impact, this conclusion is documented in a separate decision document, the FONSI.

- Environmental Impact Statement (EIS) – prepared for projects that have a significant impact on the human and natural environment. Draft EIS (DEIS) and Final EIS (FEIS) documents, with input from the public, provide a full description of the proposed project, the existing environment, and the analysis of the beneficial and adverse impacts of all reasonable alternatives.
- Record of Decision (ROD) – presents the selected transportation decision analyzed in an EIS, the basis for that decision, and the environmental commitments, if any, to mitigate project impacts to the human and natural environment.

Regardless of the type of NEPA document prepared, final selection or approval of a proposed project alternative by FHWA and FTA allows the project to be eligible for federal funding of subsequent project activities such as final design, right-of-way acquisition, and construction.

## Additional sources of information:

FHWA's website on Planning and Environment Linkages offers a wealth of information developed and compiled by the FHWA and its partners to assist in strengthening planning and environment linkages.
See **www.environment.fhwa.dot.gov/integ/index.asp#benefits**

NEPA is dedicated to the open exchange of knowledge, information, and ideas concerning NEPA and other environmental issues. The site allows anyone interested in NEPA and related topics to contribute thoughts and ideas in an open forum.
See **nepa.fhwa.dot.gov/ReNepa/ReNepa.nsf/home**

The FHWA provides information on environmental streamlining — the term for a new cooperative approach to implementing transportation projects that brings together timely delivery and the protection and enhancement of the environment. It was first enacted into legislation for highway and transit projects with the Transportation Equity Act for the 21st Century (TEA-21).
See **www.environment.fhwa.dot.gov/strmlng**

The FTA provides links to laws, regulations, and guidance affecting environmental analysis and review of public transportation projects.
See **www.fta.dot.gov/planning/planning_environment_5222.html**

# Public Involvement

## What is the role of public involvement in developing transportation policies, programs, and projects?

Public involvement is integral to good transportation planning. Without meaningful public participation, there is a risk of making poor decisions, or decisions that have unintended negative consequences. With it, it is possible to make a lasting contribution to an area's quality of life. Public involvement is more than an agency requirement and more than a means of fulfilling a statutory obligation. Meaningful public participation is central to good decisionmaking.

The fundamental objective of public involvement programs is to ensure that the concerns and issues of everyone with a stake in transportation decisions are identified and addressed in the development of the policies, programs, and projects being proposed in their communities.

## Who is the public?

The public includes anyone who resides, has an interest in, or does business in a given area potentially affected by transportation decisions. This includes both individuals and organized groups. It is also important to provide opportunities for the participation of all private and public providers of transportation services, including, but not limited to, the trucking and rail freight industries, rail passenger industry, taxicab operators, and all transit and paratransit service operators. Finally, those persons traditionally underserved by existing transportation systems, such as low-income or minority households (see section on Title VI/Environmental Justice) and the elderly, should be encouraged to participate in the transportation decisionmaking process.

**PARATRANSIT:**
A variety of smaller, often flexibly scheduled and routed transportation services using low-capacity vehicles, such as vans, which operate within normal urban transit corridors or rural areas. These services usually serve the needs of people that standard mass transit services would serve with difficulty, or not at all. Often, the patrons include the elderly and people with disabilities.

Federal, state, and local agencies with an interest in transportation issues play a particularly important role in the development of transportation projects. Many of those agencies have a statutory responsibility to review environmental documents or issue permits for transportation projects. FHWA and FTA encourage MPOs and state DOTs to aggressively pursue improved communication and collaboration with these partners, beginning early in the transportation planning process, to identify and address their concerns.

## What is the role of the MPO in implementing public involvement processes?

The MPO is responsible for actively involving all affected parties in an open, cooperative, and collaborative process that provides meaningful opportunities to influence transportation decisions. Transportation has a profound influence on the

lives of people. Decisionmakers must consider fully the social, economic, and environmental consequences of their actions, and assure the public that transportation programs support adopted land use plans and community values.

MPOs must develop and document, in consultation with interested parties, a participation plan that details strategies for incorporating visualization techniques, using electronic media, holding public meetings, and responding to public input, among other things.

## What is the role of the state Department of Transportation in the public participation process?

Similar to the role of MPOs in metropolitan areas, the state must have a documented process for engaging the public with the transportation planning process outside of metropolitan areas. The state DOT also should coordinate with MPOs for state projects within metropolitan areas.

## What are the indicators of an effective public participation process?

A well-informed public can contribute meaningful input to transportation decisions through a broad array of involvement opportunities at all stages of decisionmaking. Useful elements in planning for effective public involvement are:

- Clearly defined purpose and objectives for initiating a public dialogue on transportation issues;
- Specific identification of the affected public and other stakeholder groups with respect to the plans and programs under development;
- Identification of techniques for engaging the public in the process;
- Notification procedures that effectively target affected groups;
- Methods and measures for evaluating the effectiveness of the public involvement program;
- Education and assistance techniques, which result in an accurate and full public understanding of transportation issues;
- Follow-through by the MPO demonstrating that decisionmakers seriously considered public input; and
- Solicitation of feedback from the public and stakeholders on the effectiveness of the public involvement process.

## Additional sources of information:

The FHWA explores many transportation issues of great concern to the public, and provides more information to MPOs seeking guidance on involving the public. See **www.fhwa.dot.gov/environment/pubinv2.htm**

*Public Involvement Techniques for Transportation Decision-making*, FHWA and FTA, 1996, Publication No. FHWA-PD-96-031.

The FTA funds innovative demonstration projects through its Public Transportation Participation Pilot (PTP) Program. See **www.fta.dot.gov/planning/programs/planning_environment_5925.html**

For the Transportation Research Board's Public Involvement Committee website, see **www.trbpi.com**

For more TPCB Technical Public Involvement Resources, see **www.planning.dot.gov/technical.asp#pub**

For TPCB Peer program reports on current practices and issues in public involvement, see **www.planning.dot.gov/peer.asp#pi**

# Safety

## What makes safety an important factor in transportation planning?

Over the past three decades, transportation fatality rates have declined in relationship to system usage, due in large part to safer cars, tougher police enforcement, and increasing use of seat belts, air bags, and child safety seats. However, in many accident categories, the actual number of crashes has increased because more people are using the transportation system. In addition, there are large economic costs associated with crashes, incurred both by those involved and by other travelers affected by the traffic delay caused by crashes. Maintaining high performance in transportation safety requires seamless coordination of activities and funding among multiple partners and a transportation planning process that can coordinate and direct funding toward the highest safety priorities.

## What are the roles of the MPO and state DOT in transportation safety?

Transportation planning takes safety considerations into account by identifying the most effective strategies for reducing crashes. This identification process may include analyzing crash data to determine the emphasis to be given to critical focus areas. Several types of focus areas have been identified, known as the 'four Es' of transportation safety: engineering, enforcement, education, and emergency services. The crash data might help identify which focus areas should receive funding priority for improving safety in the region. Crash data can also identify high-accident locations to be given high priority for improvements. Many MPOs also participate in safety campaigns that educate the public on good safety practices.

Another key role of MPO and state DOT planners is to coordinate any planned safety-related transportation improvements with their safety partners, including those responsible for the state's Strategic Highway Safety Plan, the state Governor's Office of Highway Safety, law enforcement agencies, and emergency service providers. Input from these partners can improve the safety elements of planning processes and ensure strong collaboration.

Finally, many state DOTs and local transportation agencies have developed safety management systems that monitor accident locations in their jurisdictions over time. The MPO can participate in data collection for these systems or coordinate the development of a regional safety management system.

State DOTs are required, after consultation with public and private safety stakeholders, to develop and implement a Strategic Highway Safety Plan (SHSP). The purpose of an SHSP is to identify critical highway safety problems and opportunities within the state. The SHSP provides a comprehensive framework for reducing highway fatalities and serious injuries on all major roadways, enabling the state to make strategic data-driven safety investment decisions. The metropolitan and statewide transportation planning processes should be consistent with the SHSP. In addition, the metropolitan and statewide transportation plans should include sections on safety that list projects and strategies from the SHSP.

