



Comprehensive Corridor Planning for Congested Corridors: Survey of Practice

Requested by
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Executive Summary

Background

As a result of recent legislation (Senate Bill 1, 2017-2018), the California Transportation Commission (CTC) is required to develop guidelines for the new Solutions for Congested Corridors Program (SCCP). The purpose of the SCCP is to support and encourage multimodal and multiagency collaborative and comprehensive corridor planning. CTC must determine definitions of terms and what constitutes a comprehensive corridor plan that is satisfactory to the SCCP. CTC must also identify how to evaluate such plans, develop metrics for the required project scoring criteria and develop a methodology for project reporting.

To inform the development of SCCP guidelines, Caltrans and CTC are interested in learning how other local, regional and state agencies in states with large urban areas evaluate transportation corridor plans and the projects associated with those plans.

To gather information about corridor planning practices for congested corridors, CTC & Associates surveyed representatives from a range of transportation-related agencies, including state departments of transportation (DOTs), selected metropolitan planning organizations (MPOs) in California and in major metropolitan areas, and organizations conducting transportation research. A literature search of publicly available documents supplemented survey results.

Summary of Findings

Survey of Practice

An online survey was distributed to representatives from 28 agencies expected to have knowledge of and experience with the development of comprehensive corridor plans. Representatives from four state DOTs, five MPOs and one transportation research organization responded to the survey.

The survey sought information in three categories:

- Corridor plan definitions.
- Corridor plan development.
- Project evaluation.

The following highlights some of the key findings from the survey and the literature search that supplemented survey responses.

Corridor Plan Definitions

The survey sought definitions for seven terms that might be found in a comprehensive corridor plan for congested corridors. Definitions identified in publications produced by state, local and regional agencies not responding to the survey supplemented survey responses.

Below is a brief summary of the definitions described in the report. Publications providing supplemental or supporting information appear in **Related Resources** beginning on page 16.

Corridor. This is the most general of the seven terms we sought to define and the one most often addressed by respondents and in agency documents. Some agencies categorize corridors (regional or subregional, national or statewide), while others opt to define a facility plan rather than a corridor.

Highly traveled corridor. Several agencies reported no formal definition. The California MPOs responding to the survey consider annual average daily traffic; other respondents indicated that level of service (LOS) plays a role in identifying a highly traveled corridor.

Congestion on controlled access freeways. Among the measures respondents identified when defining this type of congestion are travel time index, volume to capacity (V/C) ratio, density and LOS.

Congestion on local streets and roads. Respondents most often use the LOS metric to define this type of congestion. Travel time index and V/C ratio are also used.

Congestion associated with passenger rail. While few respondents offered detailed definitions, some identified travel speed, travel time, wait times and capacity.

Congestion associated with transit. Two respondents noted peak load; other respondents provided definitions similar to those provided for congestion associated with passenger rail.

Congestion associated with bicycle and pedestrian facilities. This term generated the fewest responses, with two agencies reporting LOS or level of traffic stress as relevant measures.

A table on page 15 of the report provides definitions of congestion that are not specific to a roadway type or travel mode. These definitions are taken from agency publications and not from survey responses.

Corridor Plan Development

Respondents were asked about specific issues that could be addressed in transportation plans for congested corridors, including:

Tort liability. Most respondents indicated that tort liability was not applicable to their corridor planning practices. Respondents noted that tort liability is typically associated with the owner and operator of a facility, or is more applicable to project development than planning.

Environmental requirements. Responding agencies address environmental requirements in corridor plans by specifying them in project deliverables, employing a formalized agency process (Florida DOT's Efficient Transportation Decision Making process) or considering state and federal requirements such as the National Environmental Policy Act (NEPA) and state-specific environmental laws.

Congestion related to tourism or truck travel in rural areas. Three agencies described efforts to address congestion related to tourism or truck travel in rural areas in the corridor plans their agencies develop:

- **Metropolitan Transportation Commission (California).** Corridor improvement strategies are based on analyses of peak traffic periods, which include the impacts of tourism and/or truck traffic, where applicable or may be related to specific issues

associated with tourism or truck traffic (such as passing lanes or intersection storage).

- **Southern California Association of Governments (California).** The agency's Comprehensive Regional Goods Movement Plan and Implementation Strategy includes recommended implementation strategies to relieve truck bottlenecks identified on State Route 98 (SR-98) in Imperial County, which is located in a rural area of the state.
- **Florida Department of Transportation.** Typical peak hour congestion analysis is not enough to fully capture tourist or truck travel, so the agency collects off-peak and weekend counts on corridors that experience heavy tourist traffic. Truck counts are collected on rural corridors and the truck percentage is used in corridor analyses to develop plans that account for congestion due to truck traffic.

Best practices. Respondents pointed to exemplary plans (Southern California Association of Governments' I-105 Corridor Sustainability Study and Atlanta Regional Commission's Strategic Regional Thoroughfare Plan) when asked to share best practices associated with innovative, comprehensive transportation corridor plans. Other agencies highlighted the importance of stakeholder or public involvement. An example of this type of engagement is Florida's Future Corridors, a cooperative effort between the DOT and statewide, regional and local partners to envision and plan the future of Florida's major statewide transportation corridors over the next 50 years.

Project Evaluation

Respondents were asked how their agencies defined and measured six criteria when evaluating project effectiveness and/or competitiveness, including:

Safety. The metrics cited by respondents include the number of fatalities, injuries and crashes, and benefit-cost ratios. Agencies also consider equivalent property damage and vehicle miles traveled.

Congestion. Metrics include travel time, planning time index, LOS, queuing, delay, peak hour excessive delay, person throughput and person hours of delay.

Accessibility. Measures consider access to jobs, new or improved connections to land uses, recreation, resources and jobs, and peak period travel time.

Efficient land use. Some agencies have elected not to measure efficiency of land use, while others evaluate the amount of population and employment located in areas with high nonwork accessibility.

Economic development and job creation and retention. Measures consider accessibility, intermodal access and travel time reliability.

Furtherance of state and federal ambient air quality and GHG reduction standards. Agencies measure air quality using travel demand models and other tools. Performance measures consider reductions in emissions and levels of volatile organic compounds and a range of gases.

Other Related Resources

Publications that supplement survey findings and the documents supporting them are presented in three topic areas:

Preparing a corridor plan. National guidance includes a decision guide associated with Federal Highway Administration's (FHWA's) PlanWorks, a tool that addresses the critical topics included in a corridor plan, and a 2010 NCHRP guidebook on corridor-based planning. State practices are highlighted in a 2008 publication that provides eight case studies of tools and strategies used to develop corridor plans, and guidance prepared by Maine and Washington State DOTs.

Corridor planning and the environment. FHWA publications present a Planning and Environmental Linkages approach to corridor planning and describe how corridor planning can be used to inform the NEPA review process. A case study shows how Idaho Transportation Department integrated NEPA into corridor planning practices.

Evaluating projects. National guidance includes a transit-focused peer exchange that examined performance measures, and an SHRP 2 report that addresses how agencies can incorporate reliability performance measures into the planning and programming processes. Journal articles and conference papers describe how transportation agencies analyze project alternatives and employ various methods to screen or rank transportation projects considered for funding.

Gaps in Findings

While several respondents provided a significant level of detail, we received responses from only 10 of the 28 potential respondents. Additional outreach may encourage feedback from the agencies not responding to a request for information. Follow-up contacts with selected respondents may uncover more details of agency practices that may be of interest to Caltrans.

Next Steps

Moving forward, Caltrans could consider:

- Comparing and contrasting the definitions provided by survey respondents and those appearing in agency publications to identify common themes.
- Reviewing the corridor plans highlighted by respondents as examples of innovative corridor planning practices:
 - Southern California Association of Governments' I-105 Corridor Sustainability Study.
 - Southern California Association of Governments' Comprehensive Regional Goods Movement Plan and Implementation Strategy.
 - Atlanta Regional Commission's Strategic Regional Thoroughfare Plan.
- Consulting with the Texas DOT respondent to learn more about the agency's efforts underway to develop corridor planning processes.
- Reviewing the publications associated with Washington State DOT's Corridor Sketch Initiative and contacting an agency representative to learn more about this relatively new process.

Detailed Findings

Survey of Practice

Survey Approach

An online survey was distributed to representatives from 28 agencies expected to have knowledge of and experience with the development of comprehensive corridor plans. These agencies included state departments of transportation (DOTs), selected metropolitan planning organizations (MPOs) in California and in major metropolitan areas, and organizations conducting transportation research.

The survey included these questions:

Corridor Plan Definitions

1. Please provide definitions for the following terms used by your agency in connection with its corridor plans:
 - Corridor.
 - Highly traveled corridor.
 - Congestion on controlled access freeways.
 - Congestion on local streets and roads.
 - Congestion associated with passenger rail.
 - Congestion associated with transit.
 - Congestion associated with bicycle and pedestrian facilities.

Corridor Plan Development

1. Please describe how tort liability impacts your agency's corridor planning efforts.
2. Please describe how environmental requirements affect your agency's development of corridor plans.
3. If applicable, please describe how your agency's comprehensive corridor plans address congestion related to tourism or truck travel in the more rural areas within your jurisdiction.
4. Please describe the best practices your agency has identified for the development of innovative, comprehensive transportation corridor plans.
5. If available, please provide links to guidance documents related to development of your agency's comprehensive corridor plans. Send any files not available online to Chris Kline at chris.kline@ctcandassociates.com.

Evaluating Projects

1. How does your agency define and measure (using scoring, metrics or performance measures) the following criteria when evaluating project effectiveness and/or competitiveness?
 - Safety.

- Congestion.
- Accessibility.
- Efficient land use.
- Economic development and job creation and retention.
- Furtherance of state and federal ambient air quality and greenhouse gas reduction standards.

Completing the Survey

Please use this space to provide any comments or additional information about your answers above.

Summary of Survey Results

Representatives from the following 10 agencies and organizations responded to the survey:

State Departments of Transportation

- Florida.
- Massachusetts.
- Oregon.
- Texas.

Metropolitan Planning Organizations

- Atlanta Regional Commission (Georgia).
- Chicago Metropolitan Agency for Planning (Illinois).
- MetroPlan Orlando (Florida) (partial response).
- Metropolitan Transportation Commission (California).
- Southern California Association of Governments (California).

Transportation Research Organizations

- State Smart Transportation Initiative (University of Wisconsin–Madison).

See **Contacts** on page 45 of this Preliminary Investigation for contact information for these respondents.

Survey results are presented below in three topic areas:

- Corridor plan definitions (begins on page 8).
- Corridor plan development (begins on page 19).
- Project evaluation (begins on page 27).

Corridor Plan Definitions

The tables on the following pages present definitions of seven terms or concepts that may appear in a corridor plan:

- Corridor.
- Highly traveled corridor.
- Congestion on controlled access freeways.
- Congestion on local streets and roads.
- Congestion associated with passenger rail.
- Congestion associated with transit.
- Congestion associated with bicycle and pedestrian facilities.

The definitions were provided by survey respondents or identified in documents produced by state DOTs and other agencies not responding to the survey. Definitions derived from agency documents may be taken from regional or statewide transportation plans and not specifically associated with corridor plans.

Citations for the documents providing some of these definitions can be found in the **Related Resources** section that begins on page 16.

Corridor	
State/Agency	Definition
California: Metropolitan Transportation Commission	Segment of roadway between two points that is usually between major interchanges for freeways and major intersections for expressways and arterials.
California: Southern California Association of Governments	A broad geographical band that follows a general directional flow or connects major sources of trips. It may contain a number of streets and highways, as well as transit lines and routes.
Florida Department of Transportation	Sets of essentially parallel transportation facilities for moving people and goods between two points. A facility is a length of roadway composed of points and segments.
Florida: MetroPlan Orlando	A linear transportation asset that could include parallel streets.
Illinois: Chicago Metropolitan Agency for Planning	When a specific facility is under study, “corridor” is used to refer to the facility and generically to the adjacent transportation and land uses. A study is sometimes conducted on a wider area and “corridor.”
Massachusetts Department of Transportation	Vehicular, bicycle, pedestrian and transit infrastructure along with the adjacent land use.
Ohio Department of Transportation	National Corridors. Connect large metropolitan areas in Ohio and adjacent regions. These corridors support heavy passenger traffic and are important to the national economy as they carry large volumes of freight both inside and outside Ohio.

Corridor	
State/Agency	Definition
Ohio Department of Transportation	<p>Statewide Primary Corridors. Connect metropolitan areas within Ohio. They are important to the statewide economy as they carry freight between regions of the state. These corridors have some national travel but are predominately used for statewide passenger and freight trips.</p> <p>Statewide Secondary Corridors. Connect people and goods within and between regions of the state. They have some national and statewide travel but are predominantly used for smaller regional trips.</p> <p>Local Corridors. Have lower traffic volumes and provide connectivity between other local corridors and local destinations.</p>
Oregon Department of Transportation	Rather than defining a corridor, the agency defines a facility plan—a state, regional or local plan for an individual transportation facility such as a state airport master plan, corridor plan or transportation system plan that applies to specific areas or facilities. A corridor may also refer to refinement of a roadway segment such as an interchange area management plan or a highway segment management plan.
State Smart Transportation Initiative	Standard Wikipedia definition, with the caveat that a corridor scales up and down. It doesn't have to move people and goods across a state or region (e.g., an important route from a neighborhood to an activity center can be a corridor).
Texas Department of Transportation	The agency does not have a single definition of a corridor. How a corridor is defined depends on a specific study effort and could be 1 mile to 140 miles.
Texas: North Central Texas Council of Governments	A combination of adjacent surface transportation networks (e.g., freeway, arterial, rail networks) that link the same major origins and destinations. It is defined operationally rather than geographically or organizationally.
Virginia Department of Transportation	Parallel modal facilities, such as highways, rail lines, transit services, port facilities and airports.
Virginia: Commonwealth Transportation Board	<p>Corridors of Statewide Significance (CoSS) are designated by the Commonwealth Transportation Board. CoSS corridors are broadly drawn, include multimodal facilities and demonstrate all of the following characteristics:</p> <ul style="list-style-type: none"> • Multiple modes and/or an extended freight corridor. • Connection among regions, states and/or major activity centers. • High volume of travel. • Unique statewide function and/or fulfillment of statewide goal.
Washington: Southwest Washington Regional Transportation Council	<p>Regional corridors emulate a state highway in function, appearance and multimodal use. These corridors tend to carry regional highway and transit trips, long-haul truck/freight movement and regional bicycle/pedestrian trips. They connect two or more noncontiguous urban centers, with at least one inside Clark County, and carry 10,000 or more person-trips per day.</p> <p>Subregional corridors emulate a minor or principal arterial in function and appearance, with some multimodal use. They carry an equivalent amount of regional and subregional trips. Subregional corridors connect to the Regional Transportation System from urban areas within the county and carry a mix of regional/subregional transit and highway trips.</p>

Highly Traveled Corridor	
State/Agency	Definition
California: Metropolitan Transportation Commission	A corridor with a high annual average daily traffic (AADT) or peak period volumes for the facility type.
California: Southern California Association of Governments	A corridor associated with high AADT volumes.
Florida Department of Transportation	No formal definition. However, a corridor that operates at its defined level of service (LOS) during peak travel hours can be considered a highly traveled corridor. Such a corridor is expected to drop below its LOS standards in the near future, meaning it will reach congested conditions.
Florida: MetroPlan Orlando	Roadway with consistent and high volumes.
Illinois: Chicago Metropolitan Agency for Planning	A corridor or facility used by many vehicles or people. The respondent noted that this is not a technical term and can vary depending on the interests of the person using it. A highly traveled corridor described by an employee of a low-volume bus system is different from a highly traveled corridor in a high-volume rail system.
Massachusetts Department of Transportation	Depends on the functional classification.
Oregon Department of Transportation	No formal definition. The agency's Highway Performance Monitoring System and travel models are used to determine the volume to capacity (V/C) ratio of state highways and segments within them.
State Smart Transportation Initiative	No formal definition, though the respondent suggests a definition based on person throughput, which consistent with the definition included in Virginia DOT's SMART SCALE guidelines. (SMART SCALE is "about picking the right transportation projects for funding and ensuring the best use of limited tax dollars. ...Transportation projects are scored based on an objective, outcome-based process that is transparent to the public and allows decision-makers to be held accountable to taxpayers. Once projects are scored and prioritized, the Commonwealth Transportation Board (CTB) has the best information possible to select the right projects for funding" (see http://vasmartscale.org/about/default.asp .)

Congestion on Controlled Access Freeways	
State/Agency	Definition
California: Metropolitan Transportation Commission	Traffic queues approaching bottlenecks (a segment of freeway where demand exceeds capacity).
California: Southern California Association of Governments	The agency recognizes Federal Highway Administration's (FHWA's) four definitions of congestion in addition to Caltrans' definition of recurrent and nonrecurrent congestion. ¹
Florida Department of Transportation	<p>A nonlimited access freeway or highway whose access connections, median openings and traffic signals are highly regulated. Congestion is a condition in which traffic demand approaches or exceeds the available capacity of the transportation facility(ies).</p> <p>The agency uses several tools to measure congestion on controlled access freeways, including HIGHPLAN and Highway Capacity Software (HCS). Density and LOS are used as performance measures to gauge the level of congestion on controlled access freeways.</p> <p>(Florida DOT's LOS planning software, LOSPLAN, includes ARTPLAN, FREEPLAN and HIGHPLAN. HIGHPLAN is described in a 2013 agency handbook as "generalized and conceptual planning software for two-lane and multilane uninterrupted flow highways with points of access not fully controlled." HCS is the software that accompanies the Highway Capacity Manual.)</p>
Georgia: Atlanta Regional Commission	The agency's Congestion Management Process definition of congestion on a controlled access facility (or freeway) depends on the area type and is defined by three different measures: travel time index (congested travel time/free flow travel time); duration of congestion (hours); and extent (percent of congested vehicle hour of delay of total regional vehicle hours of delay). The thresholds for any one of these three measures has changed over the years. The agency also relies on its regional travel demand model to apply these measures and criteria on future roadway networks.
Illinois: Chicago Metropolitan Agency for Planning	An expressway that carries enough traffic to impact speeds or travel times. This can be identified by vendor-provided probe data or modeled data. When using modeled data, the agency defines the lower level congestion limit using a V/C ratio greater than 0.9. The agency also considers the duration of congestion (how many hours of the day is a facility congested).
Massachusetts Department of Transportation	This is relative and depends on urban or rural geography, but generally LOS F. ²
Oregon Department of Transportation	No formal definition. The agency considers capacity, or the maximum volume of traffic that the roadway section is able to carry on a sustained basis. The agency's highway mobility standards vary depending on the roadway classification.
Texas Department of Transportation	For urban areas, peak hour LOS D or below For rural areas, peak hour LOS C or below. ³

1 The respondent continued his response to include the following:

Congestion as defined by FHWA is as follows:

- i. Intensity. The relative severity of congestion that affects travel. Intensity has traditionally been measured through indicators such as V/C ratios or LOS measures that consistently relate the different levels of congestion experienced on roadways.
- ii. Duration. The amount of time the congested conditions persist before returning to an uncongested state.
- iii. Extent. The number of system users or components (e.g., vehicles, pedestrians, transit routes, lane miles) affected by congestion, for example, the proportion of system network components (roads, bus lines, etc.) that exceed a defined performance measure target.
- iv. Variability. The changes in congestion that occur on different days or at different times of day. When congestion is highly variable due to nonrecurring conditions, such as a roadway with a high number of traffic accidents causing delays, this has an impact on the reliability of the system.

