



# BUILDING GREAT TRANSPORTATION INFRASTRUCTURE

Toolkit on how to plan, fund, deliver, and  
maintain a transportation system

**MOMENTUM**

U.S. Department of Transportation, Office of the Secretary  
[www.transportation.gov/momentum](http://www.transportation.gov/momentum)

Edition 2  
February 2023

# TABLE OF CONTENTS

Building Great Transportation Infrastructure.....	1
Developing Infrastructure .....	3
Overview of Development Process.....	3
Plan .....	5
Governance & Accountability.....	5
Vision & Goals.....	7
Equity.....	8
Safety.....	9
Climate Change.....	10
Programming.....	12
Public Engagement.....	15
Fund .....	17
Financing.....	17
Funding .....	18
Public-Private Partnerships.....	19
Deliver .....	22
Sustainable transportation .....	23
Design.....	25
Construction .....	26
Maintain.....	28
Maintenance.....	29
Monitoring/Evaluation .....	30
Glossary.....	31
Self-Assessment Questions .....	34

# DEVELOPING INFRASTRUCTURE

---

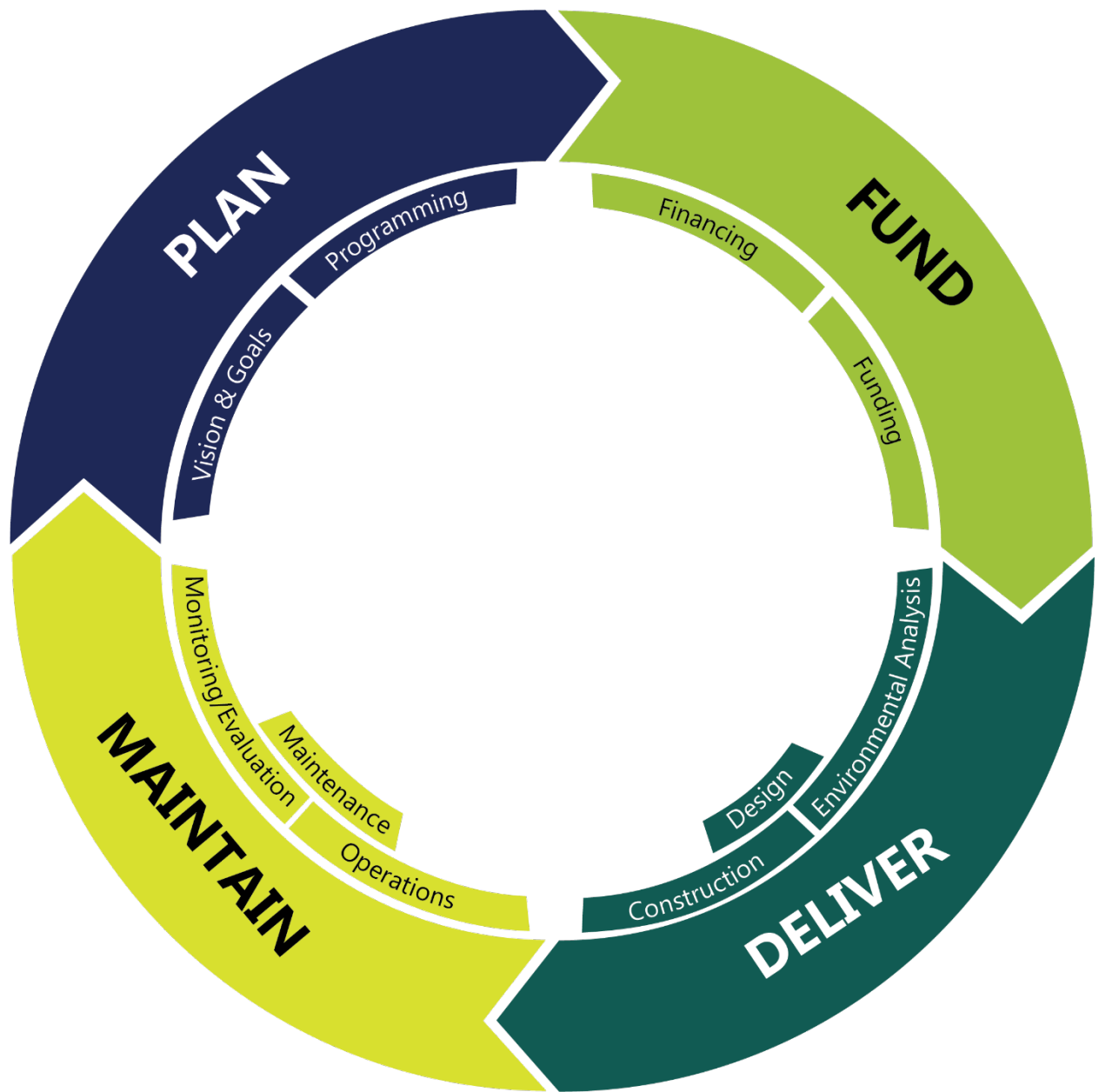
## OVERVIEW OF DEVELOPMENT PROCESS



### **What are the steps in the transportation process?**

The transportation process follows four main steps: PLAN, FUND, DELIVER, and MAINTAIN. It is an ongoing, cyclical process with public engagement at the core of every step.

- During PLAN, governments work with the public and other stakeholders to develop a vision and goals for the transportation system, identify project ideas to achieve the vision and goals, and select a set of projects to fund.
- During FUND, governments secure funding and/or financing to pay for the costs of analyzing, designing, and constructing the projects. Funding can come from government or private sources, and financing is often secured through domestic or international financial markets.
- During DELIVER, governments use an open and public process to analyze the impacts that a project might have on the environment and mitigate those impacts, design the project to meet the needs of the community, and construct the project.
- During MAINTAIN, governments operate the completed transportation infrastructure, maintain it to keep it in good working form, and monitor the use and condition of the infrastructure.





# PLAN

## GOVERNANCE & ACCOUNTABILITY

### What roles do various levels of government to play in ensuring the effective performance of transportation systems?

Depending on a country's government structure, national, regional, and local governments and authorities may have distinct roles to play in supporting the country's transportation systems. For example, the U.S. Department of Transportation implements federal transportation programs that promote national objectives (e.g., national security, environmental sustainability, economic expansion, equity) impose consistent standards, encourage connectivity across local jurisdictions, and fund critical transportation infrastructure that are implemented by state, regional, and local transportation agencies. U.S. transportation infrastructure is mostly owned and operated by state or local governments and authorities, with some run by private entities. While countries have governance structures for transportation that are similar to the U.S., in others, national governments own, operate, and maintain most transportation infrastructure with less regional or local involvement.

There is no one single "correct" way to govern, or oversee, transportation systems or projects. This Toolkit explains the steps and major oversight components that are needed for effective governance of transportation. It uses the term "government" as shorthand to refer to the governance structures of transportation systems, regardless of the organizational structures involved.

Importantly, while this document assumes that "governments" are the major actor in planning, funding, delivering, and maintaining transportation systems, it is not always the case. In some jurisdictions, quasi-governmental organizations, non-profits, or the private sector could play the primary role and achieve the same positive infrastructure delivery outcomes

#### Think about your governance structure for transportation and consider these questions:

- Does a specific transportation agency or organization structure exist?
- How are transportation agencies structured and staffed? What are their levels of technical capability?
- How are transportation agencies funded? What resources are made available?
- How are leaders and/or overseers (such as board members or commissioners) chosen?
- What level of government controls them? Who do they report to?
- What is the relationship of "government" (or multiple governments) to non-government actors?
- What is the role of the private sector? (For example, in the United States, freight railways are owned and operated by the private sector, while transit services are generally provided by, and often operated by, the public sector.)