## What are the planning requirements for incorporating safety into transportation planning?

Improving the safety of the transportation system is one of the planning factors that federal legislation explicitly requires to be considered in the transportation planning process. Short- and long-range plans should have a safety element as part of the plan, and when projects and strategies are evaluated for possible inclusion in the metropolitan transportation plan and the TIP, safety should be a factor in their rating.

## Additional sources of information:

The FHWA Office of Safety provides information on ways to improve safety on roadways. For more information, see **safety.fhwa.dot.gov**

For information from the FTA on safety and security of mass transit systems, see **transit-safety.volpe.dot.gov**

The FHWA, FTA, the Transportation Research Board, and other organizations created this website on transportation safety planning. See **tsp.trb.org**

For Bureau of Transportation Statistics (BTS) annual statistical reports on crash statistics, see **www.bts.gov**

For the Institute of Transportation Engineers' discussion paper, "The Development of the Safer Transportation Network Planning Process," see **www.ite.org**

The FHWA Office of Planning maintains a website on Transportation Safety Planning. See **www.fhwa.dot.gov/planning/SCP**

# Security

## What is transportation security?

Transportation system security can be defined as the freedom from intentional harm and tampering that affects both motorized and nonmotorized travelers, and may also include natural disasters. Security goes beyond safety and includes the planning to prevent, manage, or respond to threats of a region and its transportation system and users.

## Why should states and MPOs consider security in the transportation planning process?

Awareness of both man-made and natural security concerns has increased in recent years due to events like September 11, 2001 and Hurricanes Katrina and Rita. The vulnerability of the transportation system and its use in emergency evacuations are issues receiving new attention. Transportation planners have been encouraged to focus on security interrelated issues and to initiate the consideration of security within their transportation planning and programming activities.

## What is the role of the state DOT and the MPO in transportation security?

State DOTs and MPOs may be in a unique position to foster interagency coordination between the different modes of transportation, governmental agencies, groups focused on security, and others. State DOTs and regional transportation agencies have created homeland security plans for emergency evacuation, contingency measures, and communications interoperability. Additionally, state DOTs and MPOs can support programs and fund projects that enhance secure travel for all transportation system users. As the entities that plan and select projects for implementation, the state DOT and MPO can ensure that whatever criterion is used to select and advance projects in a particular region recognizes, highlights, and promotes projects that address transportation security.

## What are the planning requirements for considering security in transportation planning?

Federal requirements include security as a factor to be considered in transportation planning processes at both the metropolitan and statewide levels, stating that the planning process should provide for consideration and implementation of projects, strategies, and services that will "increase the security of the transportation system for motorized and nonmotorized users."

## How do you demonstrate consideration of security in the transportation planning process?

Consideration of security in the planning process may be documented in key planning documents such as the UPWP, the State Planning and Research Program, the long-range transportation plan, STIP or TIP or may be part of a standalone study. Federally funded or regionally significant transportation security should be included in the metropolitan long-range plan, STIP, or TIP. Other activities might include documenting conversations and coordination with groups focused on security or including transportation security as a project selection criterion.

## Additional sources of information:

For "The Role of the Metropolitan Organization (MPO) in Preparing for Security Incidents and Transportation System Response" by Michael D. Meyer, Ph.D., P.E., see **www.planning.dot.gov/Documents/Securitypaper.htm**

For NCHRP: Report 525 Surface Transportation Security, Volume 3, Incorporating Security into the Transportation Planning Process, Transportation Research Board, see **onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_525v3.pdf**

For FHWA's Emergency Transportation Operations website, see **ops.fhwa.dot.gov/OpsSecurity/**

GAO Report 04-1009, "Homeland Security: Effective Regional Coordination Can Enhance Emergency Preparedness;" see **www.gao.gov/new.items/d041009.pdf**

Federal Transit Administration, The Public Transportation System Security and Emergency Preparedness Planning Guide (2003) see **transit-safety.volpe.dot.gov/Publications/Default.asp**

NCHRP 525, "Incorporating Security into the Transportation Planning Process;" see **trb.org/news/blurb_detail.asp?id=5028**

For "Security Considerations in Transportation Planning" from Steven Polzin at the University of South Florida's Center for Urban Transportation Research, see **www.cutr.usf.edu/pubs/Security%20paper%200402.doc**

# System Management and Operations (M&O)

## What is system management and operations?

System management and operations (M&O) analyzes regional transportation as an interconnected set of services and systems to improve system performance through better management and use of the multimodal transportation network.

M&O is an integrated approach to optimize the performance of existing infrastructure through the implementation of multimodal, intermodal, and often cross-jurisdictional systems, services and projects. This includes regional operations collaboration and coordination activities between transportation and public safety agencies. M&O strategies aim at improving service efficiency, enhancing public safety and security, reducing traveler delays, and improving access to information for travelers.

In identifying possible system M&O improvements, it is important to understand what system users want in terms of performance. Some examples of user-oriented performance measures are average trip travel time, length of delay, and reliability of trip making. These are important indicators of how well the transportation system is operating.

**Reliability of trip making:** The level of reliability of the time it takes to make a specific trip; for example, one's daily commute, or the time it takes for goods to move between shipper and receiver.

## What are the requirements for considering management and operations in the transportation planning process?

Federal requirements call for consideration of M&O in the metropolitan and statewide transportation planning processes. For instance, "Promote efficient system management and operation" is one planning factor.

Legislation also states that transportation plans shall include operations and management strategies to improve the performance of the existing transportation system to relieve vehicular congestion and maximize the mobility of people and goods.

## What are some examples of system management and operations tools?

Intelligent Transportation Systems (ITS) are technological tools that can help to facilitate better system M&O. For example, roadway video surveillance allows better responses to changes in network conditions, such as clearing an accident faster to keep traffic moving. ITS technologies can also be used to collect real-time data, like travel speeds, which can be used to monitor system performance over time.

Other examples of system M&O tools include:

- Metropolitan traffic management centers;
- Traffic signal coordination;

- Freeway/arterial corridor management;
- Incident management programs;
- Preferential treatment for transit/ride-shares;
- Special event traffic management;
- Emergency management strategies;
- Pricing of transportation services;
- Customer information services;
- ITS applications for transit;
- Traveler information; and
- Commercial vehicle programs.

These M&O strategies and tools focus on optimizing the performance of the transportation system. It is essential to mention that M&O does not include traditional maintenance activities, such as lawn cutting, pothole repair, or resurfacing.

## What is the role of the MPO in enhancing system management and operations?

**Identifying M&O strategies and benefits:** When developing the transportation plan, the MPO should consider using M&O strategies as one method of improving mobility for constituents. Those programs and projects should then be given high priority in the TIP.

**Coordinating all agencies involved:** Many different agencies assist in system management and operations in a typical metropolitan area. The MPO can provide regional leadership in establishing a decisionmaking framework by bringing parties together, by helping to determine how M&O decisions will be made in an area, and by asking for input on M&O issues as part of the planning process. This allows agencies to develop M&O strategies in common.

**Develop performance measures:** The MPO should develop system performance measures that take into account the desires and expectations of transportation users, and can be used to decide how funds should be spent. The MPO can then work to improve the system through future plans and TIPs.

## What is the role of the state DOT in system management and operations?

Since states have the responsibility for operations and management of significant portions of the transportation network, they play a major role in considering

operations and management strategies in the planning process. State DOTs also have a major roll both outside and within metropolitan areas supporting coordination between the operations and planning functions.

## Additional sources of information:

For the FHWA and FTA Planning for Systems Management and Operation website, see **plan4operations.dot.gov**

For the FHWA's operations website, with information on travel management, transportation operations, freight management, and ITS, see **www.ops.fhwa.dot.gov**

For the U.S. Department of Transportation's official ITS site, see **www.its.dot.gov**

See also *A Toolbox for Alleviating Traffic Congestion and Enhancing Mobility.* Institute of Transportation Engineers: Washington, D.C.,1997.

See also Federal Highway Administration, *Managing Our Congested Streets and Highways,* U.S. DOT, 2001.