Caltrans' definition for recurrent congestion is defined as a condition lasting for 15 minutes or longer where travel demand exceeds freeway design capacity. Nonrecurrent congestion is defined as backups caused by special circumstances, such as accidents, stalled vehicles, sporting events, etc.

Measures to assess congestion on controlled access freeways have traditionally been based on LOS. LOS is a qualitative measure of operating conditions within a traffic stream, and their perception by motorists and/or passengers. An LOS definition generally describes these conditions in terms of such factors as speed, travel time, freedom to maneuver, comfort and convenience, and safety.

- 2 See page 1 of the Traffic Glossary, available at <https://www.massdot.state.ma.us/Portals/24/docs/dag061812/TrafficGlossary.pdf>, for Massachusetts DOT's definition of LOS.
- 3 See the October 2014 Texas DOT Roadway Design Manual, available at <http://onlinemanuals.txdot.gov/txdotmanuals/rdw/rdw.pdf>, for the agency's LOS guidelines.

Note: The Caltrans publication Statewide Mobility Performance Report 2012 (available at <http://www.dot.ca.gov/trafficops/mpr/docs/mpr2012.pdf>) provides detailed information about Caltrans' consideration of congestion that clarifies the comments from the Southern California Association of Governments respondent. The executive summary (beginning on page xiii of the report, page 13 of the PDF) describes congestion at two speed thresholds:

The MPR [Mobility Performance Report] presents congestion information at two speed thresholds: delay from vehicles traveling below 35 miles per hour (mph), and delay from vehicles traveling below 60 mph. The delay at the 35 mph threshold represents severe congestion while delay at 60 mph represents all congestion, both light and heavy. These thresholds are set by Caltrans and are based upon engineering experience and recommendations from Caltrans district staff.

Appendix B, Methodology (beginning on page 59 of the report, page 73 of the PDF), provides the following calculation of delay:

$$\text{Delay} = \text{actual volume} \times [(\text{length} \div \text{actual speed}) - (\text{length} \div \text{threshold speed})]$$

This calculation is the equivalent of:

$$\text{Actual volume} \times [\text{travel time at actual speed} - \text{travel time at threshold speed}]$$

Appendix C, Glossary (beginning on page 63 of the report, page 77 of the PDF), provides the following congestion-related definitions:

Nonrecurrent congestion: Congestion caused by events that occur irregularly, such as accidents, sporting events, maintenance or construction.

Recurrent congestion: Congestion caused by traffic demand exceeding roadway capacity, regularly resulting in delay during peak periods.

Vehicle hours of delay (VHD): The metric used to express the amount of additional time caused by congestion that vehicles spend on a section of road. This is the difference between the travel time at a threshold speed and the current speed (only calculated when the current speed is below the threshold speed). A threshold speed must be set to determine the VHD. In this report, 35 mph and 60 mph are the threshold speeds, and delay is expressed as both total delay and average delay over a given time period.

Congestion on Local Streets and Roads	
State/Agency	Definition
California: Metropolitan Transportation Commission	Usually queues approaching intersections that operate at a poor LOS.
California: Southern California Association of Governments	Similar to freeways, congestion on local streets and roads is traditionally based upon the LOS metric. Similar to freeways, the LOS metric for arterials is based on a V/C ratio.
Florida Department of Transportation	<p>A local street or arterial is a signalized roadway that primarily serves through traffic with average signalized intersection spacing of 2 miles or less. Delay, speed and LOS are common performance measures to gauge the level of congestion on local streets.</p> <p>Congestion is a condition in which traffic demand on a segment and at intersections approaches or exceeds the available capacity of the local street. The capacity is determined by various factors such as functional classification, signal spacing, signal timing and other factors.</p> <p>Several tools are used to measure congestion on local streets, including ARTPLAN (a multimodal generalized and conceptual planning software for arterial facilities), Generalized Service Volume Tables (sketch planning-level tools developed to provide a quick review of capacity and LOS of the transportation system) and Synchro (described in the agency’s 2014 Traffic Analysis Handbook as “a macroscopic analysis tool which is used to design, model and analyze signalized and unsignalized intersections. Synchro is also used to model arterial segments.”)</p>
Georgia: Atlanta Regional Commission	Similar to the determination of congestion on controlled access freeways, with the exception that the thresholds applied to local streets and roads are different from those applied to controlled access facilities.
Illinois: Chicago Metropolitan Agency for Planning	Typically, these roadways are “the smaller roads coming out of the neighborhoods onto the major arterials,” and the agency does not examine congestion on these roadways. For arterials, the agency reviews modeled data to identify the travel time index and locations where volume is exceeding capacity (V/C greater than 0.9). This varies by time of day so duration of congestion is also considered.
Massachusetts Department of Transportation	Excessive delay, with an LOS of E or F at intersections. This determination depends on urban or rural density.

Congestion Associated with Passenger Rail

State/Agency	Definition
California: Metropolitan Transportation Commission	Overcrowding as a result of either service or system limitations.
California: Southern California Association of Governments	Generally measured by travel speed, travel time, ridership, service span (time of day), headways, time spent on transfers and number of trips requiring two or more transfers.
Florida Department of Transportation	Congestion occurs at railroad crossings with signalized intersections. The agency uses Synchro and VISSIM (a microsimulation tool used to analyze and model vehicular traffic, transit and pedestrian flows) to measure this type of congestion. The definition is based on delay and LOS values.
Illinois: Chicago Metropolitan Agency for Planning	<p><i>Passenger perspective:</i> Commuter rail is congested when there aren't enough seats for all riders. Urban heavy rail congestion considers passenger peak loads and whether passengers had to skip trains that were too full and wait for the next train.</p> <p><i>Operator perspective:</i> Congestion can be delays resulting from freight rail conflicts, lack of track or platform capacity causing delays at the station. Passenger rail congestion also sometimes refers to lack of pedestrian capacity approaching platforms and on platforms. As with other definitions, it depends on the context of the conversation.</p>

Congestion Associated with Transit

State/Agency	Definition
California: Metropolitan Transportation Commission	Overcrowding or traffic congestion along the service routes.
California: Southern California Association of Governments	Generally measured by travel time, travel speed, ridership, service span (time of day), headways, time spent on transfers, number of trips requiring two or more transfers, and estimated high-occupancy toll/express lane vehicles/users.
Florida Department of Transportation	Transit congestion on local streets and arterials is typically due to vehicles queued behind the bus and looking for gaps in traffic to overtake it. It is measured at signalized intersections and defined using delay, queue lengths and LOS.
Illinois: Chicago Metropolitan Agency for Planning	For passengers, this is usually associated with peak loads and the proportion of people standing for long distances on the vehicle. This term is also used in discussions of multiple buses trying to access rail stations or bus stations. Less frequently, it is also used to describe busy urban buses on congested streets (stopping to load and unload in traffic can cause a kind of "rolling roadblock").
Massachusetts Department of Transportation	Peak load and crush load designations.

Congestion Associated with Bicycle and Pedestrian Facilities

State/Agency	Definition
California: Southern California Association of Governments	The agency is moving toward applying level of traffic stress to determine the likelihood that an individual would ride a bicycle along a corridor. It is also examining Safety Corridors—the corridors with a higher number of collisions—to make these streets safer.
Florida Department of Transportation	LOSPLAN is used to measure the LOS and operating conditions associated with bicycle and pedestrian facilities.
Illinois: Chicago Metropolitan Agency for Planning	Most typically associated with pedestrians entering confined locations like stations and platforms. Well-used bicycle facilities have been described as congested when enough bicycles of different operating characteristics use the facility that they make users feel unsafe. Slower users view congestion as the risk of being hit by high-speed users, and high-speed users feel impeded by slower users.
State Smart Transportation Initiative	Measured as the delta between perfect accessibility and actual accessibility, as affected by motor vehicle traffic flows and hazards, and network circuitry/distance.

Note: The following table presents definitions of congestion and congestion-related terms taken from agency publications. These definitions may not be specific to a roadway type or travel mode. See **Related Resources** following the table for citations for the agency publications from which these definitions are taken.

Congestion (Not Specific to a Roadway Type or Travel Mode)

State/Agency	Definition
Illinois: Chicago Metropolitan Agency for Planning	Planning Time Index. Ratio of the total time needed to ensure 95% on-time arrival as compared to a free-flow travel time. Highway Congested Hours. The average number of hours during specific time periods in which at least 20% of the vehicle miles of travel on instrumented road network is congested. Congestion is defined to occur when link speeds are less than 50 mph.
Ohio Department of Transportation	Volume to Capacity 2010 (V/C Index) is a performance attribute that documents the number of vehicles using a roadway at peak times compared with the roadway's ability to support that volume.
Tennessee: Memphis Urban Area Metropolitan Planning Organization	Roadways that operate with an LOS E or F. The operating LOS E or F for a roadway is considered to be unacceptable system performance. The Regional Travel Demand Model estimates LOS by using roadway characteristics such as number of lanes, median type, lane width and functional class, as well as time of day, roadway capacity and traffic volume to perform an assessment of a road's operating condition, generally described using a scale of A (little congestion) to E/F (severe congestion).

Congestion (Not Specific to a Roadway Type or Travel Mode)	
State/Agency	Definition
Texas: North Central Texas Council of Governments	Congestion relates to an excess of vehicles on a portion of roadway resulting in speeds that are slower than normal or “free flow” speeds.
Virginia: Commonwealth Transportation Board	<p>Congestion mitigation has two elements:</p> <ul style="list-style-type: none"> • Change in peak period (multimodal) person throughput in the project corridor. • Change in the amount of peak period person hours of delay in the project corridor.
Washington State Department of Transportation	<p>Congestion thresholds refer to a highway’s operating speed at which analysts identify the system as being congested or delayed. They are typically expressed as a percentage of the highway’s posted speed to allow for the thresholds to be applied to highways of multiple classifications.</p> <p>Maximum throughput is achieved when vehicles travel at speeds between 42 and 51 mph (roughly 70% to 85% of a posted 60 mph speed). At maximum throughput speeds, highways are operating at peak efficiency, since at slower speeds drivers feel more comfortable with less distance between vehicles; this allows more vehicles to pass through than at higher speeds, when more space is required to allow for safe stopping should the need arise.</p>
Washington: Southwest Washington Regional Transportation Council	Traffic congestion can be defined as a condition where the volume of users on a transportation facility exceeds or approaches the capacity of that facility.

Related Resources

Below are publications that provide definitions or background information about the planning terms and concepts defined in the tables above.

California

The 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy: A Plan for Mobility, Accessibility, Sustainability and a High Quality of Life, Southern California Association of Governments, April 2016.

<http://scagrtpsc.net/Documents/2016/final/f2016RTPSCS.pdf>

The survey respondent referred to this document when providing definitions for “corridor” and “highly traveled corridor.”

Florida

FDOT Multimodal Performance Measures Program Definitions, Florida Department of Transportation, October 2014.

<http://www.fdot.gov/planning/statistics/mobilitymeasures/MPMdefinition.pdf>

This document includes definitions of many of the terms used in corridor plans.

Traffic Analysis Handbook: A Reference for Planning and Operations, Florida Department of Transportation, March 2014.

http://www.fdot.gov/planning/systems/programs/SM/intjus/pdfs/Traffic%20Analysis%20Handbook_March%202014.pdf

This handbook includes a discussion of the agency's use of Generalized Service Volume Tables, Synchro and other tools to measure congestion.

Quality/Level of Service Handbook, Florida Department of Transportation, 2013.

<http://www.fdot.gov/planning/systems/programs/SM/los/pdfs/2013%20QLOS%20Handbook.pdf>

This handbook provides information about the agency's LOSPLAN software, an agency-developed program used to assess quality of service (a traveler-based perception of how well a transportation service or facility operates) and LOS (a quantitative stratification of quality of service into six letter grades).

Illinois

HERE Traffic Overview, HERE, 2017.

<https://www.here.com/en/products-services/products/here-traffic/here-traffic-overview>

This web site describes the traffic-related data products and services offered by HERE. This vendor provides probe data to Chicago Metropolitan Agency for Planning.

Congestion Management Process: Documentation, Draft, Chicago Metropolitan Agency for Planning, June 2012.

http://www.cmap.illinois.gov/documents/10180/205364/CMPDocumentation_2012June.pdf/92237ef2-a942-44c1-b6d5-89b45ab4ae4c

Page 20 of the report provides a definition of "planning time index"; see page 23 of the report for the definition of "highway congested hours."

Ohio

Corridors Identification, Technical Memorandum, Access Ohio 2040, Ohio Department of Transportation, January 2013.

https://www.dot.state.oh.us/Divisions/Planning/SPR/StatewidePlanning/access.ohio/AO40_library/Reports/Corridor/Corridor%20Identification/Corridor_Identification_Narrative.pdf

See page 3 of the PDF for Section 2, Corridor Identification and Categorization, which identifies the "objective criteria" the agency developed "to identify and categorize corridors for each transportation mode."

Strategic Transportation System (STS) Corridors, Technical Memorandum, Access Ohio 2040, Ohio Department of Transportation, October 2013.

[http://www.dot.state.oh.us/Divisions/Planning/SPR/StatewidePlanning/access.ohio/AO40_library/TechMemos/Strategic Transportation System \(STS\) Corridors.pdf](http://www.dot.state.oh.us/Divisions/Planning/SPR/StatewidePlanning/access.ohio/AO40_library/TechMemos/Strategic Transportation System (STS) Corridors.pdf)

See page 26 of this memorandum (page 34 of the PDF) for details on Ohio DOT's use of volume to capacity to assess congestion.

Tennessee

Congestion Management Process, Memphis Urban Area Metropolitan Planning Organization, August 2015.

http://memphismpo.org/sites/default/files/public/CMP%20Report_FINAL.pdf

See page 15 of the report (page 16 of the PDF) for the agency's approach to defining congestion.

Texas

Roadway Design Manual, Texas Department of Transportation, October 2014.

<http://onlinemanuals.txdot.gov/txdotmanuals/rdw/rdw.pdf>

This manual includes the agency's LOS guidelines for different roadway types.

Congestion Management Process–Glossary, Appendix A, Congestion Management Process 2013 Update, North Central Texas Council of Governments, 2013.

http://www.nctcog.org/trans/cmp/documents/APP_A_TDM_TSMO_Strategies.pdf

See page A-6 of the appendix (page 6 of the PDF) for definitions of “congestion” and “corridor.”

Virginia

Significant Corridors, Office of Intermodal Planning and Investment, Commonwealth of Virginia, 2017.

http://www.vtrans.org/significant_corridors.asp

This web site provides a description of Corridors of Statewide Significance and access to completed corridor master plans.

SMART SCALE Technical Guide, Commonwealth Transportation Board, November 2017.

http://vasmartscale.org/documents/20171115/ss_technical_guide_nov13_2017.pdf

See pages 28 and 55 of the guide (pages 35 and 62 of the PDF) for a discussion of congestion mitigation. The agency determines person throughput for roadway, bicycle/pedestrian, transit, transit demand management (including park-and-ride lots) and freight projects. Methodologies for calculating scores associated with congestion are described in an appendix to the guide.

“Revolution in Project Selection: Virginia DOT Smart Scale,” Ronique Day and Chad Tucker, *State Smart Transportation Initiative Webinar*, July 2016.

<http://www.ssti.us/wp/wp-content/uploads/2016/07/Virginia-Smart-Scale-July-2016.pdf>

See slides 41 through 44 for details on how congestion is addressed in Virginia DOT's SMART SCALE project scoring process.

Washington

Congestion Management Process: 2016 Monitoring Report, Southwest Washington Regional Transportation Council, July 2017.

<http://www.rtc.wa.gov/reports/cmp/CMrpt16.pdf>

See page 6 of the report (page 14 of the PDF) for a description of the agency's corridor concept.

Appendix D: Corridor Definition, Assessment and Performance Measures, Transportation Corridor Visioning Study, Southwest Washington Regional Transportation Council, April 2008.

<http://www.rtc.wa.gov/reports/vision/Draft-AppendixD.pdf>

See page D-1 of the appendix for definitions of “regional corridor” and “subregional corridor.”

Handbook for Corridor Capacity Evaluation, 1st Edition, Washington State Department of Transportation, October 2014.

http://wsdot.wa.gov/publications/fulltext/graynotebook/CCR14_methodology.pdf

From page 3 of the handbook: WSDOT's Handbook for Corridor Capacity Evaluation presents how WSDOT completes its annual detailed corridor analysis of where and how much congestion occurs due to capacity constraints in Washington state, and whether it has grown on state highways. The Corridor Capacity Report focuses on the most traveled commute routes in

the urban areas of the state: central and south Puget Sound areas, Vancouver, Spokane, and the Tri-Cities area and elsewhere around the state where data is available.