## **How can governments be accountable to the public for transportation decisions and investments?**

If a catastrophe occurs on the transportation system, such as a bridge collapse, multi-vehicle crash, or major transit line derailment, people wonder not only what went wrong but whom to hold responsible. When a major road project takes years to build or the plans for a new project falls apart, a country's citizens seek accountability.

In the future, as urban populations grow, economies expand, and technologies change, it is likely that transportation decision making will only become more complex and infrastructure will grow more costly. To respond to these trends, governments will need to become smarter and more innovative. They will need to adopt strategies and technologies that allow them to improve coordination, streamline processes, increase efficiency and accountability, and make the best possible use of time and money. The future calls for more resourceful, responsive, and adaptive governance that can meet emerging challenges, and that can build and sustain transportation systems that meet the needs of current and future generations.

One way that transportation agencies in all modes and at all levels are increasing accountability is by using performance measures and data to inform decisions. Performance measures help agencies demonstrate to the public that they are good stewards of taxpayer funding and that transportation infrastructure is a worthwhile investment. Data drives the implementation of transportation projects that help agencies meet performance targets.

Governments can use enhanced data on the location and conditions of infrastructure and the location and characteristics of safety incidents to guide resources to wise transportation investments. This helps to demonstrate to the public that funding is put to good use. For example, data on the condition and use of transportation assets help transportation agencies make investments that minimize life-cycle costs. Also, governments can use data on the location, severity, and frequency of transportation-related injuries and fatalities to assess risks and guide the implementation of safety countermeasures.

Even as public agencies increasingly rely on data to support decisions, they can also use the data and the growing number of sophisticated digital communications tools to educate and engage the public in the decision-making process so that more voices are heard. Performance measures can help agencies communicate to the public the needs and potential benefits of transportation investments and strategies. Two-way communication with the public about transportation needs, investments, and decisions improves accountability.

---

# VISION & GOALS

## How can governments create long-term visions and goals for their transportation systems and identify projects that help achieve those visions and goals?

Governments can ensure that their transportation investments achieve their goals and serve the public's diverse set of transportation needs through planning. A continuous, comprehensive, cooperative, and performance-driven transportation planning process allows governments to plan for the future and coordinate transportation projects that help them get there. Transportation planning typically includes the following processes:

- **Engage** the public and stakeholders to establish shared goals and visions for communities.
- **Monitor** existing conditions and compare them against transportation performance goals.
- **Forecast** future population and employment growth, assess projected land uses, and identify corridors of growth or redevelopment.
- **Identify** current and projected transportation needs, performance measures, and targets.
- **Analyze** various transportation improvement strategies and their related tradeoffs using detailed planning studies.
- **Develop** long-range plans and short-range programs of capital improvement, management, and operational strategies for moving people and goods.
- **Estimate** how improvements to the transportation system will help achieve performance goals and how they will impact the economy and the environment.
- **Prepare** a financial plan to secure sufficient funding and financing that covers the costs of implementing strategies and ensures ongoing maintenance and operation.

Following these processes ensures that – at both a system and project level – investments address long-term needs and contribute to an effective transport network. The risk of not using such an approach is that short-term political decisions or external pressures could result in projects that do not align with operational infrastructure and impede efforts to improve transport connectivity.

### For more information:

- [FHWA/FTA TPCB Planning Essentials webpage](#)
- [Performance Based Planning and Programming Guidebook](#)
- [TPM/PBPP video and companion document](#)
- [FHWA TMIP Program](#)
- [FHWA Scoping and Conducting Data-Driven 21st Century Transportation System Analyses](#)
- [U.S. DOT Leadership Academy Transportation Toolkit](#)
- [FHWA Virtual Public Involvement webpage](#)



## EQUITY

### How can planning help governments ensure that the benefits and burdens of transportation are distributed equitably?

Transportation equity refers to the way in which the needs of all transportation system users are reflected in the transportation planning and decision-making process. Transportation equity focuses on the needs of those who have limited access to the transportation system, or those who experience disproportionate impacts from the transportation system. These populations often include women and girls, low-income and minority households, older adults, individuals with disabilities, and other marginalized populations. Transportation equity means that transportation decisions deliver equitable benefits to a variety of users and that any associated burdens are avoided, minimized, or mitigated so as not to disproportionately impact specific populations.

Typically, these burdens manifest in decisions related to land acquisition, project siting, and mode choice. Considering equity early and often throughout the transportation process, and particularly in public involvement and data collection and analysis, improves a government's ability to respond to the needs of the communities it serves. It may also improve project delivery by preventing costly and time-consuming delays that could arise from previously unrecognized conflicts as projects move from planning into implementation. Those responsible for coordinating the transportation planning process should ensure that all segments of the population have been included in the planning process regardless of race, national origin, income, age, sex, or disability.

**Transportation equity does not mean equal.** An equitable transportation plan considers the circumstances impacting a community's mobility and connectivity needs. This information is used to determine the measures needed to develop an equitable transportation network.

#### For more information:

- [USDOT Justice40 webpage](#)
- [FHWA/FTA TPCB Transportation Equity webpage](#)
- [FHWA Environmental Justice, Title VI, Non-Discrimination, and Equity webpage](#)



## SAFETY

### How can planning help governments ensure that transportation investments improve safety for all users?

Transportation safety is a critical challenge across the world, with roadway crashes causing 1.3 million deaths and 50 million injuries every year.<sup>1</sup> Unfortunately, road travel is just one element that must be considered. While the overall risk to passengers is much lower, governments also play a role in minimizing the risks of traveling by all modes of transportation, including busses, trains, airplanes, and ships. Transportation systems also need to be designed and managed in a way that reduces the risk of transporting hazardous or toxic substances.

Transportation planners play an important role in making sure that transportation systems are safe. When planning a new project, governments should consider ways to improve the safety both of the infrastructure itself (for example, a bridge) and of those who use the infrastructure (for example, how pedestrians and bicyclists can safely use the bridge along with cars, trucks, and motorcycles). During the planning process, it is important to understand:

- Roles and responsibilities in planning and designing a safe transportation system
- Strategies for designing, measuring, and tracking safety-related goals, objectives, and performance measures
- Methods and tools for collaborating with transportation operators and the public when planning safety-related efforts
- Locations where incidents occur most frequently, and the most appropriate solutions to address those incidents
- The needs and challenges of different types of travelers, especially those at greatest risk
- How data be used to inform decision-making

For specific needs, the U.S. Department of Transportation operates an array of educational and research bodies, including the [Transportation Safety Institute](#), which offers face-to-face instruction, virtual courses, and web-based trainings on safety topics for all modes of transportation.

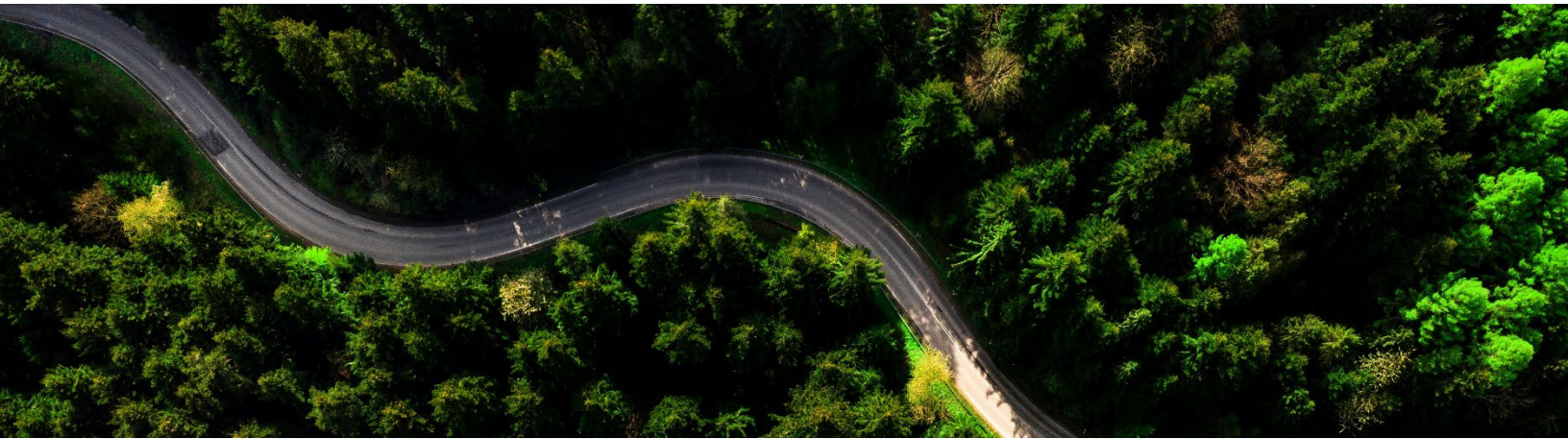
*MOMENTUM* coordinators can put interested governments and organizations in touch with these organizations to learn more.