For more information from ITS America, a nonprofit organization that acts as a clearinghouse for information on ITS, see **www.itsa.org**

# Technology Applications for Planning: Models, GIS, and Visualization

Better planning tools are increasingly available to help MPOs understand the impact of their decisions on the transportation network and the natural and human environment. A number of decision support tools are available to communities to help them tackle land use, community development, economic development, and environmental protection challenges. Geographic Information Systems (GIS)-based decision support and visualization tools assist planners with conveying information to stakeholders to encourage successful community design and informed decisionmaking. Examples of planning tools include transportation models, land use models, GIS, GIS-based decision support tools, scenario planning models, and satellite imagery.

## What are models?

Models are simulations of the "real world" that can be used to show the impact of changes in a metropolitan area on the transportation system (such as adding a new road or transit line, or increases in population or employment). Travel models may be used to test the travel impacts of changes in land use, economic development, fuel and parking cost, and new highway or transit system capacity.

Three important ingredients are part of any model used for transportation analysis:

- Key base, or current-year characteristics of travelers and the transportation system, described in terms of quantifiable variables (e.g., the number of highway travel lanes, transit service highways, household size and income, number of vehicles per household, employment patterns by type and job classification, etc.).
- The relationship between these variables and the travel behavior of individuals (e.g., the more automobiles per household, the greater the number of automobile trips per household). This relationship is most often expressed in mathematical terms.
- Future-year forecasts of key traveler and transportation system characteristics. This relationship is the same for all individuals and is constant over time.

## What is the four-step modeling process?

For the past 40 years, transportation professionals have used a four-step approach in modeling transportation demand. Most modeling approaches use some form of these

steps today. Once some understanding has been established as to what the land use, population, and employment levels are in a study area, the four modeling steps are:

- **Trip generation:** Estimating the number of trips generated in a small geographic area, called a zone, or at a particular location, and attracted to another zone or particular location, based on the assumed relationship among socioeconomic factors, land use characteristics, and the number of trips. Trip generation then leads to:

- **Trip distribution:** Estimating the number of trips that originate in every zone in the study area, with destinations to every other zone. The result is a trip table that is used in:

- **Mode split:** Estimating, for the number of trips predicted between each origin and destination, the number of trips made via each type of mode that is available for that trip. Thus, "x" percent are likely to drive alone, "y" percent are likely to take transit, "z" percent are likely to ride-share, etc. Mode split leads to:

- **Network assignment:** Estimating the number of trips via a particular mode that will take specific paths through a road or transit network. The end result, when all trips are assigned to a network, is an estimate of the total number of trips that will use each link in the network. When compared to the capacity of this link, planners can forecast the level of congestion that will occur at that location. This becomes the basis for assessing the performance of the transportation system.

## What are other types of models?

Four-step models are commonly used to predict the demand for transportation services. Transportation planners and engineers also use other types of models to analyze and evaluate the performance of transportation systems and resulting impacts.

Land use models are used to forecast future development patterns as well as the potential for proposed transportation improvement to "induce" new or accelerated land development in particular areas. The output of land use models typically provides the input to the trip generation step of the travel forecasting model.

Emissions models use the output of travel forecasting models—simulated highway travel as expressed by vehicle miles traveled—in projecting the tons of key pollutants emitted in the exhaust of vehicular trips. Estimates of the tons of emissions of hydrocarbons, nitrogen oxides, and particulates from emissions models provide important information for use in air quality analysis.

Several metropolitan areas, such as New York, San Francisco, and Columbus, Ohio have implemented advanced tour or activity-based models, which model travel differently from trip-based models. Tour-based models, for instance, keep track of travel activity throughout the day and can assemble multiple trip legs (chained trips) into tours. For example, a parent may leave work, pick up the children at day care, and stop at the grocery store on the way home. These separate trips would be linked together into a tour and, when taken as a whole, the modeled travel behavior of this parent would likely be different than if all of these trips were considered separately.

An activity- or tour-based model is able to show the extent to which mixed-use neighborhood residents tend to reduce their automobile use by taking transit, walking, or bicycling, or accomplishing several activities in one automobile trip in cases where mixed-use development places retail, entertainment, and office locations close together. The modeling approach, more disaggregated in time, space, and activities, is also better suited to analyzing other complex policy alternatives such as variable pricing, flexible working hours, nonmotorized travel, and induced demand.

## What should decisionmakers consider when presented with the results of models?

Results of a model are still only estimates—they cannot provide a definitive picture of what will happen in the future. Much like economic projections, transportation forecasts are greatly affected by the long-term economic health and attractiveness of the region, by population changes, and by the individual behavior of each person using the transportation system, which no one can predict.

Model results are only as good as the data that go into the model. MPOs must use the most current socioeconomic and census data available, especially if the region is growing rapidly. MPOs should make every effort to explain the information and assumptions that went into creating the model in plain, understandable terms. Finally, it is important that the models periodically be validated against observed conditions. And, the state, MPO, and transit operators should have a schedule for periodic re-survey of the usage and performance patterns of their systems (e.g. transit onboard and roadside origin/destination surveys).

## What are visualization techniques, and how are they used in transportation planning?

Visualization techniques are methods used by states and MPOs to communicate information used in the development of transportation plans and programs to the

public, elected and appointed officials, and other stakeholders in a clear and easily accessible format. This could involve use of one or more of a broad range of information dissemination tools, including maps, pictures, or displays, with the intention of promoting improved understanding about existing or proposed transportation plans, policies, and programs.

Visualization techniques can be used through the process, including in developing planning documents, on websites, and at public outreach and information sessions. Through visual imagery, the complex character of proposed transportation plans, policies, and programs can be portrayed at appropriate scales and from different points of view, providing the public and decisionmakers with a clear idea of the proposals and likely impacts to the human and natural environment. In addition to their use in public involvement, visualization techniques are increasingly used as tools for improved decisionmaking for context sensitive solutions.

## What is a Geographic Information System (GIS)? How can state DOTs, MPOs and public transportation providers use GIS during transportation planning?

A Geographic Information System (GIS) is a collection of computer software, hardware, and data used to store, manipulate, analyze, and present geographically referenced information. A GIS can be used both for analysis and as the basis for many of the visualization techniques described above. In transportation planning, GIS is typically used to compile and "overlay" multiple sets of data linked to particular geographic locations. Using GIS, transportation professionals can holistically and efficiently view multiple items of interest about a particular geographic area including transportation facilities, operations, demographics, environmental and cultural resources, public lands, and others. As an aid to environmental analysis, GISs are also used to overlay key features of the human and natural environment for the purpose of identifying corridors and subareas with the highest concentration of sensitive areas.

## What is scenario planning and how does it use these technologies?

One use of models is in assessing the transportation impacts of alternative possible future policy scenarios. Scenario testing, also known as scenario planning, is an important policy analysis and public involvement tool for planners and involves undertaking long-range strategic planning studies testing alternative sets of future-year assumptions and engaging stakeholders and the public in reviewing the implications.

Instead of concentrating on one aspect of planning for the future, many tools used in scenario planning estimate the impacts of people's decisions today on the land use, transportation system, and environment of tomorrow. Additionally, these tools take into account the interconnections between these three aspects of planning. For example, if a change to the transportation system is proposed for an area, models can estimate its land

use and environmental impacts. Powerful tools provide for more comprehensive geographic analysis and visualization using interactive analysis tools and a decision-making framework. Scenario planning tools can be used to view, analyze, and understand land-use alternatives and their impacts for informed decisionmaking.

## Additional sources of information:

Cambridge Systematics and Transmode Consultants, *Multimodal Corridor and Capacity Analysis Manual: National Cooperative Highway Research Program Report 399.* Transportation Research Board, 1998.

For the FHWA's Travel Model Improvement Program (TMIP) see **tmip.fhwa.dot.gov**

See also Meyer, M. and E. Miller, *Urban Transportation Planning: A Decision-Oriented Approach.* New York: McGraw Hill, 2001.