An October 2015 addendum to this handbook, available at https://www.wsdot.wa.gov/NR/rdonlyres/0244E6B4-95FB-4987-AF25-965C7F333884/116224/CCR15_methodology_addendum.pdf, provides the methodology used for transit trip analysis.

The 2016 Corridor Capacity Report, The 15th Edition of the Annual Congestion Report, Washington State Department of Transportation, November 2016. <http://wsdot.wa.gov/publications/fulltext/graynotebook/CCR16.pdf>
This report describes statewide congestion indicators and provides capacity analyses for corridors within the state.

Corridor Plan Development

Respondents were asked about specific issues that could be addressed in the transportation plans for congested corridors. The following summarizes survey responses in these topic areas:

- Tort liability.
- Environmental requirements.
- Congestion related to tourism or truck travel in rural areas.
- Best practices.

Documents provided by respondents or identified independently that relate to the survey responses are presented in the **Related Resources** section that begins on page 23. (Though Washington State DOT did not respond to the survey, we include information about the agency's Corridor Sketch Initiative in **Related Resources**; see page 25.)

Tort Liability

Respondents were asked how tort liability impacts their agencies' corridor planning efforts. Most respondents indicated that tort liability was not applicable to their corridor planning practices.

The California MPO respondents provided the following with regard to tort liability:

- **Metropolitan Transportation Commission.** Tort liability impacts are limited. Planning-level studies are done in cooperation with Caltrans and local agencies that own and operate the facilities. Tort liability is more applicable to project development than planning.
- **Southern California Association of Governments.** Tort liability is typically associated with the owner and operator of a facility. As a regional planning agency that does not own or operate a specific facility and does not implement transportation projects, tort liability is generally not applicable to the agency's corridor planning efforts.

The Chicago Metropolitan Agency for Planning respondent indicated that “[a]s an MPO, we are not impacted by tort liability. Implementing agencies are responsible for designing and implementing safe facilities. I don’t think any liability has ever reached beyond the implementing agency to the MPO planning process.”

The Massachusetts DOT respondent cited state law addressing the liability of public employers (see <https://malegislature.gov/Laws/GeneralLaws/PartIII/TitleIV/Chapter258/Section2> for Chapter 258, Section 2) but did not provide context for how this law might be applied in connection with the agency’s corridor planning efforts.

Environmental Requirements

The table below summarizes how responding agencies handle environmental requirements when developing corridor plans.

Addressing Environmental Requirements in Corridor Plans		
Activity/Practice	State/Agency	Description
Address in deliverables	Georgia: Atlanta Regional Commission	Corridor plans sponsored or funded by the agency typically include in their deliverables a rough/sketch-level analysis of alternatives, basic windshield or desktop environmental resource screening, and detailed cost estimates.
Consider or meet state and federal requirements	California: Southern California Association of Governments	Although its corridor planning efforts are not subject to the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA), the agency advocates for efforts to better link planning to CEQA and NEPA. California Senate Bill 375 also influences agency efforts to develop plans and programs. Performance measures such as greenhouse gas (GHG) emissions and vehicle miles traveled (VMT) are often used when assessing and/or measuring benefits for various plan project improvements and recommendations.
	Illinois: Chicago Metropolitan Agency for Planning	The agency considers planning-level environmental questions when it produces high-level plans for corridors. Implementing agencies are responsible for preparing appropriate environmental documents and meeting NEPA requirements.
	Massachusetts Department of Transportation	The agency’s corridor plans are conceptual, but the agency follows many of the procedures that are used in the Massachusetts Environmental Policy Act and NEPA permitting processes.
Employ a formalized agency process	Florida Department of Transportation	The agency’s Efficient Transportation Decision Making (ETDM) process is “Florida’s procedure for reviewing qualifying transportation projects to consider potential environmental effects in the Planning phase.” ETDM requires all environmental impacts associated with the corridor plan to be documented and comments obtained from relevant parties or groups.

Addressing Environmental Requirements in Corridor Plans		
Activity/Practice	State/Agency	Description
Employ a formalized agency process	Florida Department of Transportation	As corridor plans are further developed, the agency's environmental requirements are addressed in the Project Development and Environment (PD&E) process. The PD&E requirements vary depending on the type of corridor improvements proposed. The agency's Project Development and Environment Manual defines the type of environmental analysis and the requirements to be completed for the recommended corridor plan.
Seek to minimize environmental impacts	California: Metropolitan Transportation Commission	Environmental constraints are considered, and sometimes limit, the type and number of improvement strategies.
	Oregon Department of Transportation	While most of the environmental analysis seeks to identify "fatal" flaws, the agency's efforts to identify alternatives can limit environmental exposure.
	Texas Department of Transportation	The agency will "[a]lways consider natural and social environmental impacts in studying a particular corridor and look to minimize and mitigate."

Congestion Related to Tourism or Truck Travel in Rural Areas

Three respondents described efforts to address congestion related to tourism or truck travel in rural areas in the corridor plans that their agencies develop:

- **Metropolitan Transportation Commission (California).** Corridor improvement strategies are based on analyses of peak traffic periods, which includes the impacts of tourism and/or truck traffic where applicable or may be related to specific issues associated with tourism or truck traffic (such as passing lanes or intersection storage).
- **Southern California Association of Governments (California).** The agency's Comprehensive Regional Goods Movement Plan and Implementation Strategy recommends a series of implementation strategies to improve the movement of goods throughout the region. The plan includes recommended implementation strategies to relieve truck bottlenecks identified on State Route 98 (SR-98) in Imperial County, located in a rural area of the state.
- **Florida Department of Transportation.** Florida's corridors experience heavy truck traffic especially in the suburban and rural areas that have intermodal logistic centers or major distribution warehouses. Typical peak hour congestion analysis is not enough to fully capture tourist or truck travel, so the agency collects off-peak and weekend counts on corridors that experience heavy tourist traffic. Travel time reliability analysis is conducted to understand tourist patterns and nonrecurrent congestion associated with tourist travel. Truck counts are collected on rural corridors, and the truck percentage is used in corridor analyses to develop plans that account for congestion due to truck traffic. After studying truck-only lanes and bypass lanes for trucks, the agency concluded that these options are not feasible for use in Florida.

Three agencies have focused limited attention on congestion in rural areas associated with tourist or truck travel:

- **Chicago Metropolitan Agency for Planning (Illinois).** The agency does not consider tourism in rural areas but does consider truck travel in all corridor studies. The agency has found that developing truck information beyond counts is difficult, and has recently used data supplied by HERE and data purchased from the American Transportation Research Institute. The agency is also working on enhancements to its truck model.
- **Oregon Department of Transportation.** While the state DOT reviews some highway segments in cooperation with its MPOs, it is more focused on identifying interchange areas with freight bottlenecks.
- **Texas Department of Transportation.** The agency considers truck parking opportunities with the corridor.

Best Practices

Respondents were asked to share the best practices their agencies have identified for the development of innovative, comprehensive transportation corridor plans. The table below summarizes survey responses.

Best Practices for the Development of Comprehensive Corridor Plans		
Activity/Practice	State/Agency	Description
Exemplary plans	California: Southern California Association of Governments	Planning tools such as the smart mobility framework, complete streets policies and tools for operational planning have been incorporated into the overall framework of the I-105 Corridor Sustainability Study.
	Georgia: Atlanta Regional Commission	The agency’s Strategic Regional Thoroughfare Plan and Atlanta Regional Freight Mobility Plan Update include innovative strategies for preparing multimodal corridor plans.
Stakeholder, partner or public involvement	Florida Department of Transportation	Florida’s Future Corridors program is a cooperative effort between the DOT and statewide, regional and local partners to envision and plan the future of Florida’s major statewide transportation corridors over the next 50 years.
	Massachusetts Department of Transportation	Early and robust public involvement is key.
	Texas Department of Transportation	The respondent recommended effective use of stakeholders or working groups to assist in identifying concerns and recommendations.

Three agencies highlighted specific elements or practices addressed in corridor plans:

- Chicago Metropolitan Agency for Planning’s corridor plans consider:
 - Complete streets.

- All users (environmental justice, safe routes to school, senior citizens, people with disabilities, freight vehicles and transit users).
 - Freight vehicles.
 - Integration of transit services.
 - Intelligent transportation systems and other operational improvements.
 - Adjacent land uses.
 - Stormwater best practices.
- Recent innovative corridor plans produced by Florida DOT have considered the effects of autonomous vehicles, nonrecurring congestion (such as tourists or holiday travel), millennials and truck platooning.
 - Southern California Association of Governments corridor plans identify rivers, washes, drainage channels and utility corridors as active transportation corridors that are used for longer distance bicycling and create urban green space for local residents.

The Texas DOT respondent noted that the agency is currently developing its corridor planning processes and provided guidance documents that were developed to help consultant teams as they perform corridor studies (see [Appendices A](#) and [B](#)).

Related Resources

California

On the Move: Southern California Delivers the Goods, Comprehensive Regional Goods Movement Plan and Implementation Strategy, Southern California Association of Governments, February 2013.

<http://www.freightworks.org/DocumentLibrary/CRGMPIS%20-%20Final%20Report.pdf>

This is the plan the survey respondent highlighted as providing a series of implementation strategies to improve the movement of goods throughout the region, including strategies to address truck bottlenecks impacting rural areas.

I-105 Corridor Sustainability Study, Southern California Association of Governments, 2017.

<http://www.scag.ca.gov/programs/Pages/105CorridorStudy.aspx>

This corridor study “will assess freeway and arterial congestion and will also consider additional corridor improvements.” The agency expects to release a draft report of study findings in fall 2018; the final report is expected in late 2018.

A fact sheet, available at <http://www.scag.ca.gov/programs/PublishingImages/I105Freeway/I-105FactSheetEnglish.pdf>, describes the project:

The Southern California Association of Governments (SCAG), in coordination with the California Department of Transportation (Caltrans) and the Los Angeles County Metropolitan Transportation Authority (Metro) is conducting the Interstate 105 (I-105) Corridor Sustainability Study (CSS) to examine the study area from a broad multi-modal perspective. The I-105 CSS will assess freeway and arterial congestion and will also consider additional corridor improvements, such as complete streets concepts, high occupancy vehicle (HOV) lanes, ExpressLanes, and other advanced operational strategies. The goal is to recommend solutions that would improve air quality, system connectivity and efficiency, and reduce emissions, traffic congestion and improve safety. The CSS will develop local resources and

build upon previous transportation efforts to create an integrated transportation system for the I-105 region.

Florida

Project Development and Environment Manual, Florida Department of Transportation, June 2017.

<http://www.fdot.gov/environment/pubs/pdeman/pdeman1.shtm>

This web site provides access to the individual parts and chapters of this two-part manual or the entire manual. *From the manual's introduction:*

The PD&E Manual provides project analysts and Project Managers with a framework for the consistent development of analysis, technical studies, and Environmental Documents for transportation projects to achieve compliance with federal and state laws, regulations, and requirements. The PD&E Manual also serves as FDOT standard policies and procedures, supporting quality control and quality assurance in project development.

Corridor Development, Systems Planning Office, Florida Department of Transportation, 2017.

<http://www.fdot.gov/planning/systems/programs/sm/corridor/default.shtm>

This web site offers background on Florida DOT's development of corridor planning studies, including the agency's partners; the types of studies produced (corridor, alternative and feasibility); and a comparison showing differences between the study types. The site also offers links to active and completed planning studies.

Florida's Future Corridors, Office of Policy Planning, Florida Department of Transportation, 2017.

<http://www.fdot.gov/planning/Policy/Corridors/>

This web site describing the Florida's Future Corridors effort notes that "[w]ith the expected population and tourism increase in the next 30 years, the state will need to better coordinate long-range transportation and development plans to meet long-term demand for the movement of people and freight, and improve the connectivity between Florida and other states by providing alternative routes of travel through statewide transportation corridors."

Georgia

Management and Design Guidelines for the Regional Thoroughfare Network, Strategic Regional Thoroughfare Plan, Atlanta Regional Commission, 2011.

http://documents.atlantaregional.com/transportation/tp_SRTP_Design_Guidelines.pdf

From the introduction and purpose: This set of guidelines was developed to serve as a tool to facilitate a common language and process for meeting a variety of sometimes competing goals along the Regional Thoroughfare Network (RTN). As such, the purpose of this document is to provide guidance for decision makers and professionals that influence specific factors that impact the overall functionality of the RTN, and the promotion of multimodal travel.

Atlanta Regional Freight Mobility Plan Update, Atlanta Regional Commission, May 2016.

http://documents.atlantaregional.com/freight/atlanta_regional_freight_mobility_plan_update_2016.pdf

From the introduction: The primary purposes of the Atlanta Regional Freight Mobility Plan Update are the following:

- Assess the current plan against the latest understanding of existing conditions and forecasts;

- Update the plan based on the latest federal, state, and Atlanta regional policies;
- Support the development of a FAST Act compliant Regional Transportation Plan (RTP) as it relates to applicable freight provisions;
- Identify projects of national, state, and regional significance; and
- Define a path forward for project investment and establishment of responsive strategies and initiatives.

Illinois

HERE Traffic Overview, HERE, 2017.

<https://www.here.com/en/products-services/products/here-traffic/here-traffic-overview>

This web site describes the traffic-related data products and services offered by HERE. This vendor provides truck data to Chicago Metropolitan Agency for Planning.

American Transportation Research Institute, 2012.

<http://atri-online.org/>

Chicago Metropolitan Agency for Planning has used truck datasets provided by the American Transportation Research Institute in connection with its traffic analyses.

Texas

I-20 East Texas Corridor Study, Texas Department of Transportation, 2017.

<http://www.txdot.gov/inside-txdot/projects/studies/statewide/i20-east-corridor.html>

This web site provides background information and documents associated with the agency's I-20 East Texas Corridor Study, which was completed in December 2014.

I-30 East Texas Corridor Study, Texas Department of Transportation, 2017.

<http://www.txdot.gov/inside-txdot/projects/studies/statewide/i30-east-texas-corridor.html>

This web site provides information about a corridor study in process for Interstate 30, "an important east-west connection for travel and trade."

Corridor Planning: Planning Guidebook, Texas Department of Transportation, October 2016.

See [Appendix A](#).

From the guidebook: The following document aims to delineate the main components of a corridor plan while offering direction on data sources and important considerations needed for such analysis.

Planning Guidebook, Texas Department of Transportation, October 2016.

See [Appendix B](#).

This booklet is a companion to the full guidebook cited above.

Washington

Corridor Sketch Initiative, Washington State Department of Transportation, 2017.

<https://www.wsdot.wa.gov/planning/corridor-sketch-initiative>

From the web site:

WSDOT's Corridor Sketch Initiative is a set of planning activities that engages the agency's partners to determine the context and performance of state highway corridors and identify

high-level strategies for addressing performance gaps. The initiative complements and supports regional planning processes around the state.

The web site provides links to completed Corridor Sketch Summaries.

Related Resources:

User Guide for Corridor Sketch Summaries: A Companion Document for the Corridor Sketch Initiative, Washington State Department of Transportation, June 2017.

<https://www.wsdot.wa.gov/sites/default/files/2017/06/30/CSS-UserGuide.pdf>

From the document:

Each Corridor Sketch Summary is divided into four sections covering corridor context, highlights and performance, strategies, and access to additional information. If a corridor has any congestion performance gaps, there will also be a Mobility Assessment, which details the specific corridor segments where those gaps occur and potential strategies for addressing traffic congestion.

The appendix on page 10 of the guide provides the initiative's congestion methodology:

The Corridor Sketch Initiative used a two-step process to identify congestion along the corridors. The first step filters out corridors with a volume to capacity ratio of less than 0.5, meaning traffic is less than 50 percent of what a roadway can handle. This eliminates segments operating below congested speed thresholds due to external factors such as steep slopes. The second step determines if a segment is operating below congested speeds based on the type of facility and other characteristics. WSDOT uses this step (Step 2 in the graphic below) to determine if a segment is congested. As noted, the threshold for congestion varies based on the type of highway being evaluated.

A flowchart identifies the congestion thresholds for the Corridor Sketch Initiative.

Corridor Sketch Initiative: Program Status, Washington State Department of Transportation, June 2017.

<https://www.wsdot.wa.gov/sites/default/files/2017/06/30/CSI-ProgramStatusReport2017.pdf>

This document identifies what's next for the agency's Corridor Sketch Initiative. *From page 3:*

- Identify economic vitality performance issues and strategies by December 2017.
- Continually update and refine corridor sketches in 2018 and beyond. The first set of corridors have been posted to the website, and more will be added as documentation is complete.
- Conversion/upgrade to a GIS [geographic information system] map. Publishing PDFs on the website is a temporary solution; eventually, we will replace them with a GIS product that is already underway.
- Deepening analysis through site-specific studies and refine and rank proposed strategies.
- Take the cost-effective strategies from the Corridor Sketch and put them through integrated scoping process, which is part of the Refining Solutions step of Practical Solutions. Once refined, we'll put the best strategies on WSDOT's unfunded priorities list, which is a step towards funding and implementation.

Project Evaluation

Respondents were asked how their agencies defined and measured the following six criteria when evaluating project effectiveness and/or competitiveness:

- Safety.
- Congestion.
- Accessibility.
- Efficient land use.
- Economic development and job creation and retention.
- Furtherance of state and federal ambient air quality and GHG reduction standards.

The following tables summarize survey responses, with one exception: Information about the evaluation criteria associated with Virginia DOT’s SMART SCALE was pulled from SMART SCALE publications. (Virginia DOT did not provide survey responses.)

Documents provided by respondents or identified independently that relate to the survey responses are presented in the **Related Resources** section that begins on page 34.