#### For more information:

- [Road Safety Fundamentals: Concepts, Strategies, and Practices that Reduce Fatalities and Injuries on the Road](#)
- [Primer on Safe System Approach for Pedestrians and Bicyclists](#)
- [Data-Driven Safety Analysis Resources](#)

---

<sup>1</sup><https://news.un.org/en/story/2021/12/1107152#:~:text=Road%20accidents%20are%20still%20responsible,death%20and%20injuries%20by%202030>.



## CLIMATE CHANGE

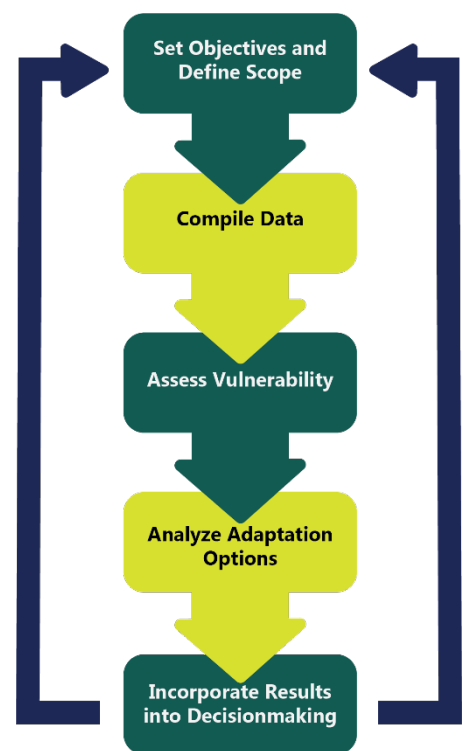
### How can planning help governments address and adapt to the impacts of climate change?

As governments prepare for the impacts of a changing climate, they must think about how transportation impacts the environment, and how the environment will impact transportation. Across the globe, transportation is responsible for 15-25 percent<sup>2</sup> of total greenhouse gas emissions. Without immediate action, this number is expected to continue to grow as global transportation demand increases over the coming decades. These harmful greenhouse gas emissions can lead to an increase in climate severity and variability, which in turn poses many threats to transportation systems and users, including:

- Damage to roads, bridges, railways, and tunnels due to flooding or extreme temperatures, leading to increased maintenance and repair costs
- Unsafe travel conditions during adverse weather events
- Increased congestion due to failed or damaged infrastructure

These negative impacts have the greatest impact on vulnerable populations, including children, the elderly, low-income communities, and communities of color.<sup>3</sup> This makes the role of governments and transportation planners even more critical.

Many countries are exploring ways to lower direct transport-sector emissions by making vehicles more efficient; advancing smart fuel efficiency and emissions



Steps in Conducting a Vulnerability Assessment

<sup>2</sup> <https://www.wri.org/insights/everything-you-need-know-about-fastest-growing-source-global-emissions-transport>

<sup>3</sup> [https://www.transportation.gov/sites/dot.gov/files/2021-10/Climate\\_Action\\_Plan.pdf](https://www.transportation.gov/sites/dot.gov/files/2021-10/Climate_Action_Plan.pdf)

standards; investing in new technologies; and encouraging the use of public transportation, walking, or biking.

Countries' sub-national governments are also looking at quantifying and reducing the carbon emissions related to constructing and maintaining transportation infrastructure. One way to accomplish this goal is by following a green procurement process to procure goods that have a lower environmental footprint across their lifecycle.

In addition to making transportation more environmentally friendly, governments must also plan for the impacts of severe weather events. Transportation agencies can conduct vulnerability assessments to understand how extreme weather and climate change could impact their infrastructure assets, such as roadways or bridges. Once a government knows which types of infrastructure is at the highest risk, it can take steps to design solutions that will help reduce that risk. For example, nature-based solutions can be used to improve the resilience of vulnerable coastal infrastructure.

***MOMENTUM* has a work stream dedicated to climate change topics, including several Toolkits.** We suggest

you check out these two Toolkits in particular:

- Addressing Transportation's Impact: A starter guide to reducing transportation greenhouse gas emissions.
- Building Resilient Infrastructure: How to create strong and adaptable transportation systems.

#### **For more information:**

- [Transportation and Climate Change Clearinghouse](#)
- [Environmental Review Toolkit](#)
- [Vulnerability Assessment and Adaptation Framework](#)
- [Nature-Based Solutions for Coastal Highway Resilience: An Implementation Guide](#)
- [Increasing Energy Efficiency and Reducing Greenhouse Gas Emissions](#)

# PROGRAMMING

## How can governments make decisions about transportation investments to achieve their vision and goals?

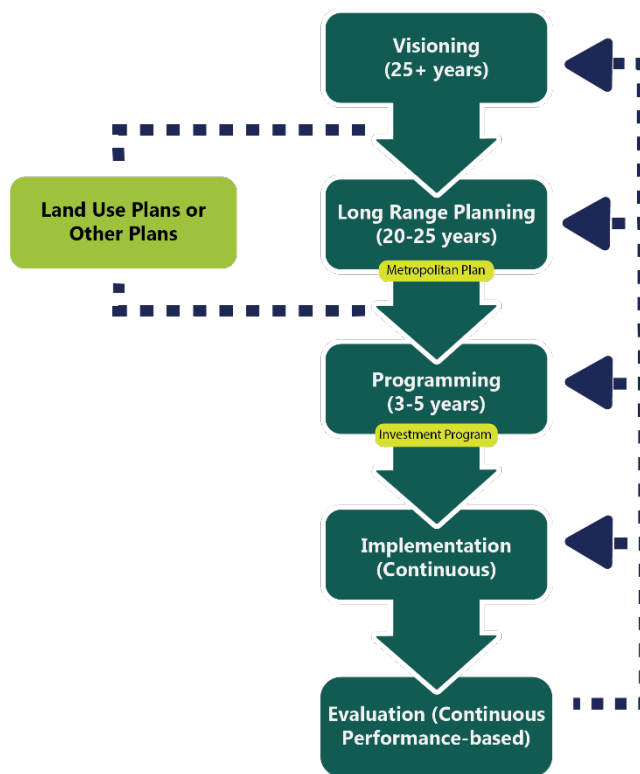
The decision to commit to investing in a project is serious for any government agency, and particularly so for transportation infrastructure projects. They can require significant upfront capital and expose an agency to a broad range of risks. Such risks include the structural failure of the facility, higher-than-anticipated construction costs, unanticipated impacts to the environment or communities, and others. Although no investment decision is risk-free, adopting a transparent, data-driven framework to manage investments can mitigate potential issues. In the United States, we use a long-term planning framework that involves a series of progressively more detailed plans, ultimately leading to a four-year spend plan. This approach ensures that projects align with the existing transportation system, and that investments match with broader policy goals.

**Planning Work Programs** list the transportation studies and tasks that transportation agencies will perform to support the transportation planning process. These planning activities are conducted to help identify the investments that can help governments achieve their transportation vision and goals. Planning Work Programs identify the funding source, the schedule of activities, and the agency or agencies responsible for each study or task.