For NETC 00-6: *Effective Visualization Techniques for The Public Presentation Of Transportation Projects* see **www.netc.uconn.edu/pdf/netcr48_00-6.pdf**

For more on TRB's work on visualization in transportation see **www.trbvis.org/**

For AASHTO's *Visualization in Transportation: A Guide for Transportation Agencies* see **cms.transportation.org/sites/design/docs/VisualizationGuideJuly2003.pdf**

For TRB's Visualization Symposium Proceedings see **www.teachamerica.com/viz/viz2006.html**

For NCHRP's Visualization in Project Development see **onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_361.pdf**

For the Federal Highway Administration's (FHWA) Office of Planning, Environment, and Realty Executive Geographic Information System (HEPGIS) see **hepgis.fhwa.dot.gov**

# Title VI/Environmental Justice

## What is Title VI/Environmental Justice?

The goal of Title VI/Environmental Justice (EJ) is to ensure that services and benefits are fairly distributed to all people, regardless of race, national origin, or income, and that they have access to meaningful participation. Title VI/Environmental Justice in transportation programs is achieved through:

- Avoiding, minimizing, or mitigating disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority and low-income populations.
- Ensuring the full and fair participation in the transportation decisionmaking process by all potentially affected communities.
- Preventing the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

## What is the role of the state DOT and MPO in incorporating Title VI/Environmental Justice into transportation planning?

As the agency responsible for coordinating the transportation planning process, the state DOT or MPO must make sure that all segments of the population have been included in the planning process.

The impact of proposed transportation investments on underserved and under represented population groups must be part of the evaluation process. In particular, the following questions are important in addressing Title VI/Environmental Justice issues in the planning process:

1. How will the public participation process reach low-income and minority communities? Specifically:
   - How and where will information be disseminated?
   - What information will be disseminated?
   - Where and when will public meetings be held?
   - At what point in the planning process do the meetings take place?
   - Are other avenues being used to reach minority/low-income communities (e.g., contacts with community leadership, community advisory boards, focus groups, surveys, etc.)?

- How will the process elicit issues of particular concern to low-income and minority communities?

2. What statistics are being collected about minority/low-income communities, and how are they used to assess possible inequities? Actions to take include:

   - Evaluating what information is already being collected.
   - Identifying what further information can and should be collected.
   - Analyzing the data to identify potential inequities.
   - Developing measures to verify whether there is equitable distribution of the benefits and burdens of transportation services.

3. How are information and data incorporated into decisionmaking? Questions to ask include:

   - How is Title VI/Environmental Justice considered in creating the transportation plan?
   - How is Title VI/Environmental Justice information collected by the MPO and relayed to officials?
   - Is additional information needed to adequately consider the impacts of transportation decisions on low-income and minority communities?
   - How are the specific interests of minority and low-income populations addressed in transportation policies, plans, and projects?

## What are the regulatory foundations for Title VI/Environmental Justice?

The legal foundation for environmental justice considerations is Title VI of the Civil Rights Act of 1964, which prohibits discrimination in any program receiving federal assistance.

The 1969 National Environmental Policy Act (NEPA) and 23 USC 109(h) also require that social, economic, and environmental consequences of programs be considered when contemplating any action having federal support.

The FHWA and the FTA have jointly issued policy guidance on how Title VI/Environmental Justice concerns can be incorporated into metropolitan transportation planning.

## Additional sources of information:

For extensive information and case studies on Title VI/Environmental Justice, including the joint FHWA/FTA policy guidance on incorporating Title

VI/Environmental Justice concerns into metropolitan transportation planning see **www.fhwa.dot.gov/environment/ej2.htm**

For information on state DOTs responsibilities, general public responsibilities, frequently asked questions, and an environmental justice library see **www.dotcr.ost.dot.gov/asp/ej.asp**

For the Washington State Department of Transportation website which provides information on environmental justtice analysis tools, resources and training see **www.wsdot.wa.gov/Environment/EJ/EnviroJustice.htm**

# Transportation Asset Management

## What is Transportation Asset Management?

Transportation Asset Management is a strategic framework for making cost-effective decisions about allocating resources (funding and personnel) and managing infrastructure (physical assets such as roads, equipment, and buildings). It is based on a process of monitoring the physical condition of assets, predicting deterioration over time, and providing information on how to invest in order to maintain or enhance the performance of assets over their useful life. The goals of a transportation asset management program are to minimize the life-cycle costs for managing and maintaining transportation assets, including pavements, bridges, tunnels, rails, and roadside features.

## What is the role of the MPO in Transportation Asset Management?

MPOs should ensure that 1) their metropolitan transportation plan is comprehensive and incorporates the transportation assets of all modes, 2) that the transportation network is managed to meet both current and future demands, and 3) that expenditures are optimized for value. Transportation asset management principles and techniques are valuable tools that can be applied by an MPO and result in more effective decision-making. The MPO role in a successful transportation asset management program includes managing public investment through the transportation plan and TIP, defining performance measures for assets through public involvement, serving as a repository for asset data, and promoting standard data collection and technology applications. MPOs can also educate the public and decisionmakers and work cooperatively with stakeholders across transportation modes.

The MPO can support asset management by encouraging the collection of data and information that helps establish priorities for improving the area's transportation assets. Typically, the MPO does not, on its own, develop and/or operate a transportation asset management decisionmaking framework; this is usually the responsibility of state and local operating agencies.

## What are the steps decisionmakers use in the Transportation Asset Management process?

The following steps are typical for the Transportation Asset Management process:

1. Decisionmakers establish strategic goals and objectives for the transportation system's performance with performance measures being set and applied to establish a strategy to achieve the goals.

2. The transportation system is inventoried, and performance data is collected and analyzed. This information is used to determine what is needed.

3. Analytical tools and models are used to establish cost-effective long- and short-range strategies to maximize benefit to the motoring public for dollars invested to maximize condition at least life cycle cost to maintain and maximize system performance. Budget allocations are developed to meet performance expectations. The alternative choices are evaluated according to how well they meet long-range plans, policies, and goals.

4. Decisions are made as a result of policies, performance-based goals, performance measures, and service levels which address the agency's strategic goals and objectives. Decisionmakers need to take into account actual project development, construction, and operation.

5. The entire process is annually reevaluated.

## What questions should transportation decisionmakers ask as part of the Transportation Asset Management process?

- What is our inventory of assets?
- What is the value of our assets (monetary, importance to region, other)? What are their functions? What services do they provide?
- What are the past, current, and anticipated conditions and performance of our assets?
- How can we preserve, maintain, or improve our assets to ensure maximum useful life and provide acceptable service to the public?
- What financial resources are available? What is the budget? How much funding can we expect in the future?
- What are our choices for investing our transportation budget? What are the costs and benefits of such choices?
- Which choice, or combination of choices, is optimal?
- What are the consequences of not maintaining our assets? How can we communicate those consequences?

## Additional sources of information:

*Asset Management: Advancing the State of the Art into the 21st Century Through Public-Private Dialogue,* FHWA, Report No. FHWA-RD-97-046. For information on obtaining a copy of this report, see **www.fhwa.dot.gov/pubstats.html**

For FHWA's *Asset Management Primer*, December 1999,
see **www.fhwa.dot.gov/infrastructure/asstmgmt/amprimer.pdf**

For more about the mission of FHWA's Office of Asset Management, and useful links,
see **www.fhwa.dot.gov/infrastructure/asstmgmt**

For *Transportation Planning and Asset Management*, FHWA, 2006,
See **www.fhwa.dot.gov/infrastructure/asstmgmt/tpamb.cfm**

# APPENDICES

| Recent Surface Transportation Reauthorizations | |
|---|---|
| ***Date signed into law*** | ***Title of Bill*** |
| 1991 | The Intermodal Surface Transportation Efficiency Act (ISTEA) |
| 1995 | National Highway System Designation Act |
| 1998 | The Transportation Equity Act for the 21st Century (TEA-21) |
| 2005 | Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) |