Defining and Measuring Safety	
State/Agency	Description
California: Metropolitan Transportation Commission	The agency works in cooperation with Caltrans District 4 to examine traffic based on accident rates and hot spot locations. The agency usually relies on data from the Caltrans Traffic Accident Surveillance and Analysis System (TASAS) database. TASAS includes information on California’s state highway system, including infrastructure (e.g., number of lanes or lane widths), vehicular volumes and crashes.
California: Southern California Association of Governments	Performance reporting requirements include the total number and rate of roadway fatalities, roadway injuries, transit fatalities and transit safety events by vehicle revenue miles. Also considered are the total number of bicycle and pedestrian fatalities and injuries, the rate of transit service vehicle failure, and pavement and bridge condition.
Florida Department of Transportation	The safety analysis performed in connection with all planning and environmental documents produced in the state can take the form of simple reporting of crash data, number of crashes and calculation of crash rates, or the more complex application of Highway Safety Manual analyses. Benefit-cost ratios are calculated to understand the safety benefits of recommended improvements. Crash modification factors are assigned to potential countermeasures intended to improve safety.
Illinois: Chicago Metropolitan Agency for Planning	The agency uses state DOT crash data to calculate crash rates that are used to score roadway segments and transportation projects.
Massachusetts Department of Transportation	Metrics consider crashes, reduction of conflict points, and identification of deficient engineering standards.

Defining and Measuring Safety	
State/Agency	Description
Oregon Department of Transportation	The agency's safety management system includes several objectives or data points that help in the identification of its high-risk areas and development of potential safety countermeasures.
Texas Department of Transportation	The agency compares statewide crash rates (number of crashes per 100 million vehicle miles) for different facility types and considers fatality and incapacitating injury data.
Virginia Department of Transportation	<p>Safety-related measures include:</p> <p>Equivalent Property Damage Only of Fatal and Injury Crashes (50%) <i>Description:</i> Equivalent property damage only (EPDO) of fatal and injury crashes expected to be avoided due to project implementation. <i>Objective:</i> Estimate number of fatalities and injury crashes (weighted by EPDO crash value used by FHWA) at the project location and the expected effectiveness of project specific countermeasures in reducing crash occurrence.</p> <p>EPDO Rate of Fatal and Injury Crashes (50%) <i>Description:</i> EPDO of fatal and injury crashes per 100 million VMT expected to be avoided due to project implementation. <i>Objective:</i> Similar to the first measure, but by focusing on the change in fatality and injury crashes (weighted by EPDO value used by FHWA) per VMT. The measure considers projects that address areas with a high rate of crashes that may be outside of high-volume roadways.</p>

Defining and Measuring Congestion	
State/Agency	Description
California: Metropolitan Transportation Commission	Existing and/or future congestion levels and potential benefit of improvement strategies are based on appropriate traffic operational analyses.
California: Southern California Association of Governments	Measures for monitoring roadway congestion include percent of interstate and noninterstate national highway system mileage with reliable person-mile travel times; percent of interstate and noninterstate national highway system mileage where peak hour travel times meet expectations; percent of interstate system mileage reporting reliable freight truck travel times; percent of interstate system mileage uncongested; and annual hours of peak hour excessive delay per capita.
Florida Department of Transportation	The agency uses V/C ratio, LOS, delay at intersections, planning time index ¹ , queue lengths, density and speed. Networkwide performance measures such as average speed are also used to measure congestion when performing microsimulation.
Illinois: Chicago Metropolitan Agency for Planning	The agency uses probe data and modeled data to evaluate and score projects.

Defining and Measuring Congestion	
State/Agency	Description
Massachusetts Department of Transportation	Travel time, LOS, queuing and delay.
Oregon Department of Transportation	Agency models allow for assessment of the V/C of state-owned highway segments. When evaluating projects for congestion, decision-makers consider whether to improve the state highway system or major access routes to the state highway system on the local system to relieve congestion by expanding capacity, enhancing operations or otherwise improving travel time within high-congestion corridors.
Texas Department of Transportation	
Virginia Department of Transportation	<p>Measures associated with congestion mitigation include:</p> <p>Person Throughput (50%) <i>Description:</i> Increase in corridor total (multimodal) person throughput attributed to the project. <i>Objective:</i> Assess the potential benefit of the project in increasing the number of users served within the peak period.</p> <p>Person Hours of Delay (50%) <i>Description:</i> Decrease in the number of person hours of delay in the corridor. <i>Objective:</i> Assess the potential benefit of the project in reducing peak period person hours of delay.</p>

1 The 2014 FDOT Multimodal Performance Measures Program Definitions provides this definition of planning time index (PTI): A travel time reliability performance measure defined by the ratio of an actual 95th percentile travel time to the free flow travel time (TTI 95). PTI conceptually represents the congested travel time travelers must spend compared to an uncongested travel time to arrive at their destination on time 95% of the time (a value of 3.00 indicates a traveler should allow 60 minutes to make an important trip that takes 20 minutes in uncongested traffic).

2 The description of LOS below is taken from Chapter 3 of the February 2015 Texas Transportation Plan 2040:

Level of Service (LOS): The LOS is a standardized grade on an A (best) to F (worst) scale that is used to evaluate the level of roadway congestion. Definitions for each level can be found in The Highway Capacity Manual and American Association of State Highway and Transportation Officials (AASHTO) Geometric Design of Highway and Streets, most generally:

- LOS A = Free flow.
- LOS B = Reasonably free flow.
- LOS C = Stable flow, at or near free flow.
- LOS D = Approaching unstable flow.
- LOS E = Unstable flow, operating at capacity.
- LOS F = Forced or breakdown flow. Congested roadways are considered to be those that are at or below LOS D.

Defining and Measuring Accessibility

State/Agency	Description
California: Southern California Association of Governments	<p>Measured by taking afternoon peak period travel demand model results for the base and forecast years and identifying the percentage of commute or home-based work trips that are completed within 45 minutes.</p> <p>Peak periods are those times during the weekday when commuting travel on regional roadways reach the highest levels. Typically peak periods occur twice daily; first during the morning commute when people are traveling to their workplaces; and again in the late afternoon when people are returning home from work.</p> <p>The agency's 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy provides a comprehensive measure of accessibility, addressing transit and high-occupancy and shared-occupancy vehicle modes for both work and nonwork trips.</p>
Florida Department of Transportation	<p>The agency's Mobility Review Guide includes criteria on planning strategies relevant to mobility or accessibility. Some of the key variables that impact accessibility include:</p> <ul style="list-style-type: none"> • Density—population and employment per square mile or per acre. • Diversity—mix of land uses. • Design—neighborhood layout and street characteristics, connectivity, presence of sidewalks, and other factors. • Destination accessibility—indicated by ease or convenience of trip destinations from point of origin. • Distance to transit—ease of access to transit.
Illinois: Chicago Metropolitan Agency for Planning	<p>Accessibility is considered more of a land use measure than a transportation measure. A travel model estimates the mix of destination opportunities available to people within specific times or distances. If projects can't be modeled, the agency considers the number and mix of destinations in the area.</p>
Massachusetts Department of Transportation	<p>New or improved connections to land uses, recreation, resources, jobs and other factors.</p>
State Smart Transportation Initiative, UW-Madison	<p>Access to jobs by auto and transit (with first- and last-mile walks). Project impact is calculated and normalized across projects on a 100-point scale, combined with other criteria scores, and divided by cost to the state to get a final ranking.</p>
Virginia Department of Transportation	<p>Accessibility measures include:</p> <p>Access to Jobs (60%)</p> <p><i>Description:</i> Change in average jobs accessibility within 45 minutes (within 60 minutes for transit projects).</p> <p><i>Objective:</i> Measure assesses the average change in access to employment opportunities as a result of project implementation based on the GIS accessibility tool.</p>

Defining and Measuring Accessibility	
State/Agency	Description
	<p>Access to Jobs for Disadvantaged Populations (20%)</p> <p><i>Description:</i> Change in average jobs accessibility for disadvantaged populations within 45 minutes (within 60 minutes for transit projects).</p> <p><i>Objective:</i> Measure assesses the average change in access to employment opportunities as a result of project implementation based on the GIS accessibility tool.</p> <p>Access to Multimodal Choices (20%)</p> <p><i>Description:</i> Assessment of the project support for connections between modes and promotion of multiple transportation choices.</p> <p><i>Objective:</i> Measure assigns more points for projects that enhance interconnections among modes, provide accessible and reliable transportation for all users, encourage travel demand management and demonstrate potential to support emergency mobility.</p>

Defining and Measuring Efficient Land Use	
State/Agency	Description
California: Southern California Association of Governments	The agency monitors local implementation of land use strategies, including local general plan and zoning code updates, complete streets initiatives, Transit Priority Area-specific plans, transit-oriented development and other infill development initiatives, greenfield land consumption,; and household and employment growth within High Quality Transit Areas.
Florida Department of Transportation	Comprehensive plans include elements that address land use and transportation, including efficient development of future land use, integration of land use and transportation planning, and mobility and accessibility.
Illinois: Chicago Metropolitan Agency for Planning	Rather than defining or measuring the efficiency of land use, the agency considers whether projects serve infill development opportunities (infill is considered more efficient than some other types of development).
Massachusetts Department of Transportation	Mixed use, accessible to transit, walking, biking and roadways.
Oregon Department of Transportation	Defined as fostering livable communities by demonstrating that the investment does not undermine sustainable urban development.
Virginia Department of Transportation	<p>Measures associated with land use coordination include:</p> <p>Future Transportation Efficient Land Use (70%)</p> <p><i>Description:</i> Evaluates the amount of population and employment located in areas with high nonwork accessibility.</p>

Defining and Measuring Efficient Land Use	
State/Agency	Description
	<p><i>Objective:</i> To determine the degree to which the project supports population and employment that on average has a reduced impact on the transportation network.</p> <p>Increase in Transportation Efficient Land Use (30%)</p> <p><i>Description:</i> Evaluates the increase in amount of population and employment located in areas with high nonwork accessibility between present day and the horizon year of 2025.</p> <p><i>Objective:</i> To determine the degree to which the project supports population and employment that on average has a reduced impact on the transportation network.</p>

Defining and Measuring Economic Development and Job Creation and Retention	
State/Agency	Description
Illinois: Chicago Metropolitan Agency for Planning	The agency's economic impact models examine the changes in time (accessibility) between labor markets and employment locations, and between employment locations to estimate economic impacts of transportation projects.
Massachusetts Department of Transportation	Improved accessibility to land uses and newly created land for economic development.
Virginia Department of Transportation	<p>Measures related to economic development include:</p> <p>Project Support for Economic Development (60%)</p> <p><i>Description:</i> Project consistency with regional and local economic development plans and policies and support for local development activity.</p> <p><i>Objective:</i> This measure assesses whether the project is supporting new economic development and the progress made toward development in the project corridor at the local level. The scoring value is scaled by square footage of sites being developed in the area of influence of the project (up to a maximum of 10 million square feet of development).</p> <p>Intermodal Access and Efficiency (20%)</p> <p><i>Description:</i> Rate projects based on the extent to which the project is deemed to enhance access to critical intermodal locations, interregional freight movement and/or freight intensive industries.</p> <p><i>Objective:</i> This measure assesses the:</p> <ul style="list-style-type: none"> • Level to which the project enhances access to distribution centers, intermodal facilities, manufacturing industries or other freight intensive industries. • Level to which the project supports enhanced efficiency on a primary truck freight route (or high-volume/high-value truck or rail freight

Defining and Measuring Economic Development and Job Creation and Retention

State/Agency	Description
	<p>corridor).</p> <ul style="list-style-type: none"> Level to which the project enhances access or reduces congestion at or adjacent to Virginia ports/airports. <p>The scoring value is scaled by the length of the project.</p> <p>Travel Time Reliability (20%)</p> <p><i>Description:</i> Improvement in travel time reliability attributed to the project.</p> <p><i>Objective:</i> This measure determines the project's expected impact on improving reliability which supports efforts to retain businesses and increase economic activity.</p>

Defining and Measuring Furtherance of State and Federal Ambient Air Quality and Greenhouse Gas Reduction Standards

State/Agency	Description
California: Southern California Association of Governments	Performance measures include Regional Transportation Plan and Federal Transportation Improvement Program (FTIP) conformity analysis, regional GHG emissions reduction (total and per capita), ozone and particulate matter (PM) (PM ¹⁰ and PM ^{2.5}) reductions provided by locally implemented Congestion Mitigation and Air Quality (CMAQ) projects, number of transportation control measure ¹ projects with committed funding included in the approved FTIP, and average annual VMT per capita (automobiles and light trucks).
Florida Department of Transportation	The agency maintains strict air quality standards, and all urban regions are required to conform to these standards. Florida's travel demand models are updated every five years and used to check the air quality standards. Air quality conformance is also evaluated during the planning and environmental stages of a project.
Illinois: Chicago Metropolitan Agency for Planning	Chicago is an air quality nonattainment area, which requires the agency to make frequent use of the MOVES air quality model to demonstrate conformity with pollutant budgets. The agency has also developed rates tables for pollutants that make it easy to apply VMT by speed bin, vehicle class and road type for corridor projects. The agency specifically reviews emissions in environmental justice areas that result from implemented projects.
Massachusetts Department of Transportation	Metrics of change in volatile organic compounds (VOC), nitrogen oxides (NOx), carbon monoxide (CO) and carbon dioxide (CO ₂).
Virginia Department of Transportation	<p>Measures related to environmental quality include:</p> <p>Air Quality and Energy Environmental Effect (50%)</p> <p><i>Description:</i> Potential of project to improve air quality and reduce GHG emissions.</p> <p><i>Objective:</i> Measure rates a project's potential benefit to air quality and ability</p>

Defining and Measuring Furtherance of State and Federal Ambient Air Quality and Greenhouse Gas Reduction Standards

State/Agency	Description
	<p>to increase energy efficiency or alternative energy use weighted by the total number of users served.</p> <p>Impact to Natural and Cultural Resources (50%)</p> <p><i>Description:</i> Potential of project to minimize impact on natural and cultural resources located within project buffer.</p> <p><i>Objective:</i> Measure evaluates how much sensitive land would be affected within project buffer around the project, and rates projects highest that have minimal or no impacts and are providing benefits in other factor areas.</p>

- 1 The agency defines a transportation control measure as any measure that is specifically identified and committed to in the applicable implementation plan 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.

Related Resources

National

MOVES and Other Mobile Source Emissions Models, U.S. Environmental Protection Agency, December 2016.

<https://www.epa.gov/moves>

From the web site: EPA's MOfor Vehicle Emission Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria air pollutants, greenhouse gases, and air toxics.

California

Appendix: Performance Measures, The 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy, Southern California Association of Governments, April 2016.

http://scagrtpsc.net/Documents/2016/final/f2016RTPSCS_PerformanceMeasures.pdf

This document provides data and discussion of the agency's performance measures associated with:

- Location efficiency.
- Mobility and accessibility.
- Safety and health.
- Environmental quality.
- Economic opportunity.
- Investment effectiveness.
- Transportation system sustainability.
- Environmental justice.

Florida

FDOT Multimodal Performance Measures Program Definitions, Florida Department of Transportation, October 2014.

<http://www.fdot.gov/planning/statistics/mobilitymeasures/MPMdefinition.pdf>

This document includes definitions of many of the terms used in corridor plans.

Project Development and Environment Manual, Florida Department of Transportation, June 2017.

<http://www.fdot.gov/environment/pubs/pdeman/current/PDE-Manual-Part1and2-2017-0614.pdf>

This manual describes the agency's alternative corridor evaluation process and other activities associated with choosing corridors or alternatives to carry forward to the project development phase.

2016 Performance Report, Florida Department of Transportation.

<http://www.fdot.gov/planning/performance/2016/2016PerformanceReport.pdf>

This annual report examines performance measures in these categories: safety, preservation, mobility, economy and environment.

Mobility Review Guide: A Proposed Practice, Florida Department of Transportation and U.S. Department of Transportation, February 2013.

<http://www.fdot.gov/planning/systems/programs/sm/mobility/cutr%20updated%20mobility%20review%20guide.pdf>

From the introduction: The objective of this Guide and Checklist is to provide the Florida Department of Transportation (FDOT) with a framework for review of local government multimodal transportation strategies submitted through the CPA [comprehensive plan amendment] review process as they relate to the function of the state transportation system. The Guide and Checklist, with appropriate modifications, may also be useful for reviewing proposed SIS [Strategic Intermodal System] mitigation plans or corridor management plans for major highway corridors. In addition, local governments may find the Guide and Checklist a useful resource in developing effective multimodal transportation strategies for improved local and regional mobility.

Oregon

Project Safety Management System (PSMS), Biennial Status Report, Oregon Department of Transportation, 2016.

http://www.oregon.gov/ODOT/Engineering/Docs_TrafficEng/PSMS_2016-Report.pdf

From page 3 of report (page 5 of the PDF): The Oregon DOT's Project Safety Management System is a comprehensive data analysis and reporting system designed to improve the safety of Oregon's transportation system and reach all safety goals. The objective of the PSMS is to help in meeting ODOT's goal to reduce the traffic fatality rate in Oregon from 10 per 100,000 population in 2009, to 9.25 per 100,000 in 2020 and 8.75 per 100,000 in 2030. The PSMS and associated tools give highway project leaders and designers pertinent PC-based and internet based crash, safety, roadway and traffic mitigation information to perform safety analyses and make safety investments where they will count the most.

Virginia

2017 SMART SCALE Resources, Virginia Department of Transportation, 2017.

<http://vasmartscale.org/resources/default.asp>

This web site offers access to a wide range of current publications describing SMART SCALE, Virginia DOT's methodology to score and prioritize transportation projects competing for funding. Among the publications available at this site are technical and policy guides, and documents describing the project prioritization process. Also included is information about the measures employed within SMART SCALE (safety, congestion mitigation, accessibility and economic development).

Texas

Chapter 3: Goals, Objectives and Measures, Texas Transportation Plan 2040, Texas Department of Transportation, February 2015.

<https://ftp.dot.state.tx.us/pub/txdot-info/tpp/2040/plan/chapter-3.pdf>

Exhibit 3-4, Texas Transportation Plan Performance Measures, appears on page 3-5 of the report (page 5 of the PDF). Measures related to safety and congestions are among those listed in this table.

Other Related Resources

Presented below are citations organized in three categories:

- Preparing a corridor plan.
- Corridor planning and the environment.
- Evaluating projects.

Preparing a Corridor Plan

National Guidance

PlanWorks Decision Guide, Federal Highway Administration, undated.