**Long-Range Transportation Plans** identify how governments intend to invest in the transportation system through the identification of a vision, goals, and projects. Transportation Plans can include both long-range and short-range transportation investments that:

- Facilitate the efficient movement of people and goods,
- Address current and future transportation demand, and
- Provide for the development of an integrated intermodal transportation system.

Transportation Plans are prepared through active engagement with the public and stakeholders. Governments should consider how roadways, transit, nonmotorized transportation, airports, ports, and intermodal connections are able to improve the operational performance of the transportation system. Transportation Plans identify performance measures and set targets based on the vision and goals to allow governments to evaluate whether the condition and performance of the transportation system is meeting those targets.



Steps in the Planning Process



**Transportation Investment Programs** identify transportation projects and strategies that governments will pursue over the next four years. These projects reflect the investment priorities detailed in the Transportation Plan. Transportation Investment Programs list the immediate program of investments that, once implemented, will go toward achieving the government’s transportation vision, goals, and performance targets. Governments allocate their transportation resources among various capital, management, and operating investments based on a clear set of short-term transportation priorities prepared through a performance-driven process.

**For more information:**

- [FHWA/FTA TPCB Planning Essentials webpage](#)
- [Performance Based Planning and Programming Guidebook](#)
- [TPM/PBPP video and companion document](#)
- [FHWA TMIP Program](#)
- [FHWA Scoping and Conducting Data-Driven 21st Century Transportation System Analyses](#)
- [U.S. DOT Leadership Academy Transportation Toolkit](#)
- [FHWA Virtual Public Involvement webpage](#)

## **How can governments use and analyze data (e.g., system performance, population, travel demand) to help achieve desired performance outcomes?**

**Performance-Based Planning** is a strategic, data-driven approach to transportation decision-making that enables transportation planning agencies to efficiently allocate resources, maximize return on investments, and achieve desired performance outcomes while increasing accountability and transparency to the public. The way in which performance is defined and measured affects the types of projects and strategies that are advanced by decision-makers. Performance indicators can also demonstrate whether investments in transportation are linked to stated goals and achieving desired outcomes.

Governments can use performance measures and targets to monitor achievement of national goals for safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, environmental sustainability, and reduced project delivery delays.

Some of the advantages of adopting a performance-based approach to transportation planning are:

- Improved investment decision-making;
- Improved return on investments and resource allocation;
- Improved system performance;
- Increased accountability and transparency; and
- Demonstrates link between funding and performance.

If governments do not use performance and condition data to inform their transportation investment decision-making, they may invest in areas of the transportation system that have less

need and neglect failing or congested infrastructure. Having a transparent, data-driven process that informs planning decision-making helps governments invest their limited resources where the needs are greatest. Collecting and analyzing data ensures that long- and short-term transportation investment decisions are made based on their ability to meet established goals and desired performance outcomes.

Data are a foundation for:

- Selecting feasible performance measures;
- Understanding current system performance;
- Monitoring performance changes over time;
- Setting performance targets; and
- Evaluating the effectiveness of implemented strategies.

Governments can apply data in the use of decision support tools to understand the potential impact their decisions have on the transportation network, people, land use, and the environment. Decision support tools include transportation models, land use models, Geographic Information Systems (GIS), scenario planning models, and remote sensing.

#### **For more information:**

- [Performance Based Planning and Programming Guidebook](#)
- [TPM/PBPP video and companion document](#)
- [FHWA TMIP Program](#)
- [FHWA Scoping and Conducting Data-Driven 21st Century Transportation System Analyses](#)



## PUBLIC ENGAGEMENT

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

Public involvement ensures that transportation decisions consider public needs and preferences. The fundamental objective of public involvement programs is to ensure that the concerns and issues of people with a stake in transportation decisions are identified and addressed. Early and ongoing public involvement brings diverse viewpoints into the decision-making process. Public involvement lets agencies make better-informed decisions and builds mutual understanding and trust between agencies and the public they serve. Successful public participation is a continuous process that obtains input from and informs the public.

When governments make decisions that affect the public without engaging the public in those decisions, they run the risk of losing public support for the project. This can lead to local resistance to transportation projects and may lead to project cancellation. While not everyone may agree on the final outcome, public engagement can help address and mitigate public concerns throughout the transportation process.

The public includes any individual or group who resides, is employed, has an interest, or does business in an area potentially affected by transportation decisions. It is also important for all private and public providers of transportation services, including, but not limited to, the trucking and rail freight industries, the intercity rail passenger industry, taxicab operators, and all transit and paratransit service operators to have an opportunity to participate. Finally, **extra efforts may be needed to engage persons traditionally underserved by existing transportation systems**, such as low-income populations, minority populations, the disabled, and the elderly.

## How can governments meaningfully engage key stakeholders (e.g., the public, other levels of government) and address their input in transportation decision making?

A well-informed public and stakeholder base has the best chance to contribute meaningful input into transportation decisions through a broad array of involvement opportunities at all stages of decision-making. Useful elements of an effective public involvement program include:

- A clearly defined purpose and objectives for initiating a public dialogue on transportation issues.
- Identification of the public and other stakeholder groups that will be affected by the plans and programs being developed.
- Identification of techniques for engaging the public in the planning process.
- A concerted effort to identify how future visions and goals of the community will affect transportation.
- Effective procedures for notifying affected groups of meetings, project progress, and other benchmarks.
- Methods and measures for evaluating whether the public involvement program is effective.
- Education and assistance techniques that lead to an accurate and full public understanding of transportation issues.
- Follow-through by the stakeholder to demonstrate that decision makers seriously considered public input.
- Feedback from the public and stakeholders on whether the public involvement process is effective.

### For more information:

- [FHWA/FTA TPCB Planning Essentials webpage](#)
- [U.S. DOT Leadership Academy Transportation Toolkit](#)
- [FHWA Virtual Public Involvement webpage](#)