## Acronyms

| | |
|---|---|
| 3-C | Continuing, Cooperative and Comprehensive Planning Process |
| AASHTO | American Association of State Highway and Transportation Officials |
| BTS | Bureau of Transportation Statistics |
| CAA | Clean Air Act as amended in 1990 |
| CE | Categorical Exclusions |
| CMAQ | Congestion Mitigation and Air Quality improvement program |
| CMP | congestion management process |
| CO | carbon monoxide |
| COG | Council of Governments |
| CPI | Consumer Price Index |
| CSS | context sensitive solutions |
| DEIS | Draft Environmental Impact Statement |
| DOT | Department of Transportation |
| EA | Environmental Assessment |
| EIS | Environmental Impact Statement |
| EJ | Environmental Justice |
| EPA | Environmental Protection Agency |
| FAA | Federal Aviation Administration |
| FEIS | Final Environmental Impact Statement |
| FHWA | Federal Highway Administration |
| FONSI | Finding of No Significant Impact |
| FTA | Federal Transit Administration |
| FY | fiscal year |
| GIS | Geographic Information Systems |
| HC | hydrocarbons |
| HOV | high-occupancy vehicle |
| I/M | Inspection and Maintenance |
| IHS | Interstate Highway System |
| IM | Interstate Maintenance |
| ISTEA | Intermodal Surface Transportation Efficiency Act of 1991 |
| ITS | Intelligent Transportation Systems |
| LRSTP | Long-Range Statewide Transportation Plan |
| LRTP | Long-Range Transportation Plan |
| M&O | management and operations |
| MPO | Metropolitan Planning Organization |
| MTP | Metropolitan Transportation Plan |
| NAA | Nonattainment Area |
| NAAQS | National Ambient Air Quality Standards |
| NADO | National Association of Development Organizations |
| NEPA | National Environmental Policy Act of 1969 |
| NHS | National Highway System |
| NOI | Notice of Intent |
| NOx | nitrogen oxide |
| PL | Planning Funds |
| PM | particulate matter |
| PPM | parts per million |
| ROD | Record of Decision |
| RPO | Regional Planning Organization |
| SAFETEA-LU | Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users |
| SDOT | state DOT |
| SHSP | Strategic Highway Safety Plan |
| SIB | State Infrastructure Bank |
| SIP | State Implementation Plan |
| SOV | single-occupancy vehicle |
| SPR | State Planning and Research Funds |
| STIP | Statewide Transportation Improvement Program |
| STP | Surface Transportation Program |
| TCM | Transportation Control Measure |
| TDM | Transportation Demand Management |
| TEA-21 | Transportation Equity Act for the 21st Century |
| TIFIA | Transportation Infrastructure Finance and Innovation Act of 1998 |
| TIP | Transportation Improvement Program |
| TMA | Transportation Management Area |
| TMIP | Travel Model Improvement Program |
| TOD | Transit-Oriented Development |
| TRB | Transportation Research Board |
| UA | urbanized area |
| UPWP | Unified Planning Work Program |
| VOC | Volatile Organic Compound |

# Glossary

## A

### Administrative Modification
A minor revision to a long-range statewide transportation or metropolitan transportation plan, TIP, or STIP that includes minor changes to project/project phase costs, minor changes to funding sources of previously included projects, and minor changes to project/project phase initiation dates. An administrative modification is a revision that does not require public review and comment, redemonstration of fiscal constraint, or a conformity determination (in nonattainment and maintenance areas).

### Amendment
A revision to a long-range statewide or metropolitan transportation plan, TIP, or STIP, that involves major change to a project included in a MTP, TIP, or STIP, including the addition or deletion of a project or a major change in project cost, project/project phase initiation dates, or a major change in design concept or design scope (e.g., changing project termini or the number of through traffic lanes). Changes to projects that are included only for illustrative purposes do not require an amendment. An amendment is a revision that requires public review and comment, redemonstration of fiscal constraint, or a conformity determination (for MTPs and TIPs involving "non-exempt" projects in nonattainment and maintenance areas). In the context of a long-range statewide transportation plan, an amendment is a revision approved by the state in accordance with its public involvement process.

### Area Sources
Small stationary and non-transportation pollution sources that are too small and/or numerous to be included as point sources but may collectively contribute significantly to air pollution (e.g., dry cleaners).

### Attainment Area
Any geographic area in which levels of a given criteria air pollutant (e.g., ozone, carbon monoxide, PM10, PM2.5, and nitrogen oxide) meet the health-based National Ambient Air Quality Standards (NAAQS) for that pollutant. An area may be an attainment area for one pollutant and a nonattainment area for others. A "maintenance area" (see definition below) is not considered an attainment area for transportation planning purposes.

## C

### Capacity
A transportation facility's ability to accommodate a moving stream of people or vehicles in a given time period.

### Capital Program Funds
Financial assistance from the transit major capital programs of 49 U.S.C. Section 5309. This program enables the Secretary of Transportation to make discretionary capital grants and loans to finance public transportation projects divided among fixed guideway (rail) modernization; construction of new fixed guideway systems and extensions to fixed guideway systems; and replacement, rehabilitation, and purchase of buses and rented equipment, and construction of bus-related facilities.

### Carbon Monoxide (CO)
A colorless, odorless, tasteless gas formed in large part by incomplete combustion of fuel. Human activities (i.e., transportation or industrial processes) are largely the source for CO emissions.

### Clean Air Act (CAA)
The original Clean Air Act was passed in 1963, but the national air pollution control program is actually based on the 1970 revision of the law. The Clean Air Act as amended in 1990 made major changes and contains the most far-reaching revisions of the 1970 law.

### Conformity (Air Quality)
A CAA (42 U.S.C. 7506[c]) requirement that ensures that federal funding and approval are given to transportation plans, programs and projects that are consistent with the air quality goals established by a State Implementation Plan (SIP). Conformity, to the purpose of the SIP, means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the National Ambient Air Quality Standards (NAAQS). The transportation conformity rule (40 CRF part 93) sets forth policy, criteria, and procedures for demonstrating and assuring conformity of transportation activities.

### Congestion Management Process (CMP)
A systematic approach required in transportation management areas (TMAs) that provides for effective management and operation, based on a cooperatively developed and implemented metropolitan-wide strategy of new and existing transportation facilities eligible for funding under title 23 U.S.C. and title 49 U.S.C. through the use of operational management strategies. Provides information on transportation system performance and finds alternative ways to alleviate congestion and enhance the mobility of people and goods, to levels that meet state and local needs.

### Congestion Mitigation and Air Quality Improvement (CMAQ) Program
A federal-aid funding program created under ISTEA. Directs funding to projects that contribute to meeting national air quality standards. CMAQ funds generally may not be used for projects that result in the construction of new capacity available to SOVs (single-occupancy vehicles).

## D

**Department of Transportation (DOT)** When used alone, indicates the U.S. Department of Transportation. In conjunction with a place name, indicates state, city, or county transportation agency (e.g., Illinois DOT, Los Angeles DOT).

## E

### Emissions Budget
The part of the State Implementation Plan (SIP) that identifies the allowable emissions levels, mandated by the National Ambient Air Quality Standards (NAAQS), for certain pollutants emitted from mobile, stationary, and area sources. The emissions levels are used for meeting emission reduction milestones, attainment, or maintenance demonstrations.

### Environmental Justice (EJ)
Environmental justice assures that services and benefits allow for meaningful participation and are fairly distributed to avoid discrimination. (See also "Title VI.")

### Environmental Mitigation Activities
Strategies, policies, programs, actions, and activities that, over time, will serve to avoid, minimize, or compensate for (by replacing or providing substitute resources) the impacts of to or disruption of elements of the human and natural environment associated with the implementation of of a long-range statewide transportation plan or MTP. The human and natural environment includes, for example, neighborhoods and communities, homes and businesses, cultural resources, parks and recreation areas, wetlands and water sources, forested and other natural areas, agricultural areas, endangered and threatened species, and the ambient air. The environmental mitigation strategies and activities are intended to be regional in scope, and may not necessarily address potential project-level impacts.

**Environmental Protection Agency (EPA)**
The federal regulatory agency responsible for administering and enforcing federal environmental laws, including the Clean Air Act, the Clean Water Act, the Endangered Species Act, and others.

## F

**Federal Highway Administration (FHWA)**
A branch of the U.S. Department of Transportation that administers the federal-aid highway program, providing financial assistance to states to construct and improve highways, urban and rural roads, and bridges. The FHWA also administers the Federal Lands Highway Program, including survey, design, and construction of forest highway system roads, parkways and park roads, Indian reservation roads, defense access roads, and other Federal Lands roads.

**Federal Transit Administration (FTA)**
A branch of the U.S. Department of Transportation that administers federal funding to transportation authorities, local governments, and states to support a variety of locally planned, constructed, and operated public transportation systems throughout the U.S., including buses, subways, light rail, commuter rail, streetcars, monorail, passenger ferry boats, inclined railways, and people movers.