<https://fhwaapps.fhwa.dot.gov/planworks/DecisionGuide?phaseId=3>

From the web site: The Decision Guide streamlines the transportation process by systematically building in collaboration. It was developed using examples of successful practice and with input from all partners in transportation decision making. The Decision Guide is the hub of PlanWorks—everything is connected to it. The Decision Guide is supported by and was initially developed from many of the Case Studies available in the Library. Individual issues identified in Assessments can be addressed by applying techniques found in the Decision Guide. Applications (accessible through the menu bar) help practitioners consider topics like land use planning, freight, greenhouse gas, and others using a subset of key decisions. Each of these aspects of PlanWorks is built on the essential information in the Decision Guide.

NCHRP Report 661: A Guidebook for Corridor-Based Statewide Transportation Planning,

John L. Carr, Carl D. Dixon and Michael D. Meyer, 2010.

Description at <http://www.trb.org/Publications/Blurbs/163783.aspx>

From the abstract: This guidebook provides a template for corridor planning that will assist states to better understand the implications of transportation decisions on mobility, communities, economic development, and environmental stewardship. The template can be a useful tool to help states program funds to meet identified needs and priorities. It should be of immediate use to transportation decision makers, managers, and planning practitioners involved in the preparation of statewide transportation plans and priority programs.

State Practices

Multiple States

Great Corridors, Great Communities: The Quiet Revolution in Transportation Planning, Project for Public Spaces, Inc., 2008.

https://www.pps.org/pdf/bookstore/Great_Corridors_Great_Communities.pdf

From the booklet: This booklet explores the importance of an emerging corridor approach to transportation planning in which the responsibility for transportation improvements is shared by local communities, private developers and nonprofit organizations, not just placed solely on the transportation or public works department. This inclusive process can yield a safer and more efficient transportation system, strengthen our communities, and protect our priceless natural and cultural resources.

“Great Corridors, Great Communities” presents a series of eight case studies that outline a variety of tools and strategies that are contributing to great corridors around the country—

creating not only successful streets, but creating places in those communities. These corridor planning efforts are in various stages of implementation, and they incorporate a wide spectrum of corridor and community types.

Maine

Maine's Best Practices for Development of Multi-Modal Corridor Management Plans, Androscoggin Valley Council of Governments and Maine Department of Transportation, December 2007.

<http://www.hcpcme.org/transportation/needs/CorridorPlanningGuide121207.pdf>

From the guide: This Multi Modal Corridor Planning Guide has been developed to assist with the preparation of regional multimodal transportation corridor plans in the State of Maine. The idea for this guide grew out of the recognition that many of Maine's transportation needs can be most effectively addressed at the corridor level rather than on a piecemeal basis. Limited resources for transportation improvements at all levels of government are dictating more creative and collaborative approaches to solving and preventing transportation problems. A corridor approach offers the opportunity for communities to collectively plot a future strategy which makes the best possible use of available resources, takes advantage of synergies to produce the best outcomes, and has a greater chance of becoming a reality than would otherwise be the case if each community acted on its own.

Washington

Best Practices in Corridor Planning, Washington State Department of Transportation Research Office, June 2007.

<http://www.wsdot.wa.gov/NR/rdonlyres/2AAA3C10-1E94-4B3C-886F-2AE71B30757F/0/CorridorStudies1.pdf>

This literature search requested by Washington State DOT staff identified reports on corridor planning or corridor studies. *From the report:*

The guidance in many of the plans described as best practices draw upon the philosophies and practices of smart growth, new urbanism and context sensitive design. The focus is on major thoroughfares in urban environments where development intensity, mix of land uses and design features combine to create the opportunity for walking, transit and biking to be feasible transportation choices. Some of the approaches address both context and developing context-sensitive designs. Most of the best practices address: (1) the relationships and tradeoffs involved in balancing mobility needs, adjoining land uses, and environment and community interests; (2) approaches to resolving the challenges encountered on a individual thoroughfare by addressing the larger scale of the network or corridor; (3) guidance to identify and select thoroughfare types and designs to best meet the needs of a particular context; and (4) design criteria for roadway elements.

Corridor Planning and the Environment

PEL and Corridor Planning: State of the Practice Review of Planning and Environment Linkages Implementation in Corridor Planning, Gina Solman, Gina Filosa, Leslie Stahl, Todd Carroll and Jordan Wainer, Federal Highway Administration, July 2014.

https://www.environment.fhwa.dot.gov/integ/corridor_planning_report_July2014.pdf

From the abstract: The Federal Highway Administration (FHWA) commissioned a review of transportation corridor plans to determine the extent to which these plans have utilized FHWA's Planning and Environment Linkages (PEL) approach, as described in the FHWA Guidance on

Using Corridor and Subarea Planning to Inform National Environmental Policy Act (NEPA). The PEL program seeks to help transportation decision-makers to consider environmental factors early in the planning process and to use that information to inform the environmental review process. Each corridor plan in the review was evaluated based on a set of PEL elements organized into four categories: Planning, Collaboration, NEPA, and Data and Documentation. The review found that the most common elements in corridor plans included: transportation problem statement, study purpose and need, corridor definition, and transportation modes. Across the 87 plans evaluated in this review, incorporation of environmental information varies from plan to plan and from State to State. However, the review found that several States have taken steps to explicitly incorporate PEL elements and mention PEL and the NEPA process in corridor plans.

Guidance on Using Corridor and Subarea Planning to Inform NEPA, Federal Highway Administration, April 2011.

https://www.environment.fhwa.dot.gov/integ/corridor_nepa_guidance.pdf

From the executive summary: This guidance is provided to assist transportation planners and environmental practitioners in the use of corridor and subarea planning to inform the National Environmental Policy Act (NEPA) review process. Current law provides authority for, and even encourages, the integration of information and products developed in highway and transit planning into the NEPA review process. This document responds to the need for additional guidance on how best to use corridor and subarea planning to bridge the transportation planning and NEPA processes as described in Appendix A to 23 Code of Federal Regulations (CFR) Part 450 – Linking the Transportation Planning and NEPA Processes.

Related Resource:

“Guidance on Using Corridor and Subarea Planning to Inform NEPA,” Federal Highway Administration, Webcast, April 2012.

<https://connectdot.connectsolutions.com/p6pfj3kjrlj/?launcher=false&fcsContent=true&pbMode=normal>

FHWA’s web site provides the following description of this training webcast:

FHWA’s PEL program recently offered a new training webcast to help transportation planning and environmental practitioners better understand how to conduct corridor or subarea planning studies with the goal of using information and decisions to inform the environmental review process. The course provides information on planning and initiating a study, conducting a study, and making a study viable for NEPA.

FHWA Peer Exchange on Using Corridor Planning to Inform NEPA: Summary Report, Federal Highway Administration, December 2009.

https://www.environment.fhwa.dot.gov/integ/peer_exch_corridors.pdf

From the report: This report summarizes the FHWA Peer Exchange on Using Corridor Planning to Inform NEPA (National Environmental Policy Act), held December 2 and 3, 2009 in Denver, Colorado. The peer exchange workshop examined the use of corridor planning studies as a foundation for NEPA decision making. It highlighted several different approaches that states and metropolitan areas across the country have taken in the use of corridor studies. Peers shared lessons they learned and made recommendations on how best to use corridor planning to bridge the transportation planning and environmental review processes.

Case Studies: Idaho Transportation Department: Corridor Planning/NEPA Integration Guide, *Environmental Review Toolkit*, Federal Highway Administration, undated.

https://www.environment.fhwa.dot.gov/integ/case_idaho.asp

From the web site: Corridor planning began in Idaho as an effort to improve the planning process, and is now the primary method for conducting medium and long-range planning on state system corridors. Early on, planners encountered issues regarding the relationship between the corridor planning process and project selection and development. They identified a need for guidance on integrating NEPA into the corridor planning practices, which led to the development of the Corridor Planning/NEPA Integration Guide. The integration guide describes a range of options for NEPA involvement within corridor planning through scoping, project and cumulative assessments, and alternatives analysis, including documentation of alternatives considered.

Evaluating Projects

National Guidance

Establishing and Integrating Performance Measures: A TPCB Peer Exchange, Scott Middleton, Transportation Planning Capacity Building Program, Federal Transit Administration and Federal Highway Administration, August 2015.

https://www.michigan.gov/documents/mdot/PeerExchangeReport_Final_499635_7.pdf

From the report: The objective of this peer exchange was to help the Michigan Department of Transportation (MDOT) and its partners (including metropolitan planning organizations (MPOs) and transit agencies) prepare for forthcoming rulemaking under the Moving Ahead for Progress in the 21st Century Act (MAP-21). MAP-21 will require transportation agencies to integrate performance management principles into planning and programming. Specifically, the event helped MDOT and its partner agencies prepare for three key requirements of MAP-21: The development of performance measures and targets; the integration of performance measures into the planning process; and the development of performance-based plans for safety, asset management, and congestion.

Incorporating Reliability Performance Measures into the Transportation Planning and Programming Processes: Technical Reference, Anita Vandervalk, Hugh Louch, Joseph Guerre and Rich Margiotta, Strategic Highway Research Program 2, 2014.

Project description at <http://www.trb.org/Main/Blurbs/168856.aspx>

From the abstract: This document is the technical reference for incorporating reliability performance measures into the planning and programming process. It provides a how-to guide for technical staff to select and calculate the appropriate performance measures to support the development of key planning products, including the following: long-range transportation plans; State Transportation Improvement Programs and Transportation Improvement Programs; congestion management process; corridor planning; and operations planning. This technical reference is designed to accompany the guide written for planning, programming, and operations managers and focuses on the options that need to be considered to integrate reliability into the planning and programming process. Detailed case studies were also developed as part of the L05 project [SHRP 2 Reliability Project L05, Incorporating Reliability Measures into the Transportation Planning and Programming Processes] to develop and validate the guidance and techniques presented in the guide and the technical reference.

State Practices

Multiple States

“Maryland Latest State to Consider Transportation Project Prioritization Process,” *Sean Slone’s Blog*, The Council of State Governments, February 2016.

<http://knowledgecenter.csg.org/kc/content/maryland-latest-state-consider-transportation-project-prioritization-process>

This blog post summarizes legislative actions taken in Louisiana, Maryland, Massachusetts, North Carolina, Texas and Virginia to improve transportation project selection processes.

States’ Approaches to Transportation Project Prioritization: Linking Policy, Planning and Programming, Chicago Metropolitan Planning Council, undated.

<http://www.metroplanning.org/uploads/cms/documents/nationalpractices.pdf>

This report summarizes how Illinois and seven other states prioritize transportation projects. Relevant statutes, goals and processes are referenced.

Colorado

“A Comparison of Alternative Techniques for Portfolio Optimization: A Case Study by the Pikes Peak Area Council of Governments,” Maureen Paz de Araujo, Craig Casper, Carlos Paz de Araujo, Mary Lupa and Katherine Haire, *TRB 95th Annual Meeting Compendium of Papers*, Paper #16-5883, 2016.

Citation at <https://trid.trb.org/view.aspx?id=1394202>

From the abstract: Increasing awareness of the complex interdependencies among transportation, land-use, social, economic and ecological systems has fostered implementation investment prioritization approaches that incorporate increasingly more complex goals and metrics. The simplest among newer decision models is the Weighted Score Method (WSM). More rigorous methods, including the Technique for Ordered Preference by Similarity to Ideal Solution (TOPSIS) and Logic Scoring of Preference (LSP), support prioritization driven by asset performance and financial return. A downside of more complex methodologies is a lack of transparency that can foster distrust in results. To build confidence in project prioritization equity associated with more rigorous methodologies, the Colorado Springs Metropolitan Planning Organization (MPO) engaged collaborating partners in a process utilizing three alternative project scoring and prioritization methodologies: 1) WSM; 2) TOPSIS; and 3) LSP. This paper examines the result produced by each methodology, the suitability of each for the optimization of transportation investment priorities, and acceptance of results. The application of each differing approach is contrasted alternative approaches. Functionality, advantages, and disadvantages of each approach are discussed, and potential enhancements are identified. The effectiveness of the multi-technique scoring exercise in building project prioritization consensus is also examined.

Florida

“Automated System to Prioritize Highway Improvement Locations and to Analyze Project Alternatives,” Albert Gan, Priyanka Alluri, Md Asif Raihan, Kaiyu Liu, Dibakar Saha and Rax Jung, *Transportation Research Record 2654*, pages 65-75, 2017.

<http://dx.doi.org/10.3141/2654-08>

From the abstract: The Florida Department of Transportation (DOT) District One first deployed a web-based system in 2009, called the Congestion Management Process (CMP), to screen and prioritize highway locations on its Strategic Intermodal System (SIS) for low-cost, near-term improvements. The system prioritizes highway locations on the SIS within the district on the

basis of a simple scoring method with seven performance measures (i.e., crash ratio, fatal crash, volume-to-capacity ratio, average annual daily traffic, truck volume, truck percent, and delay). Once the Florida DOT adopted the Highway Safety Manual (HSM), there was a desire to apply safety performance measures to the CMP that were consistent with the manual's methodology. There also was a desire to explore and implement a more advanced project prioritization method for better location screening and prioritization and to add mapping capabilities to improve data visualization. This paper describes the district's efforts to incorporate these improvements into the CMP system. The CMP system can calculate performance measures automatically, including two safety-related measures on the basis of the HSM methodology, and prioritize highway locations with the Analytic Network Process, an advanced multicriteria decision-making technique. The system can create thematic maps of performance measures and other input variables on Google Maps for data visualization. It also can evaluate potential projects and record project-level information. Although developed for the Florida DOT District One, the system can serve as a prototype and be customized to prioritize highway locations in other states.

Kansas

“Incorporating Economic Impact Metrics in Transportation Project Ranking and Selection Processes,” Glen Weisbrod, *TRB 90th Annual Meeting Compendium of Papers DVD*, Paper #11-2438, 2011.

Citation at <https://trid.trb.org/view.aspx?id=1092475>

From the abstract: While alternative rating mechanisms and metrics have been summarized in prior literature reviews, this paper seeks to critically examine their differences and implications for project selection. It shows that alternative rating systems actually share a common underlying theory but reflect different factor weights. However, the difference in factor weights does affect project selection, as illustrated through an empirical analysis of alternative rating approaches developed in Kansas. The findings from this research can help any transportation agency involved in ranking and selecting among alternative transportation project proposals, by enabling refinement of performance metrics, analysis methods and their interpretation for use in future decision-making.

Tennessee

Project Evaluation Criteria: 2035 Regional Transportation Plan, Nashville Area Metropolitan Planning Organization, March 2010.

http://www.nashvillempo.org/docs/lrtp/2035rtp/docs/mpo_scoring_031710.pdf

This project scorecard used to evaluate proposed transportation projects includes nine categories, with multiple criteria within each category.

Virginia

“Selection and Evaluation of Bicycle and Pedestrian Safety Projects,” Michael J. Demetsky and Shankar Natarajan, *TRB 88th Annual Meeting Compendium of Papers DVD*, Paper #09-1880, 2009.

Citation at <https://trid.trb.org/view.aspx?id=881411>

From the abstract: The Virginia Department of Transportation's (VDOT) Bicycle and Pedestrian Safety (BPS) Program provides funds for implementing short-term, low-cost bicycle and pedestrian safety projects in Virginia. This initiative is administered by evaluating each project application on a case-by-case basis. The current evaluation process does not include a direct linkage between the selection criteria and conditions at the site that might be hazardous to

nonmotorized travel. This study developed a four-component framework for administering the BPS and similar programs. In this framework, analysis procedures were identified for each component that can be used for identifying hazardous locations, determining causal factors, establishing performance measures, and determining potential countermeasures. The framework was then applied for selecting an appropriate safety treatment and for prioritizing a set of safety projects requested for funding. To demonstrate the applicability of the framework, five case studies were conducted, and the prioritization process was demonstrated using the results of the case studies. The study findings showed that the framework synthesizes existing practice into a systematic approach for identifying bicycle and pedestrian hazardous locations and selecting appropriate countermeasures for implementation.

Other Resources

“Initial Screening Methodology for Corridor Planning Projects,” Adriana Rodriguez and Alan R. Danaher, *TRB 95th Annual Meeting Compendium of Papers*, Paper #16-2951, 2016.

Citation at <https://trid.trb.org/view.aspx?id=1393117>

From the abstract: A typical corridor planning project is conducted with the purpose of leading to a local decision on the best set of potential transit operational and capital improvements within a defined study area. This includes identifying the appropriate transit mode(s) and technologies that may be advanced for implementation. The corridor planning process starts with the understanding of the characteristics of the study area and the identification of the needs of the community. The evaluation framework presented in this paper presents an initial screening process of potential transit modes and alternate routes in narrowing down to a smaller set of complete mode/corridor alternatives for more detailed evaluation in a transit corridor study. It includes a discussion of a segment-based approach which allows combining the best performing corridor routes into initial complete corridor alternatives. This approach incorporates measures reflective of the Purpose and Need identified for a project.

“Trade-Off Analysis Approach for Multiobjective Transportation Investment Decision Making,” Arash M. Roshandeh, Zongzhi Li, Mohammad Neishapouri, Harshingar Patel and Yi Liu, *Journal of Transportation Engineering*, Vol. 141, No. 3, March 2015.

Citation at <http://ascelibrary.org/doi/10.1061/%28ASCE%29TE.1943-5436.0000747>

From the abstract: The existing methods for project selection capable of conducting trade-off analyses mainly focus on assessing trade-offs between project construction time, duration, and cost, as well as swapping between transportation agency costs and user costs. However, they have largely not addressed impacts on the overall economic returns by changing a few important decision factors such as differentiating relative importance of various transportation performance goals and measures, and different types of highway facilities, and further relaxing the budget constraints by management programs dealing with physical facilities and system operations while keeping the total budget unchanged. This paper introduces a trade-off analysis approach that uses a multicommodity minimum-cost network (MMCN) model to establish traffic details for the transportation network needed for estimating the benefits of implementing a single project or multiple projects jointly, and a surrogate worth trade-off (SWT) method for multiobjective project selection based on the estimated project benefits. A computational study has revealed that the proposed trade-off approach can generate noninferior solutions and increase the total benefits by 18-20%.