# FUND

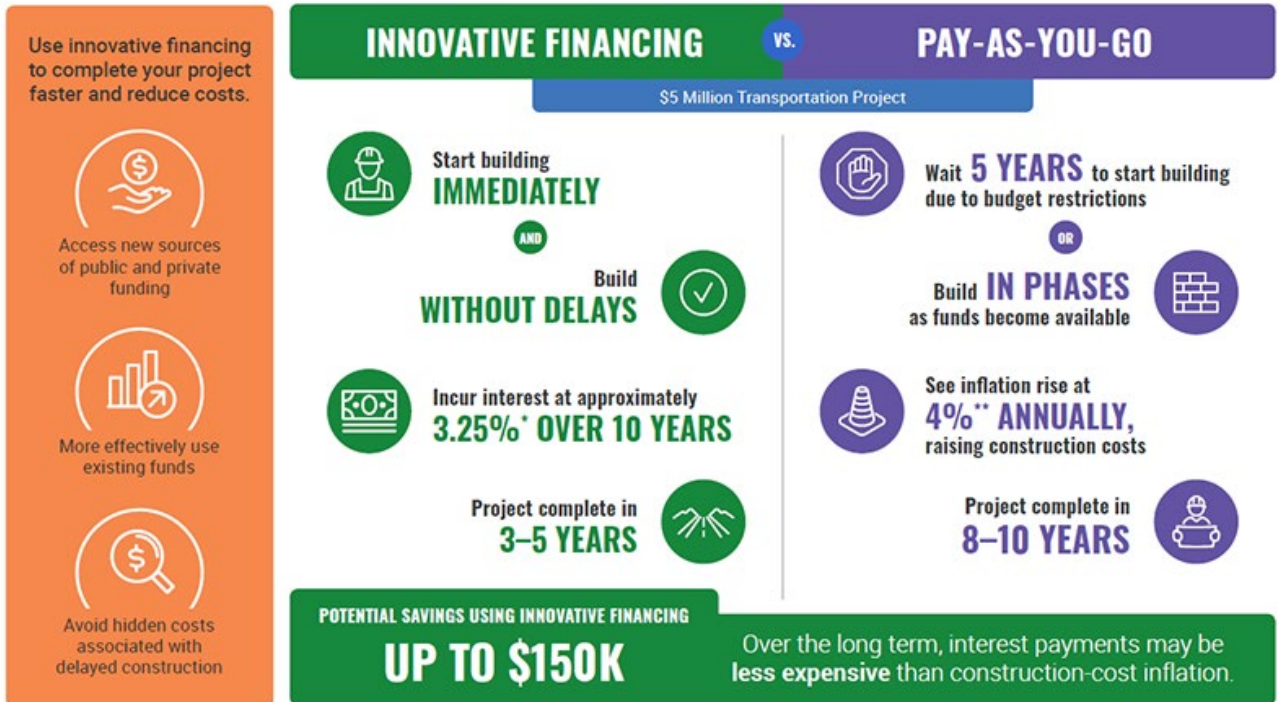
## FINANCING

### How can governments employ traditional and innovative finance techniques for transportation investments?

Project finance refers to specially designed techniques and tools that supplement traditional financing methods, improving governments' ability to deliver transportation projects. This typically means borrowing money, through bonds, loans, or other financing mechanisms. Borrowing money for project implementation helps accelerate implementation of needed infrastructure. But just like borrowing money for a home or other major purchase, project finance tools require a repayment source. In many instances, using project finance tools requires the development and imposition of new revenue streams to pay back bonds or loans issued to support investment.



## Accelerate Your Transportation Program



\*Interest rate variable | \*\*Estimated from FHWA data

A Comparison of Innovative Financing and Pay-as-you-Go

Project finance is typically used for large capital projects in cases where using the "pay-as-you-go" model does not make good planning and programming sense; that is, because the project's capital needs would consume most if not all available funding - and still often fall short of being fully funded. Further, given long-term benefits of transportation infrastructure, it can be economically sound to spread the project costs over the asset's life-cycle. However, project finance comes at a cost, because interest is paid over the long-term for the money that is borrowed today. But the additional cost of financing might be justified if it is less than the potential project cost increase due to inflation, or it is outweighed by the benefits of having the project available in the near-term.

---

## FUNDING

### **How can governments generate sustainable, long-term revenue streams that can help repay debt used to finance the upfront costs of building infrastructure?**

Tolls, user fees, and other project-based revenue sources, in combination with new finance tools, can substantially increase a governments' ability to deliver projects.

While grants may traditionally be viewed as the primary answer to providing funding for transportation projects, they are often only a part of the equation. With limited funding available, transportation agencies and governments at all levels must increasingly think outside the box to explore other options for supplementing their budgets. Innovative finance techniques can help make the best use of the resources and financing and funding opportunities available.

Innovative financing includes borrowing funds, either through bonds, loans, or other financing mechanisms. Innovative funding is the revenue that is needed for the financing. By using innovative finance techniques, transportation agencies can better leverage resources, allowing for more flexibility and expanded options in managing and delivering transportation projects.

An example of an innovative finance technique is tolling. Tolling is the charging of fees for motorists' use of a roadway facility. These fees may be per-use, fixed, dynamic, or distance-based that vary by vehicle type. The primary purpose of tolling is to generate revenue.



## **PUBLIC-PRIVATE PARTNERSHIPS**

### **What are public-private partnerships?**

Public-private partnerships (P3s) are contractual agreements between a government and a private entity that can involve the private sector taking on additional project risks, such as design, construction, finance, long-term operation, and traffic revenue. P3s can also provide different ways to repay private entities who have invested in transportation projects, often through tolling, fees, or other payments. There are numerous benefits to the P3 approach. P3s may:

- Shift some risk from the public sector to the private sector;
- Accelerate the delivery of transportation projects;
- Spur innovation in project design or delivery;
- Enable a longer-term view of asset management;
- Provide access to additional capital to fund design, construction, or maintenance, and
- Reduce public cost and/or the need to incur debt to fund projects.

P3s are undertaken for a variety of purposes. In some cases, the purpose is to use existing assets to generate funds (asset monetization). In other cases, P3s are used to develop greenfield (i.e., new construction) projects or to rehabilitate and expand existing facilities. It is important to note that P3s are a procurement option, not a revenue source. Although P3s may increase financing capacity and reduce costs, the public sector still must identify a source of revenue to pay for the project. In addition to the benefits of P3s, there are some limitations. P3s:

- Require considerable time and cost to develop, analyze, procure, and monitor;
- Can offer access to capital, they do not provide States with new revenue; in fact, P3s need a revenue stream to work; and
- May not be the most cost-effective or appropriate procurement model for projects if the public sector can deliver better value without it.

Before entering into a P3, governments should determine the appropriate level of return on investment for the private sector and to ensure fair toll rates for users. P3 procurement involves

difficult financial, legal, and technical issues. States need to acquire the technical and institutional capacity to develop and oversee P3s and will need to hire outside expertise to help in various phases, including planning, project feasibility evaluation, and contract negotiations. Most countries with P3 programs require rigorous analysis, such as a "value for money analysis," which evaluates the relative value of delivering the project through a P3 vs. a more traditional procurement model.

**For more information:**

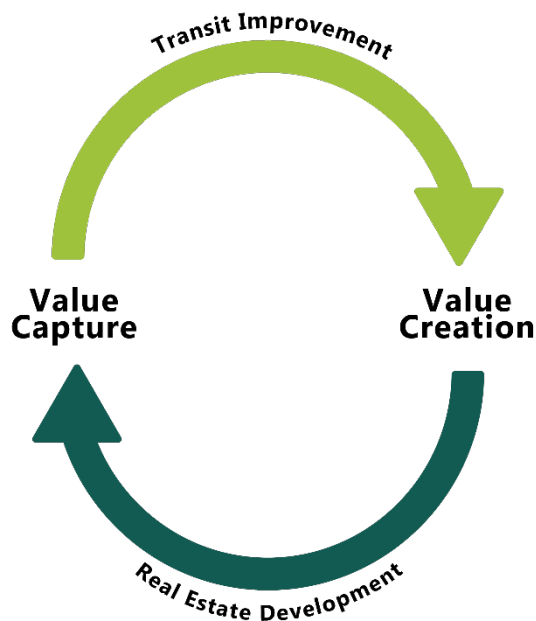
- [FHWA P3 Toolkit](#)
- [FHWA P3 Website](#)
- [FHWA P3 Video](#)

## How can governments use value capture strategies to fund transportation projects and maintenance?

Public investments in transportation infrastructure often improve access to properties, increasing property values and promoting economic development. Value capture may help recover a portion of these increased property values, which can be used to pay for current or future transportation projects or improvements.

Value capture is an umbrella term, covering a range of revenue mechanisms with a common goal—funding projects from those who benefit from transportation improvements rather than from general taxpayers. This video will introduce you to the seven most common value capture techniques. They are:

- **Developer Contributions**, where governments receive fees or contributions from private entities that directly benefit from a transportation project;
- **Special Assessments**, which generate funding by getting beneficiaries in a specific geographic area to help pay for public infrastructure improvements;
- **Transportation Utility Fees**, which treat the transportation system like a utility and charge fees based on expected trip generation;
- **Incremental Growth**, through which governments allocate a portion of increased tax revenues generated by new development to help pay for infrastructure for a specified period;
- **Joint Development**, which enables governments to work together with developers to make improvements above or near transportation infrastructure;
- **Naming Rights, Advertising, and Sponsorships**, where private entities pay to name, advertise on, or sponsor transportation facilities; and



Value Capture and Value Creation



- **Asset Recycling**, where governments extract value from existing assets through the sale or lease of the assets to the private sector, and the use of the proceeds to invest in new infrastructure.