**Financial Plan**
The documentation required to be included with a MTP and TIP (optional for the long-range statewide transportation plan and STIP) that demonstrates the consistency between reasonably available and projected sources of federal, state, local, and private revenues and the costs of implementing the proposed transportation system improvements.

**Financial Programming**
A short-term commitment of funds to specific projects identified in both the regional and the statewide Transportation Improvement Program.

**Fiscal Constraint**
Making sure that a given program or project can reasonably expect to receive funding within the time allotted for its implementation. The MTP, TIP, and STIP must include sufficient financial information for demonstrating that projects in the MTP, TIP, and STIP can be implemented using committed, available, or reasonably available revenue sources, with reasonable assurance that that the federally supported transportation system is being adequately operated and maintained. For the TIP and the STIP, financial constraint/fiscal constraint applies to each program year. Additionally, projects in air quality nonattainment and maintenance areas can be included in the first two years of the TIP and STIP only if funds are "available" or "committed."

**Formula Capital Grants**
Federal transit funds for transit operators, allocated by FTA, and used to purchase rolling stock (e.g., buses and trains) as well as design and construct facilities (e.g., shelters, transfer centers, etc.).

## G

**Geographic Information System (GIS)**
Computerized data management system designed to capture, store, retrieve, analyze, and display geographically referenced information.

## H

**High-Occupancy Vehicle (HOV)**
Vehicles carrying two or more people. The number that constitutes an HOV for the purposes of HOV highway lanes may be designated differently by different transportation agencies.

## I

**Intelligent Transportation Systems (ITS)**
Electronics, photonics, communications, or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system. The National ITS architecture is a blueprint for the coordinated development of ITS technologies in the U.S., providing a systems framework to guide the planning and deployment of ITS infrastructure.

**Intermodal**
The ability to connect, and connections between, differing modes of transportation.

**Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA)**
Legislative initiative by the U.S. Congress that restructured and authorized federal funding for transportation programs; provided for an increased role for regional planning commissions/MPOs in funding decisions; and required comprehensive regional and statewide long-term transportation plans.

**Interstate Highway System (IHS)**
The specially designated system of highways, begun in 1956, which connects the principal metropolitan areas, cities, and industrial centers of the United States. Also connects the U.S. to internationally significant routes in Canada and Mexico.

## L

**Land Use**
Refers to the manner in which portions of land or the structures on them are used (or designated for use in a plan), i.e., commercial, residential, retail, industrial, etc.

**Long-Range Statewide Transportation Plan (LRSTP)**
The official, statewide, multimodal transportation plan covering no less than 20 years developed through the statewide transportation planning processes.

**Long-Range Transportation Plan (LRTP)**
A document resulting from regional or statewide collaboration and consensus on a region's or state's transportation system, and serving as the defining vision for the region's or state's transportation systems and services. In metropolitan areas, this is the official multimodal transportation plan addressing no less than a 20-year planning horizon that is developed, adopted, and updated by the MPO through the metropolitan transportation planning process.

## M

**Maintenance Area**
Any geographic region of the United States that the EPA previously designated as a nonattainment area for one or more pollutants pursuant to the CAA Amendments of 1990, and subsequently redesignated as an attainment area subject to the requirement to develop a maintenance plan under section 175A of the CAA, as amended.

**Metropolitan Planning Area**
The geographic area determined by agreement between the metropolitan planning organization (MPO) for the area and the Governor, in which the metropolitan transportation planning process if carried out.

**Metropolitan Planning Organization (MPO)**
The policy board of an organization created and designed to carry out the metropolitan transportation planning process for urbanized areas with populations greater than 50,000, and designated by local officials and the Governor of the state.

**Metropolitan Transportation Plan (MTP)**
The official multimodal transportation plan addressing no less than a 20-year planning horizon that is developed, adopted and updated by the MPO through the metropolitan transportation planning process.

# Glossary

**Mode**
A specific form of transportation, such as automobile, subway, bus, rail, air, bicycle, or foot.

## N

**National Ambient Air Quality Standards (NAAQS)**
Federal standards that set allowable concentrations and exposure limits for various pollutants. The EPA established these standards pursuant to section 109 of the CAA. Air quality standards have been established for the following six criteria pollutants: ozone (or smog), carbon monoxide, particulate matter, nitrogen dioxide, lead, and sulfur dioxide.

**National Environmental Policy Act of 1969 (NEPA)**
Established requirements that any project using federal funding or requiring federal approval, including transportation projects, examine the effects of proposed and alternative choices on the environment before a federal decision is made.

**Nonattainment Area (NAA)**
A geographic region of the United States that has been designated by the EPA as a nonattainment area under section 107 of the CAA for any pollutants for which an NAAQS exists, meaning that federal air quality standards are not being met.

## O

**Operational and Management Strategies**
Actions and strategies aimed at improving the performance of existing and planned transportation facilities to relieve congestion and maximize the safety and mobility of people and goods.

**Ozone (03)**
Ozone is a colorless gas with a sweet odor. It is a secondary pollutant formed when VOCs and NOx combine in the presence of sunlight. Ozone is associated with smog or haze conditions. Although the ozone in the upper atmosphere protects us from harmful ultraviolet rays, ground-level ozone—resulting from human and natural sources—produces an unhealthy environment in which to live.

## P

**Particulate Matter (PM-10 and PM 2.5)**
Particulate matter consists of airborne solid particles and liquid droplets. Particulate matter may be in the form of fly ash, soot, dust, fog, fumes, etc. These particles are classified as "coarse" if they are smaller than 10 microns, or "fine" if they are smaller than 2.5 microns. Coarse airborne particles are produced during grinding operations, or from the physical disturbance of dust by natural air turbulence processes, such as wind. Fine particles can be a by-product of fossil fuel combustion, such as diesel and bus engines. Fine particles can easily reach remote lung areas, and their presence in the lungs is linked to serious respiratory ailments such as asthma, chronic bronchitis, and aggravated coughing. Exposure to these particles may aggravate other medical conditions such as heart disease and emphysema and may cause premature death. In the environment, particulate matter contributes to diminished visibility and particle deposition (soiling).

**Performance Measures**
Indicators of how well the transportation system is performing with regard to such measures as average speed, reliability of travel, and accident rates. Used as feedback in the decisionmaking process.

**Planning Funds (PL)**
Primary source of funding for metropolitan planning administered by the FHWA.

**Public Participation / Public Involvement**
The active and meaningful involvement of the public in the development of transportation plans and programs.

## R

**Regional Council of Governments (COG)**
Regional councils of governments are multipurpose, multijurisdictional public organizations. Created by local governments to respond to federal and state programs, regional councils bring together participants at multiple levels of government to foster regional cooperation, planning and service delivery. They may also be called planning commissions, development districts, or other names, and may or may not include the structure and functions of Metropolitan Planning Organizations (MPOs).

## S

**SAFETEA-LU**
The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). SAFETEA-LU authorized the federal surface transportation programs for highways, highway safety, and transit for the 5-year period 2005-2009.

**Sources (Pollution)**
Refers to the origin of air contaminants. Can be point (coming from a defined site) or nonpoint (coming from many diffuse sources). Stationary sources include relatively large, fixed facilities such as power plants, chemical process industries, and petroleum refineries. Area sources are small, stationary, non-transportation sources that collectively contribute to air pollution, and include such sources as dry cleaners and bakeries, surface coating operations, home furnaces, and crop burning. Mobile sources include on-road vehicles such as cars, trucks, and buses; and off-road sources such as trains, ships, airplanes, boats, lawnmowers, and construction equipment. Common mobile source-related pollutants are carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NOx), and particulate matter (PM-10 and PM 2.5).

**Stakeholders**
Individuals and organizations involved in or affected by the transportation planning process. Include federal/state/local officials, MPOs, transit operators, freight companies, shippers, users of the transportation infrastructure, and the general public.