Transportation Decision Making: Principles of Project Evaluation and Programming,

Kumares C. Sinha and Samuel Labi, John Wiley & Sons, Inc., 2007.

<http://www.wiley.com/WileyCDA/WileyTitle/productCd-0471747327.html>

From the book publisher: This pioneering text provides a holistic approach to decision making in transportation project development and programming, which can help transportation professionals to optimize their investment choices. The authors present a proven set of methodologies for evaluating transportation projects that ensures that all costs and impacts are taken into consideration.

The text's logical organization gets readers started with a solid foundation in basic principles and then progressively builds on that foundation. Topics covered include:

- Developing performance measures for evaluation, estimating travel demand, and costing transportation projects.
- Performing an economic efficiency evaluation that accounts for such factors as travel time, safety, and vehicle operating costs.
- Evaluating a project's impact on economic development and land use as well as its impact on society and culture.
- Assessing a project's environmental impact, including air quality, noise, ecology, water resources, and aesthetics.
- Evaluating alternative projects on the basis of multiple performance criteria.
- Programming transportation investments so that resources can be optimally allocated to meet facility-specific and system-wide goals.

Contacts

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Planning Guidebook

Corridor Planning

TxDOT, Transportation Planning and Programming Division

October 2016

List of Abbreviations

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
BRINSAP	Bridge Inventory, Inspection, and Appraisal Program
CAGR	Compound Annual Growth Rate
CRIS	Crash Records Information System
DCIS	Design and Construction Information System
EMS	Emergency Management Systems
FAA	Federal Aviation Administration
FARS	Fatality Analysis Reporting System
FHWA	Federal Highway Administration
GPS	Global Positioning System
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
LOS	Level of Service
MAP-21	Moving Ahead for Progress in the 21 st Century
MPO	Metropolitan Planning Organization
NHS	National Highway System
NHTSA	National Highway Traffic Safety Administration
PMIS	Pavement Management Information System
RHiNo	Roadway-Highway Inventory Network
RMA	Regional Mobility Authority
RPO	Regional Planning Organization
SAM	Statewide Analysis Model
STRAHNET	Strategic Highway Network
TFN	Texas Freight Network
TIP	Transportation Improvement Program
TNRIS	Texas Natural Resources Information System
TTC	Texas Transportation Code
TTP 2040	Texas Transportation Plan 2040
TP&P	Transportation Planning and Programming Division
TxDOT	Texas Department of Transportation
UCDB	Under Clearance Database
UTP	Unified Transportation Program

Dear Transportation Partners!

It is an exciting time here in Texas! New sources of highway funding from both the state and federal levels have been made available; the concept of measuring the performance of the transportation system is becoming a reality; and the newly adopted values, vision, mission and goals for the Texas Department of Transportation include the goal “Deliver the Right Projects”.

All these “drive” us to the fact that proper planning must be performed to identify the best projects. These projects must deliver real benefits to the citizens while making the most efficient use of financial resources.

To aid us all in this process, we have reviewed recent planning experience throughout the State, and developed this Transportation Planning Guide so that we can all work together to achieve the Department’s goals and objectives. Within the following pages, not only do we describe some of the best planning practices developed through our work on both big and small projects, but we highlight key lessons learned along the way. Good planning practice comes as a result of good experiences; and sometimes good planning practices evolve out of experience gained from less than desirable results.

So, my hope is that this booklet will aid you in your efforts to build a better tomorrow for Texas! My staff and I have been down this road already, and are always available to help in any way we can.



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The following document aims to delineate the main components of a corridor plan while offering direction on data sources and important considerations needed for such analysis.

1. The Purpose and Importance of Corridor Planning

In this era of limited resources, public concerns about excessive reliance on the private automobile, as well as a desire to promote the most cost-effective and environmentally friendly solutions, corridor planning must be conducted as quickly and intentionally as possible. This paper lays out strategies developed over the past three years by the Corridor Planning Branch of TxDOT's Transportation Planning and Programming (TP&P) Division.

1.1. What is the purpose of corridor planning?

Corridor planning studies can help inform those responsible for the transportation decision-making process, in areas such as defining transportation deficiencies, identifying funding needs, determining how corridor improvements fit into larger system plans and understanding the public's priorities. Corridor studies provide the State with an overall vision, as well as guidance and coordination on what future improvements are needed to enhance system safety as well as operations.

1.2. What are some of the goals of a corridor plan?

Some of the main goals of a corridor study may include the following:

- Identifying the existing and forecasted deficiencies;
- Improving safety along the facility;
- Establishing the function, operation, and design criteria for the corridor;
- Linking the corridor to surrounding land uses;
- Planning improvements with a sustainable long-term vision;
- Coordinating and integrating multiple modes of transportation within the corridor;
- Determining the best solution(s);
- Calculating preliminary costs for improvements; and identifying current projects within the corridor study and the progress that is being made for public review;
- Consider environmental, community and economic goals in the planning process and use its results to inform the environmental review process;
- Incorporating public input into the decision making process; and
- Optimizing the impact of transportation expenditures over the planning horizon.

1.3. How do we identify a corridor study?

To determine if a corridor should be the subject of a study some of the following criteria can be considered:

- Congestion;
- High frequency of crashes and/or serious injuries and fatalities;
- Infrastructure that limits commerce or economic development along the corridor;
- Restrictions on travel speed;
- Lack of alternative transportation modes, including non-motorized modes;

- Lack of access control (such as excessive number of driveways) along roadways intended primarily for longer distance travel;
- Lack of complementary facilities;
- Need for vision of future infrastructure development; and
- Public needs and concerns.

Corridor studies may provide benefits in terms of improved access, reduced infrastructure costs, coordinated redevelopment or economic development, and resolution of major planning issues. Corridor-based planning processes usually include the involvement of local officials and other stakeholders because of their ability to relate to the issues being analyzed and their ability to communicate study concerns and findings more widely. A clear and broad communication of the final results of the corridor study is necessary to maximize benefits.

2. The Planning Process

A comprehensive approach to the planning process takes into account three main partners: stakeholders (S), general public (P) and technical staff (T).

Each one has a defined role to play with specific knowledge to contribute.

Planning efforts are continuous and parallel for all three participants with specific times when all three parties come together to both discuss information and revise the direction of the study. The overlapping nature of the work allows for the process to be compressed for time efficiency.

The planning process diagram below illustrates from left to right the main stages of this planning process, how they relate to parallel activities and the role each of the participants has in it.



Stakeholders

Selected members of the community



Public Input

Information or data volunteered by the general public



Technical Staff

TxDOT and/or consultant staff

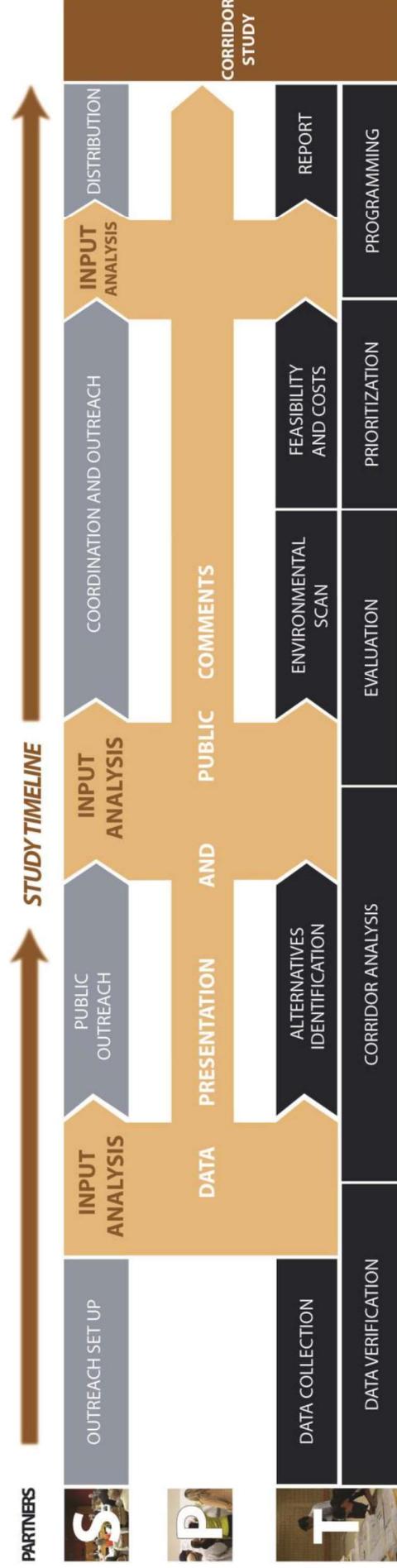


Figure 1 Planning Process Timeline

3. Planning Tools and Strategies

3.1. *Define Goals and Objectives*

The goals and objectives of a corridor study should align with those defined by national and statewide legislation. The Moving Ahead for Progress in the 21st Century Act (MAP-21) outlines a performance-based and multimodal program to strengthen the US transportation system. This is accomplished by establishing national performance goals for the Federal-aid Highway Program in seven areas:

- Safety;
- Infrastructure condition;
- Congestion reduction;
- System reliability;
- Freight movement and economic vitality;
- Environmental sustainability; and
- Reduced project delivery delays.

MAP-21 is echoed by provisions of the Texas HB 20 legislation. State based planning documents like the Texas Transportation Plan (TTP) 2040 and the 2015-2019 Strategic Plan should also be considered when defining goals and objectives. In addition, goals and visions included in plans for counties and cities in the study area should be considered. The process of defining goals and objectives for a corridor study could include input from the public as well as broader environmental issues, including historical and archeological. Involvement of a stakeholder group (working group or advisory committee) should be considered and conveying the message to the public using practical explanations, easy to understand graphics, and outreach activities.

3.2. *Set Up Outreach*

One of TxDOT's goals is to focus on the customer and to have people at the center of what the agency does. Outreach activities aim to represent the interest of affected communities, governmental entities and interested parties along any corridor subject to study.

It is necessary to gauge the level of involvement preferred by TxDOT as well as the level of involvement included in the scope. A schedule for involvement should be developed from this information, which should include the type and number of activities needed for the specific type of study. There are two areas of outreach 1) Stakeholder Outreach (working group/advisory committee) and 2) Public Outreach. In all cases, schedules should be as short as possible to maintain public interest, and committee cohesion.

3.2.1. Stakeholder Outreach

Studies for larger facilities, such as an interstate or US highway, usually call for input from a stakeholder group. Referred to as a working or advisory group, they provide local understanding of the study area and its transportation needs, which results in greater cooperation and coordination among the various entities (local, regional, state, federal) involved during the project planning process and development especially in areas that are more sparsely populated. Members are encouraged to facilitate and achieve consensus among their constituents and peers by conducting public outreach, actively participating in stakeholder meetings, and providing input into study products, such as a draft list of recommended projects and draft corridor plans. Members usually include county judges, MPO, RPO and RMA representatives, city mayors, as well as representatives of key private industries located along the study area. A final member list and the intended goal of the group are usually defined by TxDOT's Project Manager, TxDOT Administration and/or the Texas Transportation Commission.

Working and advisory group meetings and workshops should be geared toward maximum productivity and engagement. Hands-on exercises and participatory strategies are more effective in obtaining information from the process. A streamlined public involvement calendar helps retain the attention and commitment of the stakeholders throughout the process and purpose to the outreach.

The usual sequence of stakeholder group meetings includes the following, but may vary based on the level of study being conducted:

- 1) Kick-off, corridor introduction, and objectives development;
- 2) Review corridor data (traffic, crashes, vertical clearance, etc.) and identify potential improvements;
- 3) Review improvements, evaluate and prioritize projects; and
- 4) Review draft plan.

Activities of the stakeholder group to conduct additional public outreach are performed in parallel with technical analysis and project planning being conducted by TxDOT.

LESSONS LEARNED

- ✓ Attendance by stakeholders is generally proportional to community size.
 - ✓ Meetings need to be focused on actions like decision-making and input gathering by committee.
 - ✓ Distance is critical in participation. If the corridor is longer than 150 miles it is advisable to break the corridor into sections for meetings and to hold them in different sections to optimize attendance and to be fair to all stakeholders.
 - ✓ Working or Advisory group meetings should be stand-alone events.
 - ✓ Simplified educational materials that help explain how corridor planning fits into the traditional transportation schedule are important since the conceptual nature of the corridor planning stage can be confusing for the public during meetings.
 - ✓ Careful selection of group members is critical. Inviting elected officials is important but also key members of the public as well as members from Environmental Justice groups are important.
 - ✓ Multiple shorter meetings with smaller groups improve interaction with stakeholders.
 - ✓ Morning meetings are generally more effective than afternoon ones.
 - ✓ District office involvement needs to be continuous to encourage participation/data sharing.
 - ✓ The appointment of a specific District liaison should be considered to improve communication and facilitate logistics.
 - ✓ Developing a communication toolkit for stakeholder and stakeholder groups can be very helpful which could include fact sheets, presentations for use and outreach activity track logs.
 - ✓ Outreach efforts by stakeholders are well received within their communities. Communication from stakeholders to local media outlets draws good attention.
-

3.2.2. Local Public Outreach

With the goal of conducting a grassroots effort for project planning and development, the responsibility of local public outreach is usually assigned to the stakeholder group. TxDOT provides support to the stakeholders on any activities the group would like to conduct, or any support materials they request.

Communication activities can include public presentations, open houses, surveys, distribution of information through social media, website content, newsletters, email blasts and postcards. However, the specific type of communication tool used must be based on the communities involved in the study as well as the type of message to be delivered and the format of responses being sought. All publicly released materials must be vetted through TxDOT 's Communication Division to assure compliance with departmental guidelines. A week's lead time should be included in the meeting preparation schedule to permit proper reviews.

Given the highly technical nature of the information used for analysis, publicly available information must be as concise and accessible as possible. Uses of summaries, pictograms and infographics have proven to be exceptionally helpful in conveying needs and study findings.

As part of the public outreach/involvement plan, different informational materials can be developed. These include but are not limited to:

- Project webpages;
- Project fact sheets;
- Activity reports;
- Press releases;
- Public presentations; and
- Online surveys.

A Public Involvement Plan (PIP) is a strategic document that outlines the project background, stakeholders, issues and objectives, goals tactics and timelines. As part of the PIP, different avenues of participation should be outlined.

LESSONS LEARNED

- ✓ Survey of public interests and concerns was effective during study initiation.
 - ✓ Media ready materials prompted stakeholders to share study information.
 - ✓ Postcards and other traditional approaches appeared to be more effective in rural areas.
 - ✓ Consultant team or TxDOT staff support during local outreach efforts improved effectiveness and boosted stakeholder confidence in arranging and conducting meetings.
 - ✓ Compilation of an e-mail list for broad public releases should be encouraged throughout the study to improve transparency and coordination.
 - ✓ First round of outreach was critical to obtain input; second round at the end of study was valuable primarily in confirming acceptability of study results.
 - ✓ One must consider how broad the use of internet platforms is in the study area. What is the nature and frequency of usage? This can be especially important in rural locations.
-

4. Data Inventory and Analysis

4.1. Planned and Programmed Improvements

Project Tracker is TxDOT's online reporting system that provides information related to transportation projects in Texas. The online and desktop versions of the Statewide Planning Map as well as the Statewide Transportation Improvement Program (STIP)/Unified Transportation Program (UTP) are additional sources of planned/programmed projects in Texas. When near an urban area, the MPO's Transportation Improvement Program (TIP) and the Long-Range Transportation Plan should also be reviewed.

The STIP is TxDOT's four-year program summarizing project development, where all projects are described by funding and an expected let date. The UTP is used by TxDOT as a 10-year plan to guide transportation project development based on anticipated funding. Specifically, it is a listing of projects and programs that are planned to be constructed and/or developed within the first ten years of the 24-year Statewide Long-Range Transportation Plan.

LESSONS LEARNED

- ✓ Review all available databases for Planned and Programmed Improvements, including the Long Range Plan, UTP, TIP/STIP, as well as Project Tracker. Local and regional plans should also be considered.

4.2. Road Designation

Highway designations are used to determine funding and the need for upgrades or improvements. They can be confirmed through various TxDOT sources like the desktop and online version of the Statewide Planning Map or the Roadway-Highway Inventory Network (RHiNo) database. The Texas Freight Network (TFN) is defined by key transportation corridors and includes major highways, railroads, waterway, airports, and pipelines. Criteria necessary to be included in the TFN includes corridors that:

- Carry the highest freight volumes;
- Connect key highway, rail and waterway corridors;
- Connect to key gateways, such as water ports, rail terminals, airports and international border crossings;
- Connect to key generators serving local, regional, statewide, intrastate, interstate and international trade and economic development areas;
- Connect to military installations, distribution centers, oil and gas terminals, agricultural regions, intermodal centers and other economic regions and commodity centers; and
- Connect to markets and population centers.

The TFN is comprised of a Primary Freight Network and Secondary Freight Network/Emerging Freight Corridors. Included in these are Interstates, the National Highway System (NHS), and the Texas Trunk System. This last category is a network of rural highways that complements and includes elements of the Interstate Highway System. During a previous economic downturn, there was a desire to strengthen the State's economy by improving the highway networks in areas not well served by Interstates. Creating four-lane divided highways to serve areas with lower access to the Interstate was viewed as a means to increase travel and commerce in the region. During this same time, the next federal transportation bill (called ISTEA) was under development.

One key element of ISTEA was the development of a National Highway System (NHS) of interconnecting principal arterial routes, which would serve major population areas, international border crossings, and other modal transportation facilities. TxDOT decided to develop a long-range highway plan that would address the needs of local communities and incorporate required elements of the federal legislation.

The Strategic Highway Network (STRAHNET) is a system of roads deemed necessary for emergency mobilization and peacetime movement of supplies and commodities to support U.S. military operations. Although most miles of the STRAHNET are interstate facilities, their consideration is necessary in prioritizing improvements to ensure proper functionality.

Designation under one or more of these categories lends prioritization to corridors or corridor segments when choosing implementation timeframes for improvements and possible funding sources. Equally important for many purposes, roadways under state jurisdiction carry a designation, and occasionally can carry several designations, when routes overlap each other.