Value capture can be applied to most transportation development scenarios, including new capacity, rehabilitation, and improvement projects in urban, suburban, and rural settings. Value capture could provide governments with additional opportunities to raise funds for project construction and infrastructure maintenance.

Here are some of the other benefits of value capture:

- **Accelerated Project Delivery.** Waiting for funding to become available can delay project delivery, resulting in additional costs, traffic congestion, safety impacts, and degraded infrastructure. Value capture strategies may enable projects to be constructed sooner by generating revenue prior to and during project implementation.
- **Sustained Revenue Sources.** Value capture techniques may provide reliable and continuous funding for capital costs as well as for operations and maintenance.
- **Encouraging Equity.** Value capture can promote equity by reinforcing the “beneficiary pays” principle, where those who benefit from a public investment pay in proportion to the benefits they receive.
- **Smart Land Use.** Value capture can encourage the highest and best use of property near publicly owned transportation infrastructure. It can help prevent sprawl and encourage land uses that reflect community priorities.

#### For more information:

- [FHWA Value Capture Website](#)
- [FHWA Value Capture Video](#)

# DELIVER

---

## ENVIRONMENTAL ANALYSIS

### How can governments assess and mitigate the impacts that transportation projects have on the environment and climate change?

The transportation system impacts the environment. Vehicles may emit pollutants, release greenhouse gas emissions, and create noise. Transportation infrastructure may inhibit the flow of water and wildlife and damage natural resources. Governments should understand and mitigate the impacts that proposed transportation projects will have on the environment and mitigate them to limit negative environmental impacts. If the environmental impacts of transportation are not mitigated, air and water quality, natural resources, and wildlife may be irreparably damaged or destroyed.

The essential elements of a comprehensive environmental review process include:

- Assessment of the social, economic, and environmental impacts of a proposed project;
- Analysis of a range of reasonable alternatives to the proposed project, based on the purpose and need for the project;
- Consideration of the appropriate impact mitigation: can the impact be avoided, minimized, or compensated for;
- Coordination and consultation with agencies that manage natural resources;
- Public involvement activities that provide opportunities for the public and stakeholders to participate and comment; and
- Documentation and disclosure of the environmental analysis and a final decision on the approach to addressing the environmental impacts.

#### For more information:

- [Synchronizing Environmental Reviews for Transportation and Other Infrastructure Projects: 2015 Red Book](#)
- [FHWA Environmental Review Toolkit](#)
- [FTA Environmental Resources Information](#)
- [FHWA PlanWorks GHG Emissions webpage](#)



## SUSTAINABLE TRANSPORTATION

### How can government increase the sustainability of transportation infrastructure?

Sustainability is often described using the “triple bottom line” concept, which includes consideration of three primary principles: Social, Environmental, and Economic. The goal of sustainability is the satisfaction of basic social and economic needs, both present and future, and the responsible use of natural resources, all while maintaining or improving the well-being of the environment on which life depends.

In the transportation industry, projects and systems serve many objectives, including safety, mobility, environmental protection, livability, and asset management. A sustainable approach seeks to meet all of these needs while hitting economic targets for cost-effectiveness throughout a highway's life cycle. By taking a sustainable approach to transportation investments, governments can make balanced choices among environmental, economic, and social values that benefit current and future road users. A sustainable approach considers access (not just mobility), movement of people and goods (not just vehicles), and provision of transportation choices, such as safe and comfortable routes for walking, bicycling, and transit.

Transportation projects that are not designed and constructed with sustainability in mind may contribute to climate change through increased greenhouse gas emissions and may be more vulnerable to extreme weather caused by climate change.

The [Infrastructure Voluntary Evaluation Sustainability Tool \(INVEST\)](#) is used by government agencies in the U.S. to identify characteristics of sustainable highways. It provides information and techniques to help agencies and organizations integrate sustainability best practices into highway and other roadway projects. The tool is intended to provide a method for practitioners to evaluate their transportation projects and to encourage progress in the sustainability arena.

Several other tools are available to assess and measure the sustainability of transportation assets. These include:

- **Economic:** Life Cycle Cost Analysis (LCCA) and Life Cycle Planning (LCP)
- **Environmental:** Life Cycle Assessment (LCA)
- **Social:** Sustainability Rating Systems (SRS) and Social LCA (SLCA)

There are also many different strategies governments can use to increase infrastructure sustainability across all phases of the lifecycle:

- **Materials:** When possible, use recycled, co-products, or waste materials, or incorporate emerging technologies that can improve sustainability.
- **Design:** Use sustainable design strategies, such as using longer life pavements, incorporating local materials, accelerated construction, and single lane rehabilitation.
- **Construction:** Identify and implement new construction techniques and software tools that are available to improve construction efficiency and reduce environmental impacts.
- **Use:** Consider the impacts of pavement on vehicle operations and the interaction between infrastructure, the environment, and humans.
- **Maintenance and Preservation:** Use low-cost, low-impact methods to improve pavement life.
- **End-of-Life:** Determine the economic and environmental impacts associated with re-using, recycling, or removing pavement at its end-of life

#### For more information:

- [FHWA Sustainable Highways Initiative](#)
- [INVEST \(Infrastructure Voluntary Evaluation Sustainability Tool\)](#)
- [FHWA Sustainable Pavements Program](#)
- [Toward Sustainable Pavement Systems: A Reference Document](#)

---

# DESIGN

## How can governments design transportation projects that achieve their goals?

The U.S. Department of Transportation has developed guidance on how project sponsors should design transportation projects to ensure that they are safe, achieve desired levels of functionality, and are practical.

When governments are faced with the challenges of aging transportation infrastructure and limited funding, it is important to consider how changing technologies and an increased understanding of performance can improve the design of transportation infrastructure. Doing so can improve the government's return on investment and ensure that the project achieves vision and goals laid out in the planning process and improves system performance.

**Performance-Based Practical Design (PBPD)** is a decision-making approach that can help governments better manage transportation investments and improve performance with limited resources. Through PBPD, governments can weigh project-level results and associated trade-offs against system-wide performance needs and goals. By focusing on system-wide performance, governments can better manage the cumulative effectiveness of individual project investments to achieve the vision and goals.

**Value Engineering (VE)** is a systematic process of review and analysis of a project, during the concept and design phases, by a multidiscipline team of persons not involved in the project. VE helps governments in the design process by helping to identify the functions needed to address safety, reliability, efficiency, and cost. VE improves the value and quality of the transportation project while saving time and money. VE process can improve the quality of transportation projects and improve the delivery of transportation projects overall.

### For more information:

- [Federal Lands Highway Design Library](#)
- [Manual on Uniform Traffic Control Devices](#)
- [Performance-Based Practical Design Start-Up Guide](#)
- [Value Engineering](#)
- [Federal Lands Highway Project Development and Design Guide](#)
- [Federal Transit Administration Project and Construction Management Guidelines](#)



## How can governments partner with the private sector to deliver transportation projects?

Governments can engage the private sector in the design and construction of transportation projects. This can be through a standard contract or through a public-private partnership (P3). See page 17 for more information on P3s. Governments partner with private firms to take advantage of their expertise and capacity for designing and constructing projects. For example, a government agency may not have expertise in designing a light rail train, so the agency would contract with a private firm that has a proven history of designing light rail trains for other parts of the world. Contracting with the private sector also helps to create jobs and spur economic development.

Through contracts and P3s, governments detail specifications that a private firm must meet to be compensated for their work, and the government and firm agree to specific terms as part of the agreement. These terms include the government's actions to oversee the private firm's progress and approving interim deliverables before the work is completed. Having effective oversight over the work helps to ensure the private firm meets the government's needs. Without proper oversight, the work may not meet the government's expectations or may not be delivered at all, wasting public resources.