**State Implementation Plan (SIP)**
The portion (or portions) of the implementation plan (as defined in section 302[q] of the CAA), or most recent revision thereof, which has been approved under section 110 of the CAA, or promulgated or approved under section 301(d) of the CAA and which implements the relevant requirements of the CAA. Although the SIP is produced by the state environmental agency (not the MPO) to monitor, control, maintain, and enforce compliance with the NAAQS, it must also be taken into account in the transportation planning process.

**State Infrastructure Bank (SIB)**
A revolving fund mechanism for financing a wide variety of highway and transit projects through loans and credit enhancement. SIBs are designed to complement traditional federal-aid highway and transit grants by providing states increased flexibility for financing infrastructure investments.

**State Planning and Research Funds (SPR)**
Primary source of funding for statewide long-range planning, administered by the FHWA.

**Statewide Transportation Improvement Program (STIP)**
A statewide prioritized listing/program of transportation projects covering a period of four years that is consistent with the long-range statewide transportation plan (LRSTP), metropolitan transportation plans (MTPs), and transportation improvement plans (TIPs), and is required for projects to be eligible for funding under title 23 U.S.C. and title 49 U.S.C. Chapter 53.

**Surface Transportation Program (STP)**
Federal-aid highway funding program that supports a broad range of surface transportation capital needs, including many roads, transit, sea and airport access, vanpool, bike, and pedestrian facilities.

## T

**Telecommuting**
Employment utilizing electronic communications (by telephone, computer, fax, etc.) with a physical office, either from home or from another site, instead of traveling to and working in the office.

**Title VI**
Title VI of the Civil Rights Act of 1964 prohibits discrimination in any program receiving federal assistance. (See "Environmental Justice")

**Transportation Control Measure (TCM)**
Any measure that is specifically identified committed to in the applicable SIP that is either one of the types of listed in section 108 of the CAA or any other measure for the purpose of reducing emissions or concentrations of air pollutants from transportation sources by reducing vehicle use or changing traffic flow or congestion conditions. Notwithstanding the above, vehicle technology-based, fuel-based, and maintenance-based measures that control the emissions from vehicles under fixed traffic conditions are not TCMs.

**Transportation Demand Management (TDM)**
Programs designed to reduce demand for transportation through various means, such as the use of public transit and of alternative work hours.

**Transportation Equity Act for the 21st Century (TEA-21)**
Legislated in 1998, TEA-21 authorized approximately $217 billion in federal funding for transportation investment for FYs 1998-2003. Used for highway, transit, and other surface transportation programs.

**Transportation Improvement Program (TIP)**
A prioritized listing/program of transportation projects covering a period of four years that is developed by an MPO as part of the metropolitan transportation planning process, consistent with the metropolitan transportation plan (MTP), and required for projects to be eligible for funding under title 23 U.S.C. and title 49 U.S.C. Chapter 53.

**Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA)**
A federal credit program under which the DOT may provide three forms of credit assistance—secured (direct) loans, loan guarantees, and standby lines of credit – for surface transportation projects of national or regional significance. The fundamental goal is to leverage federal funds by attracting substantial private and non-federal co-investment in critical improvements to the nation's surface transportation system.

**Transportation Management Area (TMA)**
An urbanized area with a population of 200,000 or more, as defined by the U.S. Bureau of the Census and designated by the Secretary of Transportation, or any additional area where TMA designation is requested by the Governor and the MPO and designated by the U.S. Secretary of Transportation.

**Trust Fund**
A fund credited with receipts that are held in trust by the government and earmarked by law for use in carrying out specific purposes and programs in accordance with an agreement or a statute.

## U

**Unified Planning Work Program (UPWP)**
A statement of work identifying the planning priorities and activities to be carried out within a metropolitan planning area. At a minimum, a UPWP includes a description of of the planning work and resulting products, who will perform the work, time frames for completing the work, the cost of the work, and the source(s) of funds.

**Urbanized Area (UA)**
A geographic area with a population of 50,000 or more, as designated by the U.S. Bureau of the Census.

## V

**Visualization Techniques**
Methods used by states and MPOs in the development of transportation plans and programs with the public, elected and appointed officials, and other stakeholders in a clear and easily accessible format such as maps, pictures, and/or other displays to promote improved understanding of existing or proposed transportation plans and programs.

## Financing the Statewide Plan

A modified version of the following tables is found in *Financing the Statewide Plan: A Guidebook,* Federal Highway Administration, November 1999: **www.fhwa.dot.gov/hep10/state/04703r04.pdf.** For more information about FTA funding programs, see **www.fta.dot.gov/funding.**

### Federal Transportation Programs and Revenue Sources

| Mode | Major Transportation Programs | Federal Revenue Sources |
|---|---|---|
| **Administered by FHWA** | • Interstate Maintenance<br>• National Highway System<br>• Highway Bridge Program<br>• Congestion Mitigation and Air Quality Improvement (in air quality non-attainment and maintenance areas)<br>• Surface Transportation Program (includes transportation enhancements and planning funds)<br>• Highway Safety Improvement Program<br>• National Corridor Planning and Development and Coordinated Border Infrastructure<br>• High Priority (Demonstration) Projects<br>• Intelligent Transportation Systems<br>• Equity Bonus<br>• Federal Lands Highway Program<br>• National Scenic Byways Program (discretionary for use on nationally designated routes only)<br>• Recreational Trails | • Highway Trust Fund with funds from federal:<br>- Motor Fuel Tax (15.44 cents/gallon of gasoline; varies for other fuel types)<br>- Truck and Trailer Tax<br>- Tire Tax<br>- Heavy Vehicle Use Tax<br>- Tire Tax Quality Improvement |
| **Administered by FTA** | • Major Capital (Section 5309)<br>• Urbanized Area Formula (Section 5307)<br>• Other than Urbanized Area Formula (Section 5311)<br>• CMAQ (only when funds flexed from FHWA)<br>• Elderly Individuals and Persons With Disabilities (Section 5310)<br>• Job Access and Reverse Commute Program(JARC)<br>• New Freedom Program<br>• Alternative Transportation in Parks and Public Lands<br>• Clean Fuels Discretionary Grants Program (Section 5308)<br>• Over-the-Road Bus Program<br>• Over-the-Road Bus Accessibility (Rural Transportation Accessibility Incentive Program) | • Mass Transit Account of the Highway Trust Fund with funds from motor fuel tax (2 cents/gallon)<br>• General Fund<br>• Interest |
| **Administered by FAA** | • Federal Airport and Airway Trust Fund, which is the source for airport development grants; airport planning grants<br>• Airport Improvement Program (AIP), a source that provides grants to public agencies for the planning and development of public-use airports that are included in the National Plan of Integrated Airport Systems (NPIAS) | • Aviation Fuel Tax<br>• Air Freight Tax<br>• Passenger Ticket Tax<br>• International Departure Tax |

| Mode | Major Transportation Programs | Federal Revenue Sources |
|---|---|---|
| **Administered by FHWA, FRA** | • Federal Railroad Administration Grants (planning, rail service continuation, rehabilitation, provision of substitute service) | • General Fund |
| **Administered by FRA** | • High-Speed Rail<br>• Amtrak | • Highway Trust Fund<br>• General Fund<br>• General Fund (relies on specific capital appropriations)<br>• Passenger Fares<br>• Food/Beverage Revenue |
| **Administered by MARAD & FHWA** | • Army Corps of Engineers—Construction, operation, and maintenance of waterways, locks and harbors<br>• Construction of Ferry Boats and Terminal Facilities | • Fuel taxes paid by inland water carriers<br>• Ad valorem taxes paid by users of ports<br>• Highway Trust Fund |

## Major Federal-Aid Highway Programs under SAFETEA-LU

| Program | Eligible Uses |
|---|---|
| **Highway Bridge Program** | Replacement and rehabilitation of any public bridge. |
| **Congestion Mitigation and Air Quality** | A wide range of projects in air quality nonattainment and maintenance areas for ozone, carbon monoxide, and small particulate matter, which reduce transportation-related emissions. |
| **Interstate Maintenance** | Resurfacing, restoring, and rehabilitating routes on the IHS, but no new capacity except HOV or auxiliary lanes in nonattainment areas. |
| **National Highway System (NHS)** | Interstate routes, major urban and rural arterials, connectors to major intermodal facilities, national defense network. Fifty percent of NHS funds can be freely flexed to STP; 100% with U.S. DOT approval. |
| **Surface Transportation Program (STP)** | Broad range of surface transportation capital needs, including many roads, transit, sea, and airport access, vanpool, bike, and pedestrian facilities. |