LESSONS LEARNED

- ✓ Certain roads can carry several designations and/or names. Planners should be aware of all the designations on a roadway as well as any past designations and future ones.
- ✓ Several designations have similar roadway symbols (e.g. FM, RM, etc.) and may be easily confused. Planners should search for the road names using the TxDOT Statewide Planning Map Search tool to check roadway designations.

4.3. Corridor Characteristics

Every year TxDOT publishes a new version of the Roadway Highway Network (RHiNo) dataset georeferenced and including 144 attributes (refer to RHiNo Data Dictionary) such as:

- Functional classification;
- Highway design;
- Median width;
- Average daily traffic;
- Percentage of trucks;
- Speed limits;
- Number of lanes;
- Right-of-Way.

The information contained in this dataset allows for the assessment of current conditions on existing roadways and determination of needs and opportunities for improvements.

Data verification is necessary given the magnitude and ever-changing nature of the dataset. It can be performed through desktop research by comparing RHiNo data against Google Maps or other recent databases, especially between versions of RHiNo datasets which are updated on an annual basis. Videotaping the corridor during the first field visit is advisable in order to have the latest possible resource for subsequent verification.

LESSONS LEARNED

- ✓ RHiNo appears to use averaged data for long segments of highway.
 - ✓ ROW data from original construction plans does not appear to have been consistently updated when improvements are performed on highways. ROW data for segments expanded at a later date may not have been digitized and entered into RHiNo.
 - ✓ Average ROW width is described generally by segment, so closer examination of ROW widths must be performed when exploring the feasibility and impact of highway improvements. Also, ROW is not specified at interchange locations.
-

4.4. Crash Data

4.4.1. Crash Sources

There are two main sources where raw crash data can be obtained: The Crash Records Information System (CRIS), maintained by TxDOT, and the Fatality Analysis Reporting System (FARS), maintained by the National Highway Traffic Safety Administration (NHTSA).

CRIS

CRIS is a statewide dataset maintained and updated by TxDOT for all reported motor vehicle traffic crashes within the State. It is compiled and submitted by law enforcement agencies and interpreted as data fields.

The CRIS Public Interface contains data collected that may be released to the public as per Texas Transportation Code (TTC) 500.065. CRIS data can be obtained using TxDOT's automated online process or by requesting it directly from TP&P's Corridor Planning Branch. Online CRIS data requests can be in XML or CSV format and are downloaded as raw data. Requests usually take 24 hours to process after which the data file becomes available for download by the user, up to a certain time before it expires. CRIS data is available for the current calendar year plus the five previous calendar years.

CRIS data usually requires some data management before it can be imported into a Geographical Information System for analysis. The most commonly used data fields for crash analysis include the following:

Table 1 CRIS Database Fields

Crash Data Field	Example
	11807193
Crash Date	11/9/2012
Crash Day of Week	FRIDAY
City	Marble Falls
County	Burnet
Rural Flag	Yes; No
Highway	US0281
Crash Control Section	0253-03
Crash Time	7:18 AM
Crash Milepoint	12.118
Crash Latitude	29.93832
Crash Longitude	-98.4104
Road Part	Main/Proper Lane
Road Type	4 or more lanes, undivided
Secondary Highway	FM0306
Intersection Related	Intersection; Driveway Access
Derived Intersecting Road	RM0473
First Harmful Event	Motor Vehicle in Transport; Fixed Object
Light Condition	Daylight, Dark-Not Lighted, Dawn
Weather Condition	Cloudy, Clear, Rain
Surface Condition	Wet, Dry, Ice
Manner of Collision	SD* Both Left Turn, OD** Both Going Straight
Crash Contributing Factor List	Failed to control speed, Changed lane when unsafe
Crash Severity	Not Injured, Possible Injury, Fatal
Vehicle Body Style	Passenger Car 2-Door, Pickup, Truck Tractor
Vehicle Direction of Travel	North, South, East, West

* Same Direction

** Opposite Direction

TxDOT publishes an annual report called the Texas Motor Vehicle Crash Statistics¹, which contains statistics generated from CRIS data and aggregated by several categories. The report can be accessed off the web and is summarized by year.

¹ <http://www.txdot.gov/government/enforcement/annual-summary.html>

FARS

NHTSA maintains a dataset called FARS that summarizes all vehicle crashes involving a fatality. The crash data begins in 1975, and extends to the present day for public roadways. Crashes resulting in the death of a person (occupant of the vehicle or not) within 30 days of the crash are included in FARS. FARS offers additional information related to the crashes not included in CRIS such as sequence of events leading to the crash, any visual obstruction and/or driver distractions, and number of fatalities. The CRIS and the FARS databases do not share a unique ID per crash, but it is possible to intuitively identify the same crash in the two databases using its date, time, and location (city, county, geocoding).

4.4.2. The Crash Analysis Process

The crash analysis process begins with identifying sources where crash data can be extracted. Those can be statewide, or even federal sources such as those mentioned in the previous section. Based on the selected sources, the analyst can determine what time periods the crash data is available for an appropriate study period (usually the previous full five years of data is utilized).

After obtaining and processing the data, locations of high concern can be identified. These are typically locations with high crash frequencies, or concentrations of severe crashes. Another strategy that can be used is the crash rate. This allows the analysis to be normalized by taking into account segment lengths and traffic volumes. Note that TxDOT's statewide average crash rates posted on the web are updated regularly and may change even between years. It is advisable that whenever an average crash rate is obtained from the TxDOT website and used in a corridor study, that file be saved because if the analyst attempts to access that same file location for the same year in the future, he/she might obtain different rates than the ones previously reported.

One method for identifying high crash locations is comparing the computed crash rates to statewide averages which can be obtained by facility type from TxDOT's Texas Motor Vehicle Crash Statistics. Road segments of special concern, often referred to as hotspots, are usually stretches of the corridor where the crash rate is significantly higher (e.g. 1.5 times to two times) than the statewide average. Another method is to define crash locations by looking for crash clusters which are locations with a high number of crashes typically (e.g. at least 5 per year per approach).

After identifying locations of concern, it is important to investigate these areas and highlight any existing crash patterns. Characteristics and histories of the area being studied are also important in making an assessment. Information on when the road was last resurfaced, new land developments being built in the immediate area, or new traffic control devices are examples of useful inputs when analyzing crash experiences at a given intersection or road segment.

These crash investigations help analysts come up with recommendations for future improvements that could reduce or eliminate some of the most significant crash patterns. Such recommendations depend on engineering judgement and analyst experience in the area.

4.4.3. Key Concerns

In any crash analysis, there are a number of factors to keep in mind. Although the CRIS user interface is user-friendly and the data fields are detailed and clearly described, there are still some considerations that need to be addressed to ensure an accurate and comprehensive crash analysis.

One of these key considerations is a highway with multiple designations which usually exists in an area where multiple highways intersect. It is important to request crashes coded on each of the designated facilities separately since the CRIS database associates a crash with only one major highway. For example, if a study was being conducted on the US 281 corridor in Texas and there are sections that have dual designation (like the US 281/US 183/US 190 section in Lampasas), some crashes may be coded to US 281 while some may be coded to the other two facilities.

Another consideration is similarly described intersections. Several highways in Texas intersect the same facility twice, overlapping with it in between such as the US 290 East and US 290 West intersections with US 281 in Blanco County. Since the CRIS database does not differentiate between the naming of the two roads (both referred to as US 290), there could be instances where a crash that occurred on US 290 East is coded to US 290 West. Therefore it is important to analyze crash directions and make sure they make sense in the context of the intersection to which they are coded to. After summarizing all crashes with CRIS supplied data fields, analysts should group crashes according to factors such as manner of collision or vehicle direction of travel. If some of the records do not appear to be consistent with the intersection's geometry, further investigation may be justified. One way to double check is to request individual crash reports for these locations. The reports include a more detailed description of each crash, and usually include a diagram of the collision which could clarify which intersection they occurred. Another means of verifying that all crashes have been located accurately is by requesting CRIS data on intersecting highways within a short distance of the corridor under study. Previous study experience has helped determine that as much as 27 percent of total crashes could be coded to the intersecting highway.

A key source of error related to geocoding is the synchronization of the geographical coding of the crash to its "Derived Intersecting Road" field. Since the CRIS database relies on automation, some software errors are bound to occur. There are some crashes that the study team has come across where the crash is coded onto a certain road but the corresponding "Derived Intersecting Road" field is another road. The CRIS team is currently working on improving the automation of the database to eliminate such inconsistencies. However, it is still important to keep in mind that such an error may occur, so when a crash does not seem to make sense based on the intersection it is associated with; it is useful to determine its location based on its geocoding and check if that makes more sense. It is also helpful to look at individual crash reports when no clear conclusions can be made otherwise. Because of privacy concerns, access to these reports is limited, and judicious requests should be made through the TP&P Corridor Planning Branch.

Since the CRIS database uses coded fields that are interpreted from officer reports, it is important to keep in mind that the same crash may be interpreted in different ways. This is an essential point for identifying patterns. For example, a rear-end crash between two northbound vehicles turning right in the channelized lane controlled by a yield sign can be described through three different directions and manners of collision: 1) North-North/SD² Both Right Turn, 2) Northeast-Northeast/SD Both Going Straight – Rear End, and 3) Northeast-Northeast/SD One Straight-One Stopped.

4.4.4. Crash Validation

It is useful to rely on other sources as well to validate crash results. Such sources may include other research studies, statewide averages, and most importantly, district and local staff knowledge. Coordination with local staff at all levels of the crash analysis is important to ensure a comprehensive study that incorporates local experience/knowledge with a specific area, previous and future plans, and any other studies that have been completed. Coordination with EMS or other incident management entities along the corridor may be another source to validate results or get additional information related to crashes or safety.

4.4.5. TxDOT Initiatives

Based on national or local experience, TxDOT frequently focuses resources on specific types of crashes. At the time of the writing of this paper, the focus was on head-on collisions resulting from one vehicle turning the wrong way down a one-way ramp. Previous initiatives have targeted drunk driving, or distracted driving due to cell phone use.

LESSONS LEARNED

- ✓ Reporting of all vehicle classes involved in a multi-vehicle crash as a single record would improve data searches and expedite analyses.
- ✓ Crashes on multi-designation sections of a highway may be coded to any one of the designated facilities and as such, records for all the co-designated facilities should be requested and analyzed.
- ✓ At intersections, crash records on both the main and the intersecting facility need to be considered since in some cases it has raised crash frequency by up to 27%.
- ✓ Crashes coded as having occurred in one of two intersections for the same cross street have a chance of being miscoded and must be checked more closely.
- ✓ As a result of a level of automation in record processing, inconsistencies between facility names and CRIS geocoding have been found as well as inconsistencies between CRIS geocoding and reported crash coordinates. Diagrams and descriptions included in individual crash reports have been found to be the best source for resolving these conflicts.
- ✓ Heavy vehicle classification in crash reports could be improved. Confusion could happen over descriptions of “mixed vehicles” or inconsistent classification of large vehicles as RV, private vehicle, or commercial truck.

² Same Direction

4.5. *Geometric Review of the Existing Facility*

Roadway design standards evolve to reflect new measures of safety and efficiency as well as in response to improved vehicle performance. A geometrical evaluation of the corridor in question should be used to determine its consistency with current design standards.

TxDOT's Roadway Design Manual defines design ideals for everything from curves to sight distances. Elements to consider may include:

- Exit and Entrance Ramps;
- Sight distances along the roadway and at intersections;
- Superelevations;
- Passing lanes at intersections;
- Horizontal and vertical curves; and
- Review of traffic control devices at high crash locations.

LESSONS LEARNED

- ✓ Vertical and horizontal information needs to be considered in facility and interchange reviews.
 - ✓ Horizontal curves and alignments for planning purposes can be measured from Google Map/ TNRIS imagery.
 - ✓ Vertical elevations have been acquired during consultants' own data collection activities in the corridor using GPS.
 - ✓ Some initial cost estimates for improvements were lower than expected by the Districts because they were based on the lowest available bid prices from TxDOT sources. Cost estimates should use a more conservative approach.
-

4.6. *Traffic Analysis and Forecasting*

Average Annual Daily Traffic (AADT) is included in corridor plans and used to determine the Level of Service (LOS) for specific segments, and to analyze usage patterns of the roadway. While traffic counts can be obtained from TxDOT's annual traffic counting program as summarized on the Statewide Planning Map and RHiNo as well as from the Statewide Analysis Model (SAM) and RHiNo for forecasting purposes, it is preferable to request a corridor traffic package. This should be done as soon as possible due to the lead time needed to process such requests. Analysts should use edit and logic checks on all data regardless of its source to ensure its accuracy. In areas within MPO boundaries, the MPO travel demand model should also be considered for traffic forecasts.

RHiNo forecasts use a uniform average annual growth rate for all highways, without consideration of localized changes in land use and/or activity patterns. SAM uses socio-economic factors and forecasts for each county within Texas, along with average capacities and other factors to forecast traffic within the entire state. Alternative forecasting approaches can be considered to provide a

more sensitive traffic forecast within the corridor being studied. Some of these alternatives include the use of historical traffic to compute Compound Annual Growth Rate (CAGR) or the use of the ratio of historical traffic to population growth rates to determine traffic forecasts.

Other methods include the use of big data such as Bluetooth, AirSage, HERE Data or similar source/tools. The origin-destination (O-D) information from these data sources can be used to validate the trip table for a travel demand model, if applicable. Alternatively, a trip table can be developed based on these O-D data, and traffic assignments can be conducted to calibrate with the existing traffic counts. These data, along with demographic forecasts, can be utilized to develop preliminary traffic forecasts without having to refine the travel demand model.

Separate truck traffic forecasts should also be considered for corridor studies, particularly if the study corridor is recognized as a major freight route. Similar approaches to the ones previously mentioned can be used to estimate truck traffic growth. The RHiNo dataset includes the percentage of trucks based on the total AADT count. In addition, TxDOT provides the Statewide Flowband Maps, which depict the total bi-directional traffic and truck volume. However, the Statewide Flowband Maps do not provide forecasted truck traffic.

LESSONS LEARNED

- ✓ INRIX and, Bluetooth (when available) are useful in calculating congestion by developing actual/posted speed ratios. However averaging data in order to aggregate it can bring the actual speed total below observed speeds; and therefore it is important to spot check the datasets.
- ✓ Traffic forecasts included in RHiNo are based on average growth rates, and may not accurately reflect local conditions.
- ✓ The Statewide Analysis Model (SAM) has not been calibrated to specific corridors, making it a less than reliable tool for local studies. SAM is presently calibrated on various cordon lines across the state, and is only good for use on the macroscopic level. Understandably, it consistently underestimates localized traffic movements.
- ✓ Corridor level enhancement of SAM model may be too expensive to justify use for planning purposes, but may be considered on a case by case basis.
- ✓ Forecasts should include truck volumes.

4.7. *Bridges and Vertical Clearances*

TxDOT develops the Bridge Inventory, Inspection, and Appraisal Program (BRINSAP) to assess all aspects of bridge structures within the State's transportation network. Sufficiency Ratings are evaluated using a scale of 0 to 100, with higher scores signifying better structural condition. Functional Obsolescence and Structural Deficiency should also be considered when reviewing structures along a corridor. Structures falling in either of these classifications do not necessarily

require replacement, but their status can be an important input into determining an investment strategy for the structure itself, or even the larger portion of the transportation system that it is connected with.

In addition, vertical clearance information is considered based on the UnderClearance DataBase (UCDB) since low clearances create height restrictions for freight flow along the corridor. Vertical clearances are evaluated under two different design standards; (1) Federal Highway Administration (FHWA) standards which state that the minimum acceptable bridge clearance nationwide is between 14 ft. and 16 ft., and (2) State standards which recommend clearances of six inches (16'6") greater than the Federal standard. The BRINSAP and UCDB datasets are both available through TxDOT and can be imported into GIS.

The 2014 RDM requires 16'6" ft. of minimum vertical clearance for all new structures, regardless of the classification or the type of roadway (urban street, suburban street, freeway, etc.). They allow design exceptions on a case by case basis down to 14'6" ft. Most design exceptions usually involve an existing structure that doesn't need to be replaced due to obsolescence or sufficiency rating. Existing structures with vertical clearances lower than this may be considered for urban and suburban streets only.

Structures over the main lanes of Interstates or controlled access highways must meet these minimum vertical clearance requirements except within cities where the 16'6" ft. vertical clearance is provided on an interstate loop around the particular city. Less than 16 ft. vertical clearance on rural interstate and single priority defense interstate routes has to be approved by TxDOT's Design Division, FHWA, and the Department of Defense.

As part of the planning process, one task of a corridor study is to identify low clearance locations and recommend improvements that can be coordinated with other possible improvements at that location. Alternative routing potentials should be evaluated at each low clearance location in order to prioritize locations that provide the most benefit if improved (because there are no alternative routes). The Texas Freight Mobility Plan recommendation of an 18'6" clearance for corridors with oversized trucks should be considered in a corridor study where relevant.

LESSONS LEARNED

- ✓ UCDB database is the most accurate source for vertical clearances.
 - ✓ BRINSAP database is a reliable source, but the consultant must be familiar with criteria used to apply for funding and improvement or structures using these ratings.
-

4.8. *Pavement Condition*

The Pavement Management Information System (PMIS) is TxDOT's automated system for storing, retrieving, analyzing, and reporting surface pavement condition information and can be used to illustrate current pavement conditions as well as to determine total needs along a specific corridor. PMIS scores include in their calculation considerations for traffic volume (ADT) and speed (speed limit). Pavement conditions are rated using both visual observation and automated pavement tools. However structural soundness of pavement should be assessed separately based on actual pavement age and local staff assessment of need.

LESSONS LEARNED

- ✓ Lack of data on pavement condition (below surface) as well as historical costs for pavement rehabilitation limits the usefulness of PMIS data.
 - ✓ Spending on pavement maintenance is not readily available or closely monitored. Districts do not usually keep records. Yearly budgets allocated for pavement maintenance are available, however expenditure on specific facilities is not always accessible.
 - ✓ Scoring of pavement in PMIS and implementation of pavement upgrades are not always coordinated. There is a considerable lag between when the pavement improvement occurs and when it is re-inspected for PMIS.
-

4.9. *Truck Parking*

Trucking in Texas accounts for a large portion of freight movements. Over the past decade, Federal rules on the number of hours that truck drivers can operate their vehicles between rest cycles have been reduced. This leads to trucks having to park for rest periods more frequently. As such, the need for additional truck parking increases. Determining the number of available parking spaces, current and future demand, and identifying opportunities for additional facilities along a corridor is necessary to improve performance and safety.