### For more information:

- [FHWA Contract Administration Core Curriculum Manual](#)
- [FHWA Alternative Contracting Methods Library](#)
- [FTA Best Practices Procurement & Lessons Learned Manual](#)

---

## CONSTRUCTION

### How can governments improve effectiveness, efficiency, and safety of their construction programs?

Transportation construction projects are successful when they achieve the intended scope and function of the project, are built to world-class standards, and are delivered on-schedule and within the estimated budget. Governments should use sound construction management practices, whether construction is being done in-house or through a private firm, to ensure that the construction project meets the government's needs.

Before a project is ready for construction, it will have gone through planning, environmental review, design, and engineering processes to identify the need, methods for addressing the need, and how the project will function. Prior to construction, governments should develop a project management plan to deliver the project as expected.

The project management plan is a tool to help governments effectively and efficiently deliver a quality product through the completion of construction. The purpose of the project management plan is to clearly define the roles and responsibilities of leadership and the management team, and to document the procedures and processes that are in effect. This will provide timely information to project decision-makers in areas such as:

- Identifying project requirements;
- Establishing communication protocols; and
- Managing scope, quality, schedule, cost, resources, risks, and applicable laws and regulations.

Without a project management plan to define roles, responsibilities, procedures, and processes, the construction requirements may not be clear to the entity performing the work. This could lead to inferior products being used, unsafe construction practices, missed deadlines, and wasted money. Project management plans with effective construction oversight can ensure that the project is built to specification and meets the defined project need.

#### Elements of a Project Management Plan:

1. **Project Purpose, Goals, Objectives, and Metrics:** What is the project trying to achieve, and how will success be measured?
2. **Project Description:** What are the scope and elements of the project?
3. **Project Procurement:** How will services (e.g., environmental analysis, design, construction) be acquired?
4. **Project Organizational Management:** Who makes up the project management team, and what are their roles?
5. **Project Management Controls:** What tools will be used to evaluate performance?
6. **Project Communications Management:** How will lines of communication be maintained throughout construction?
7. **Project Documentation and Reporting:** How will project records be managed?
8. **Project Closeout:** What processes will take place to close out the project as it nears completion?
9. **Project Oversight:** What are the roles and responsibilities for ensuring requirements are met?
10. **Management of the Project Management Plan:** How will the project management plan be updated and maintained?

#### For more information:

- [FHWA Construction and Project Management Website](#)
- [FHWA Project Management Plan Guidance for Major Projects](#)
- [FTA Project and Construction Management Guidelines](#)

# MAINTAIN

---

## OPERATIONS

### How can governments get through the most performance out of existing transportation facilities through operational improvements?

Transportation Systems Management and Operations (TSMO) is a set of strategies that focus on operational improvements that can maintain and even restore the performance of the existing transportation system before extra capacity is needed. TSMO strategies can also help make maintenance activities safer and more efficient. By using these strategies, governments can improve the performance of existing facilities and systems, while also increasing quality of life indicators, improving traffic flow and congestion, reducing congestion and fuel waste, improving economic vitality, and using resources more efficiently.

TSMO considers the transportation system as a whole and is considered at every stage of the project lifecycle. Some examples of TSMO strategies include:

- **Road Weather Management:** Developing and deploying innovative strategies to mitigate disruptive impacts of weather events
- **Integrated Corridor Management:** Coordinating operations across networks and facilities to improve the efficiency of transportation corridors
- **Traffic Incident Management:** Developing planned and coordinated multi-disciplinary processes to detect, respond to, and clear traffic incidents.
- **Traveler Information:** Communicating real-time information to travelers about maintenance work or other disruptions

#### For more information:

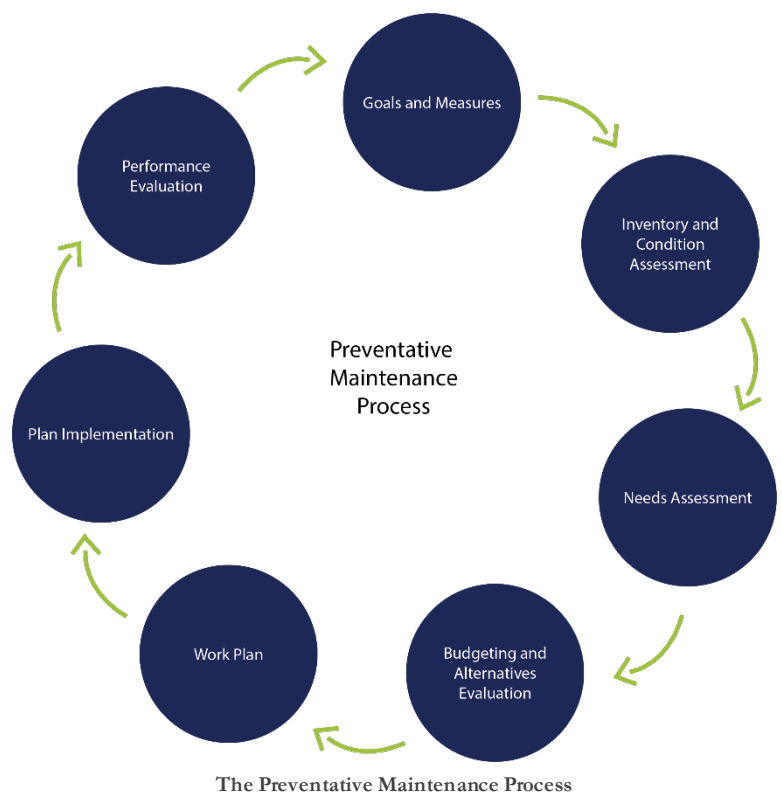
- [FHWA Transportation System Maintenance and Operations \(TSMO\) Website](#)
- [Connecting TSMO and Maintenance](#)
- [Transportation Systems Management and Operations in Action](#)

# MAINTENANCE

## How can governments plan for and implement regular and routine maintenance programs?

Maintenance describes work that is performed to maintain the condition of the transportation system or respond to specific conditions or events that restore the highway system to a functional state of operations. Maintenance activities can be either routine or preventive. Routine maintenance is a reoccurring activity that takes place in response to an event, season, or short-term operational needs. Preventive maintenance is a planned strategy that focuses on preservation, reducing deterioration, and improving functionality. To develop a strategic approach, a government can follow the steps of a Systematic Preventive Maintenance (SPM) program, which include:

- Clearly defining goals and objectives for the maintenance effort
- Defining specific activities, including assessing existing condition criteria
- Conducting infrastructure inspections and evaluations
- Documenting a needs assessment process that outlines the identification, prioritization, and programming of maintenance needs
- Demonstrating the cost-effectiveness of strategies for extending infrastructure life
- Identifying and implementing projects, including assessing the availability of tools and resources to complete the planned work
- Tracking, evaluating, and reporting planned and completed maintenance activities



### For more information:

- [FHWA Guidance on Preservation and Maintenance](#)
- [FHWA Bridge Preservation Guide](#)
- [Connecting TSMO and Maintenance](#)
- [FTA Transit Asset Management Website](#)

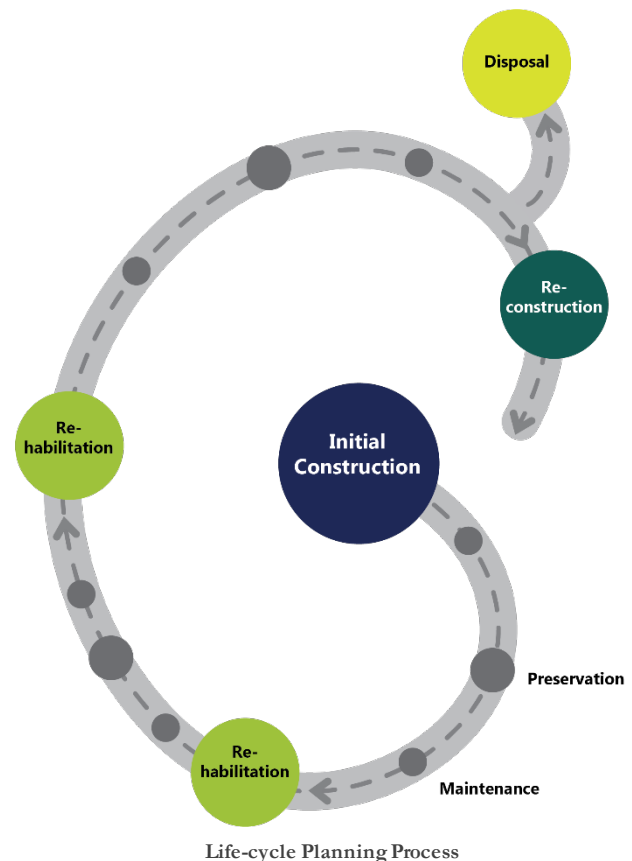
---

# MONITORING/EVALUATION

## How can governments apply a strategic and systematic process of operating, maintaining, upgrading, and expanding physical assets effectively throughout their lifecycle?