## Major Federal Transit Administration Programs

| Program | Eligible Uses |
|---|---|
| **Capital Investment Grants Section 5309** | New starts or extensions to existing fixed guideway systems that comply with CAAA and ADA. Fixed guideway modernization. Clean fuel busses and related facilities. |
| **Clean Fuels** | Purchase, lease of clean fuel buses and facilities; improvements to existing facilities to accommodate clean fuel vehicles. |
| **Job Access and Reverse Commute (JARC) Grants Section 5316** | Provides formula grants to support programs that support job access and reverse commute services to provide transportation for low income individuals who may live in the city core and work in suburban locations. |
| **New Freedom Section 5317** | Provides formula grants for capital and operating costs to support services and facility improvements to address the needs of persons with disabilities that go beyond those required by the Americans with Disbilities Act. |
| **Other than Urbanized Areas Section 5311** | Capital and operating expenditures in non-urbanized areas (under 50,000). |
| **Over-the-Road Bus Accessibility (Rural Transportation Accessibility Incentive Program)** | Eligible Capital Projects include adding lifts and other accessory components. Eligible training costs include developing training materials or providing training. |
| **Special Needs of the Elderly and Individuals with Disabilities Section 5310** | Capital assistance to organizations providing specialized services for the elderly and disabled. |
| **Urbanized Areas Section 5307** | Capital and operating expenditures. Capital and preventive maintenance; 1% must go to transit enhancements. |

## Funding Transferability under SAFETEA-LU

| Program | Transferability |
|---|---|
| **Highway Bridge Program** | • Up to 50% of Bridge Program apportionments may be transferred to NHS, IM, STP, and/or CMAQ. Funds set aside for bridges not on federal-aid highways (off-system bridges) may not be transferred unless a determination is made that the state has inadequate needs to justify expenditure of the full amount of the set-aside funds. |
| **Congestion Mitigation and Air Quality (CMAQ)** | • States may transfer up to 50% of the amount by which the CMAQ apportionment for the fiscal year exceeds the amount that would have been apportioned for that fiscal year if the CMAQ program had been funded at $1.35 billion annually to STP, NHS, IM and/or Bridge Replacement/Rehabilitation. Transferred funds may only be used in nonattainment and maintenance areas. |
| **Interstate Construction (IC)** | • A state other than Massachusetts may transfer an amount equivalent to the federal share of the cost to complete its open-to-traffic Interstate segments included in the latest Interstate Cost Estimate (ICE) from its IC funds to NHS and/or IM. The work on which the transfer is based will be removed from the ICE and will lose its IC fund eligibility.<br>• States may transfer IC funds remaining after all work included in the ICE has been fully financed to the NHS.<br>• States with remaining completion work on Interstate gaps or open-to-traffic segments may relinquish IC fund eligibility and transfer to the NHS amounts equivalent to the federal share of the cost of such work in the most recent ICE. |
| **Interstate Maintenance (IM)** | • States may transfer up to 50% of IM apportionments to NHS, STP, CMAQ, and/or Bridge Replacement/Rehabilitation. |
| **National Highway System (NHS)** | • States may freely transfer up to 50% of NHS apportionments to IM, STP, National Highway System (NHS), CMAQ, and/or Bridge Replacement/Rehabilitation.<br>• States may transfer up to 100% of NHS apportionments to STP if approved by the Secretary of Transportation and if sufficient notice and opportunity for public comment is given. |
| **Surface Transportation Program (STP)** | • Transportation Enhancement (TE) set-aside states may transfer up to 25% of the difference between the amount set aside for TE for the fiscal year and the amount set aside for TE for FY 1997 to IM, CMAQ, NHS, and/or Bridge Replacement/Rehabilitation.<br>• Safety set-aside funds equivalent to the funds made available for FY 1991 for the Hazard Elimination and Railway-Highway Crossing Programs may not be transferred. Up to 25% of the difference between the remainder of the safety set aside for the fiscal year—the "optional safety" funds—and the comparable amount for FY 2007 may be transferred to IM, CMAQ, NHS, and/or Bridge Replacement/Rehabilitation.<br>• Suballocation to areas—STP funds allocated to sub-state areas (rural, urbanized areas over 200,000 population) may not be transferred.<br>• Transfers to STP from IM, NHS, CMAQ, and Bridge Programs will not be subject to further STP set asides or suballocations. |

## Innovative Highway Financing Strategies/Tools • Cash Flow Approaches

| Tool | Approach |
|---|---|
| **Advance Construction** | Allows states to independently raise upfront capital required for a project and preserve eligibility for future federal funding for the project. Projects must be designated as advance construction projects to be eligible. |
| **Bond Cost Reimbursement: Grant Anticipation Revenue Vehicle (GARVEE)** | State-issued short-term note or long-term bond that uses future federal funds to support payment of principal and interest. Issuance and insurance costs are also eligible. This is generally used in combination with advance construction. |
| **Flexible: Federal Land Management Agency Funds** | Funds from other federal agencies may count toward the non-federal matching share for recreational trails and transportation enhancement projects. |
| **Flexible: Federal Lands** | Funds from DOT's Federal Lands Highway Program may count toward non-federal match for projects within or providing access to federal or Indian lands. |
| **Flexible: Publicly Owned Land** | Permits donations of publicly owned property to count toward non-federal match on all federal-aid highway projects. |
| **Partial Conversion of Advance Construction** | Form of advance construction; state only converts, obligates, or receives reimbursement for part of its funding for an eligible project in a given year. States no longer have to wait until the full amount of obligation authority is available. |
| **Program Level** | For STP projects, allows federal share for funds to be matched across the full program, not on a project-by-project basis. |
| **Tailored (Variable) Match** | Allows non-federal share to vary over project life, so long as the ultimate matching share is preserved over time. |

## Tolls and Other Income-Generating Tools

| Tool | Approach |
|---|---|
| **Right-of-Way Income** | This allows income from right-of-way sales and leases to be used for Title 23 (highway) purposes, as currently allowed for airspace income. ISTEA Section 1044 Toll allows states to receive investment credit for certain toll revenue Investment Credits expenditures, which can be applied toward the non-federal matching share of all ISTEA programs. |

## Leveraging Tools

| Tool | Approach |
|---|---|
| **Bonds and Debt Costs, Issuance** | Allows states to use federal funds for bond principal, interest "Instrument Financing" costs, and insurance on eligible projects. |
| **Federal Share on Toll Projects** | Expanded use of federal funds for toll projects to include construction of new facilities, resurfacing, restoration, and rehabilitation of existing facilities and conversion of free facilities. Private facilities are now also eligible. |
| **Flexible Match** | Allows states to apply private donations of materials, labor, or assets and private funds toward the state or local match for federal-aid projects. |
| **ISTEA Section 1012 Loans** | Removes the limitation that federal funds can be used only once. Allows states to loan federal funds to leverage any eligible investment; the state can use the funds again once they have been paid back |

## Credit Tools

| Tools | Approach |
|---|---|
| **Rail Credit Pilot** | This provides direct federal loans and loan guarantees for rail and inter-modal projects. |
| **State Infrastructure Bank** | States could allocate up to 10% of their ISTEA/TEA-21 apportionment to capitalize the state bank. Funds can be used to provide loans for projects. This can be structured as a revolving loan fund, where loans are recycled for new projects.<br><br>State infrastructure banks can provide third-party guarantees to projects to ensure that there is sufficient revenue to pay project costs or debt service. |
| **Surface Transportation Credit Program** | This provides direct federal loans, loan guarantees, and lines of credit for large surface transportation programs of national significance. |
| **TIFIA (Transportation Infrastructure Finance and Innovation Act of 1998)** | A federal credit program under which the U.S. DOT may provide three forms of credit assistance—secured (direct) loans, loan guarantees, and standby lines of credit—for surface transportation projects of national or regional significance. The fundamental goal is to leverage federal funds by attracting substantial private and non-federal co-investment in critical improvements to the nation's surface transportation system. |

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