Governments can use life-cycle planning processes to develop strategies for all aspects of asset management. These processes allow an organization to:

- Establish a long-term focus for improving and preserving the system.
- Develop maintenance strategies that consider long-term investment needs.
- Determine the funding needed to achieve the desired state of good repair.
- Determine the conditions that can be achieved for different levels of funding.
- Reduce the annual cost of system preservation without impacting asset conditions.
- Provide objective data to support investment decisions.
- Eliminate existing performance gaps.
- Demonstrate good stewardship to internal and external stakeholders.



### For more information:

- [FTA Transit Asset Management Systems Handbook](#)
- [FHWA Resources for the Asset Management Practitioner](#)
- [Using a Life Cycle Planning Process to Support Asset Management](#)
- [Demonstrating the Application of Life Cycle Planning on a Pavement Network](#)



## GLOSSARY



**Accountability:** An obligation or willingness to accept responsibility or to account for an individual's group's, or organization's actions.

**Climate Change:** A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions, and persistent human-caused changes in the composition of the atmosphere or in land use.

**Equity:** The consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as indigenous and racial/ethnic minorities; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality. Transportation equity ensures that transportation delivers equitable benefits to a variety of users and that any associated burdens are avoided, minimized, or mitigated so as not to disproportionately impact specific populations.

**Geographic Information Systems (GIS):** Digital mapping tools that allow users to display, analyze, and manipulate spatial data. Geospatial data analysis can be used to support decisions, to pinpoint hot spots to allocate resources, and to advance other projects that support our mission.

**Greenhouse Gas Emissions:** Gaseous constituents of the atmosphere that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, the atmosphere itself and by clouds. This property causes the greenhouse effect. Water vapor (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>) and ozone (O<sub>3</sub>) are the primary GHGs in the Earth's atmosphere.

**Green Procurement:** The acquisition of products and services with smaller-than-average environmental footprints.

**Life-Cycle Planning Process:** A systematic asset management strategy that plans for each asset's life-cycle while considering ways to minimize costs and preserve or improve system conditions and performance.

**Long-Range Transportation Plan:** A multi-decade (e.g., 20-year) planning vision document that reflects the application of programmatic transportation goals to project prioritization. Long-

range transportation plans identify how governments intend to invest in the transportation system through the identification of a vision, goals, and projects.

**Maintenance:** Work that is performed to maintain the condition of the transportation system or respond to specific conditions or events that restore the highway system to a functional state of operations. Routine maintenance is a reoccurring activity that takes place in response to an event, season, or short-term operational needs. Preventative maintenance is a planned strategy that focuses on preservation, reducing deterioration, and improving functionality.

**Performance-Based Planning:** A strategic, data-driven approach to transportation decision-making that enables transportation planning agencies to efficiently allocate resources, maximize return on investments, and achieve desired performance outcomes while increasing accountability and transparency to the public.

**Performance-Based Practical Design (PBPD):** A project scoping process that strictly addresses the purpose and need of a project while grounding decisions in a performance-management framework. PBPD helps governments better manage transportation investments and improve performance with limited resources.

**Planning Work Program:** A statement of work that identifies the funding source, the schedule of activities, and the transportation agency or agencies responsible for each transportation study or task.

**Project Finance:** Specially designed techniques and tools that supplement traditional financing methods, improving governments' ability to deliver transportation projects. Project finance typically involves borrowing money through bonds, loans, or other mechanisms.

**Project Management Plan:** A tool to help governments effectively and efficiently deliver a quality product through construction. Project management plans clearly define the roles and responsibilities of leadership and the management team and document procedures and processes.

**Public Engagement:** A process that engages the public in transportation decision-making and considers public input in making decisions. Public engagement ensures that transportation agencies consider public needs and preferences as well as how transportation plans, projects and policies will benefit and burden the public.

**Public-Private Partnership (P3):** A contractual agreement between a government and a private entity that can involve the private sector taking on additional project risks, such as design, construction, finance, long-term operation, and traffic revenue.

**Resilience:** The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning, and transformation.

**Stakeholder:** A person or group that is or believes they are affected by a transportation plan, program, or project. Stakeholders can also include residents of affected geographical areas.

**Sustainability:** The satisfaction of basic social and economic needs, both present and future, and the responsible use of natural resources, all while maintaining or improving the well-being of the environment on which life depends.

**Transportation Investment Programs:** A planning framework that lists the immediate program of investments that, once implemented, will help achieve the vision, goals, and performance targets identified in a long-range transportation plan. Transportation investment programs identify transportation projects and strategies that governments will pursue over several (e.g., 5) years.

**Transportation Systems Management and Operations (TSMO):** A set of strategies that focus on operational improvements that can maintain and even restore the performance of the existing transportation system before extra capacity is needed.

**Value Capture:** An umbrella term covering a range of revenue mechanisms that fund projects from those who benefit from transportation improvements rather than from general taxpayers.

**Value Engineering (VE):** A systematic process of review and analysis of a project during the concept and design phases by a multidisciplinary team of persons not involved in the project. The goals of VE are to provide the needed functions safely, reliably, efficiently, and at the lowest overall cost; improve the value and quality of the project; and reduce the time to complete the project.

**Vulnerability:** The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

## SELF-ASSESSMENT QUESTIONS



This Appendix presents a series of questions that will help you and your agency think through how you plan, fund, deliver, and maintain transportation infrastructure.

Additionally, if your agency is interested in partnering with *MOMENTUM* to share approaches or learn more about transportation infrastructure development and delivery, answering these questions in advance of reaching out will help improve the quality of the cooperation between your agency and the U.S. DOT.

Consider the following questions:

- **What roles and responsibilities do government agencies in your country have regarding the development of the transportation system?**
- **How is your agency accountable to the public?**
- **What are your government's short-term and long-term goals for transportation infrastructure?**
  - What projects is your agency developing that can help achieve those goals?
- **What are some of the equity gaps your country is facing?**
  - Which groups are underserved by transportation in your country?
- **What are the biggest transportation safety concerns your agency is facing?**
- **Which elements of your country or region's transportation system need the greatest investment? Why?**
- **What data does your government analyze to inform transportation decisions?**
- **How does your government involve and engage the public in the development of transportation policies, programs, systems, and projects? Is this required by laws or regulations?**
- **What are the financial opportunities for transportation investments in your country?**
- **How does your government engage the private sector in transportation investments?**
- **How does your government assess and mitigate the impacts that your country's transportation system has on the environment and climate change?**

- **What design strategies has your government implemented to help achieve your country's transportation goals?**
- **What operations and maintenance strategies has your government implemented that improve transportation system performance?**



For more information about processes for building great transportation infrastructure, or to learn more about partnering with *MOMENTUM*, please contact us at [momentum@dot.gov](mailto:momentum@dot.gov).