In estimating the number of parking spaces available along a corridor, it is necessary to take into consideration freight trip generation as well as the presence of truck yards, truck stops, safety rest areas maintained by TxDOT, and traveler information centers.

The Federal Highway Administration (FHWA), various states and even private companies have developed equations to determine truck parking demand based on several factors such as: annual average daily traffic (AADT), segment length, average speed, percentage of trucks and average parking duration per hour of travel. These factors can help define truck parking needs.

A general desktop survey would identify existing truck parking facilities. Armed with this information, a more detailed survey would be necessary to determine the specific number of parking spaces available.

LESSONS LEARNED

- ✓ Phone surveys have proven effective in determining alternative truck parking locations such as those in big box retail stores available at each site.

4.10. *Alternative Modes*

Population and traffic growth across the State has increased the need for transportation alternatives. Safety concerns and air quality impacts related to the use of private automobiles have also influenced the desire for the implementation of transportation alternatives.

Since each corridor has different socio-economic and performance characteristics, each study should analyze different elements to determine the feasibility of passenger and freight transportation alternatives. These analyses must include considerations for the urban and/or rural character of a corridor.

Alternatives should be explored for corridors with high demand for freight or passenger travel. Trip data on the number of trips beginning and terminating are necessary for this type of alternative.

LESSONS LEARNED

- ✓ Population density and system accessibility as well as safety considerations are usually determining factors of the success of new non-motorized alternatives. These are most frequently employed to solve the “last-mile” needs.
- ✓ Optimization of existing travel alternatives should also be explored before considering implementation of new alternatives. Coordination or restructuring of existing alternatives can help ameliorate demands on the system as well as help create the necessary conditions for other solutions in the future.
- ✓ Use of emerging technologies should be explored in developing solutions that are relatively easy to implement with lower capital costs.

4.11. *Energy Sector Considerations*

Among the 254 counties in Texas, 223 are actively producing oil or natural gas. Growth in the energy sector has a significant impact on the service life of existing pavement, not to mention travel times and safety that can be affected by the growth in heavy truck volumes.

According to TxDOT³, the service life on IH, US, SH, and FM highways is reduced by 30% due to truck traffic associated with natural gas well operations, and by 16% due to truck traffic associated with crude oil well operations. This creates a high cost to repair roadway infrastructure from drilling damage, which is especially true in rural areas where local roads were not designed to handle heavier freight loads.

Additionally in 2011, Texas had nearly three times the installed wind capacity of any other state in the United States⁴. The estimated truck traffic associated with a single windmill site is 336 trucks. However, growth slowed significantly by 2013, and the future freight impacts in Texas may include slower growth in wind turbines and parts being transported from ports to West Texas if legislation doesn't change the market feasibility for wind power.

TxDOT's Statewide Planning Map (desktop version) includes information related to the energy sector. It contains information about existing oil and gas wells, permitted locations for exploration/production, and pipeline or shale play locations across the State.

The U.S. Fish & Wildlife Service provides wind turbine location derived from the Federal Aviation Administration (FAA) Obstruction Analysis/Airport Airspace Analysis. Four generalized status categories for windmills are included in the dataset: *Determined with build date*, *Determined without build date*, *Determined as hazard*, *Not yet determined*. The yearly dataset can be downloaded from http://www.fws.gov/southwest/es/Energy_Wind_FAA.html.

Identifying the existing and future location of oil and gas wells, as well as windmills, may be a necessary part of the planning process in a corridor study since it aids in determining possible constraints and localized needs.

5. Use of Mapping and Geocoding

Mapping for corridor studies includes the development of protocols for data analysis and delivery in addition to the definition of data representation standards.

5.1. Data Analysis

Geographical analysis of corridor data must rely on coordinate based digitization of available databases through geocoding.

³ Texas Department of Transportation. Energy Sector Impacts to Texas' Transportation System. (March 16, 2016). https://ftp.dot.state.tx.us/pub/txdot-info/energy/presentation_041312.pdf

⁴ Texas Coalition for Affordable Power. Texas Wind Energy. (March 16, 2016). <http://texaswindenergy.tcaptx.com/>

5.2. *Data Representation*

Aerial Imaging is available through TNRIS as a downloadable picture and as a WMS server service. TxDOT can provide its subcontractor with the use of the official TNRIS aerial photography, developed in partnership with Google and available as a WMS service. Link and instructions must be requested from TxDOT's Project Manager.

TxDOT has document templates and complementary graphic guidelines available in SharePoint for all documents prepared in their representation. Templates were developed in InDesign, and as such, changes to their configuration should be minimized to maintain consistency.

Maps prepared for any study must comply with the Data Management Section's current map template and include the most recent date of the data displayed as well as the name of the company preparing the map on behalf of TxDOT.

5.3. *Database Delivery and TxDOT Data Management Practices*

The online version of the Statewide Planning Map is an ArcGIS web-based application that allows quick reference of basic TxDOT inventory databases. The desktop version is a downloadable ArcGIS map package containing TxDOT inventory databases in a georeferenced layer format. Information on it includes current conditions of the roadway network; city, county, and district boundaries, MPO and RMA boundaries; state or national parks; military installations, among others.

The Design and Construction Information System (DCIS) is an automated system used for planning, programming, and developing projects. Derived from DCIS, the online and desktop versions of the Statewide Planning Maps include four geo-enabled databases with data related to highway road improvement projects. Attributes include location, cost estimates, lengths, to-be-let dates, brief description of the project, among others.

Finally the data related to analyses must be delivered to TxDOT in an appropriate format once the study is completed. Analysts should confirm the desired format prior to completing work.

5.4. *Map Packaging*

All maps created as supporting material for a corridor study should be delivered to TxDOT in both PDF and MXD format. PDFs should have enough resolution to be legible both in printed and digital format. MXD files should be stored as Map packages with all their corresponding shapefiles stored in a properly named Geodatabase. Shapefiles developed or digitized during the analysis should be included with the following nomenclature: ShapefileName_Date(MMDDYY).

6. Identification of Possible Projects

After contrasting all the previously mentioned databases with their particular preferred standards, a preliminary "current state of affairs" assessment can be developed. Findings from this preliminary

assessment should be presented and corroborated with local stakeholders and TxDOT staff to warranty their relevance, and avoid conflicts with planned or programmed improvements. A matrix of proposed projects or improvements is typically the result of this effort. Once analysis has begun, a final status check on current projects as well as identification of any new projects is recommended every once in a while during the duration of the project.

6.1. Stakeholder & Public Input

- Coordinating proposed improvements with local plans
- Incorporation of local visions for the corridor

6.2. District Consultation

- Coordinating proposed improvements with District plans
- Incorporation of District visions for the corridor

6.3. Technical Analysis

- Aligning proposed improvements and deficiencies
- Selecting the best transportation improvements with the least negative impacts

7. Preliminary Project Evaluation

Once all the proposed projects for the corridor study have been identified, they must be evaluated based on specific criteria reflective of state and federal goals. TxDOT's current goals are performance-based, including MAP-21 or other performance measures.

Safety benefits can be addressed through specific measures like the crash rate ratio of a segment to that of the state as a whole. If a working group or advisory committee is involved during the corridor study, this evaluation should be validated through public input or coordination with involved stakeholders

8. Environmental Scan

The primary objective of an environmental scan is to determine potential impacts, constraints, and opportunities for a specific corridor as well as determining the existence of environmental features, if any, that may warrant further analysis. An environmental scan is designed to identify physical, ecological, social, and cultural features within the study area of a corridor that may be impacted by potential improvements to the corridor. Additional project-level analysis will be required depending on the nature of an improvement before it is implemented. This scan can assist in refining the level of effort required to advance the project to construction.

9. Engineering Feasibility and Cost

Performing a feasibility analysis can help to determine if the projects considered for a specific corridor should be undertaken based on costs and technical limitations. Technical limitations can be determined by considering design alternatives, geographic location of the project, among other factors. Preliminary cost estimates, provided for all projects under consideration, can be calculated

based on unit bid prices. Once the preliminary costs have been identified, alternative funding sources should be considered to supplement available traditional funding sources.

LESSONS LEARNED

- ✓ *Consulting with District offices in regards to cost estimations and per mile cost assumptions specific to their areas proved valuable in ensuring the development of relevant preliminary cost estimates.*
-

10. Prioritization

Due to limited resources and programming constraints, the prioritization of projects is a necessity when conducting corridor studies. Prioritization could be based on general considerations (i.e. traffic levels or safety considerations) or on project specific elements. Priorities and the evaluation approach will vary depending on the characteristics of each corridor. Working groups or advisory committees should guide the prioritization process, whenever they are involved in a corridor study.

LESSONS LEARNED

- ✓ There's a need for discussion of alternative methods of financing and implementation, both to gather local support for State initiatives, and to identify and build support for local sources of funding.
 - ✓ These topics might be more germane and effective if brought up later in the process, after potential improvements have been identified.
-

11. Programming and Reporting

Based on feedback received from an advisory or working group, as well as public input; results from the needs assessment, ranking, and prioritization of proposed projects should provide comprehensive and project level programmatic recommendations broken down in a logical timeframe (near, mid and long term).

Proposed project listings and programming recommendations are typically presented to Directors and Administrators in order to be validated for inclusion on improvement plans. Complete and easily understandable information is crucial in aiding discussions of priorities and funding.

LESSONS LEARNED

- ✓ Preparing a summary of appropriate programming recommendations is recommended for use in discussion with TxDOT officials.
 - ✓ Graphical representations of project programming are helpful in communicating study recommendations to the public as well as quick reference guides to TxDOT and District officials.
-

12. Draft and Final Plan

As a final deliverable a report detailing the corridor study is prepared in compliance with TxDOT's graphic standards and requirements up to their most recent version.

Consideration must be given to the formatting of the final documents in order to enhance readability and ensure the use of the document. For example long corridors presented as independent section reports that assemble a corridor document can be used as needed by TxDOT and its officials for reference, decision-making and programming of projects.

While the structure of this report is dependent on the specific needs of each study, it is advisable to include an executive summary, a main report, an implementation program, a public involvement summary and all other relevant appendices.



TEXAS DEPARTMENT OF TRANSPORTATION

PLANNING GUIDEBOOK



STAKEHOLDERS



PUBLIC INPUT



TECHNICAL

OCTOBER 2016

CORRIDOR PLANNING

Corridor planning studies can help enhance the transportation decision-making process by defining transportation deficiencies, identifying funding gaps and determining how corridor improvements fit into larger system plans.

Corridor studies provide an overall vision, as well as guidance and coordination on what future improvements are needed to enhance safety and travel efficiency.

Corridor-based planning processes can benefit from involvement of local officials and other stakeholders who can relate to the issues being analyzed from local perspectives. A clear communication of findings of the corridor study to the general public is necessary to create support for various improvements.



Texas Department of Transportation

Corridor studies can improve access, identify the most cost-effective improvements, coordinate economic development, improve safety and enhance travel.

- What are some of the goals of a corridor plan?**
- Linking the corridor to surrounding land uses;
 - Planning improvements with a sustainable long-term vision;
 - Coordinating and integrating multiple modes of transportation within the corridor;
 - Optimizing cost effective transportation expenditures;
 - Improving safety along the facility; and
 - Establishing the function, operation, and design criteria for the corridor.

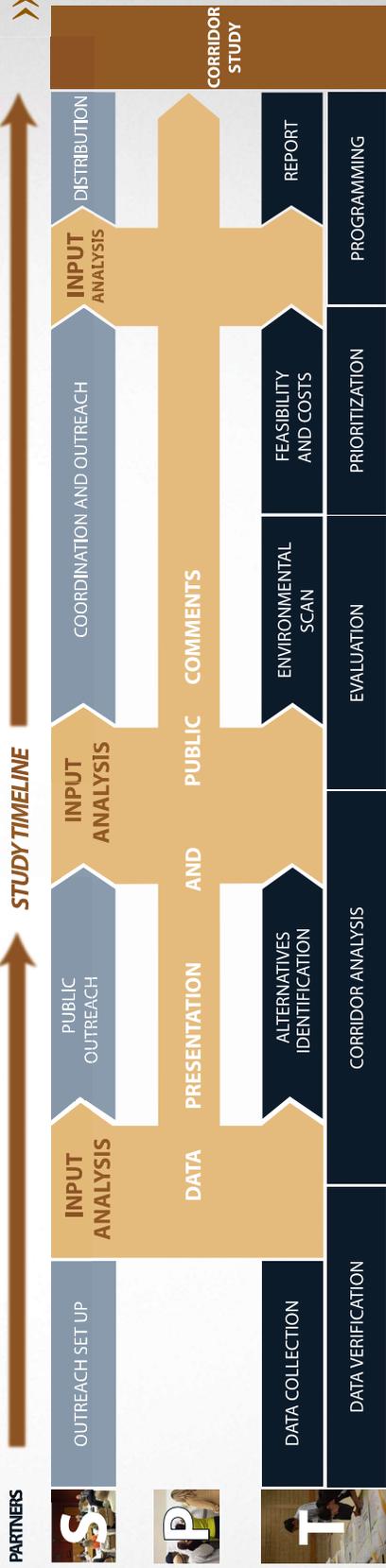
- How do we identify the need for a corridor study?**
- Congestion;
 - High numbers of crashes and/or serious injuries and fatalities;
 - Infrastructure that limits commerce or economic development;
 - Conflicts between local and longer distance travel;
 - Lack of alternative transportation modes, including non-motorized modes; primarily for longer distance travel;
 - Lack of complementary facilities such as rest areas;
 - Need for vision of future infrastructure development; and
 - Other public concerns.

PLANNING PROCESS

STAKEHOLDERS

PUBLIC

TECHNICAL



TOOLS AND STRATEGIES

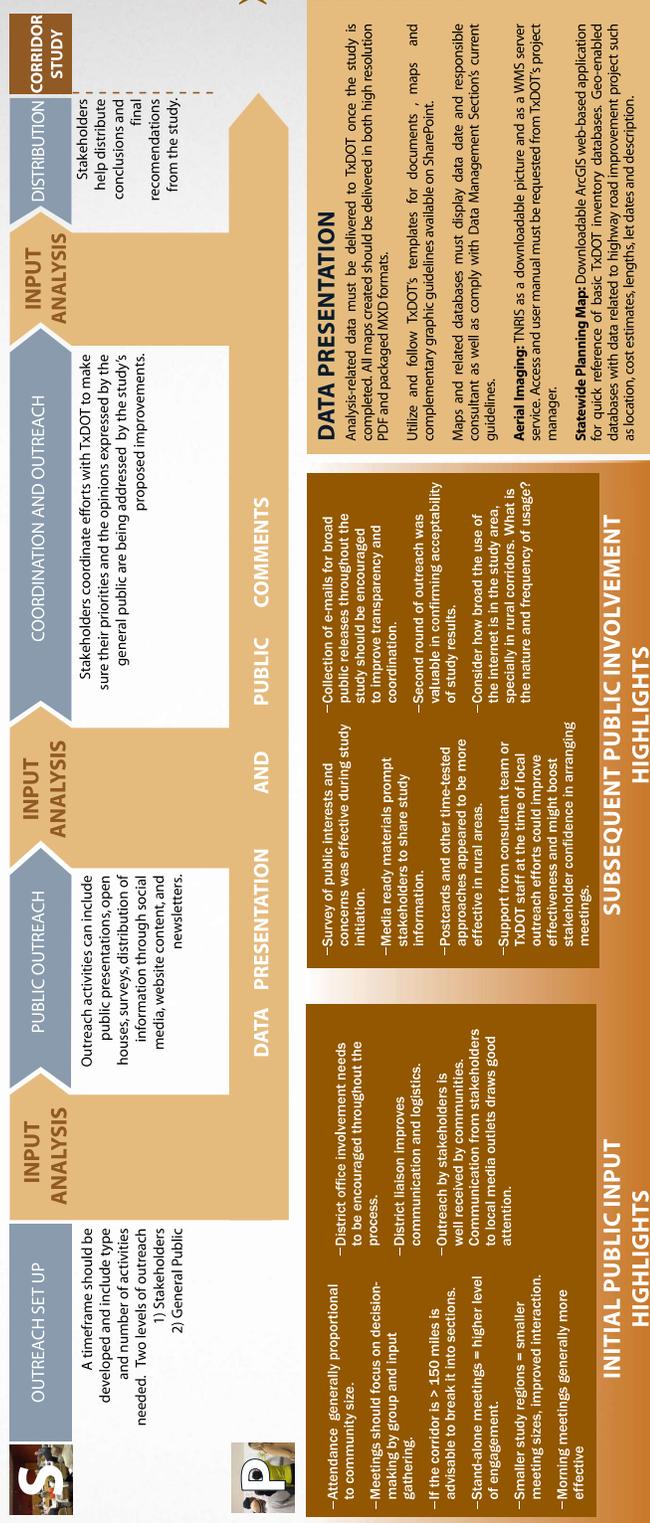
GOAL SETTING

The goals and objectives of a corridor study should align with those defined by national and statewide legislation. The **Moving Ahead for Progress in the 21st Century Act (MAP-21)** outlines a performance-based and multimodal program to strengthen the US transportation system. This is accomplished by establishing national performance goals for the Federal-aid Highway Program in seven areas:

- Safety;
- Infrastructure condition;
- Congestion reduction;
- System reliability;
- Freight movement and economic vitality;
- Environmental sustainability; and
- Reduced project delivery delays.

State based planning documents like the **Texas Transportation Plan (TTP) 2040 and the 2015-2019 Strategic Plan** should also be considered when defining goals and objectives. In addition, goals and visions included in plans for counties and cities in the study area should be incorporated.

The process of defining goals and objectives for a corridor study could include input from the public. Involvement of a stakeholder group (working group or advisory committee) should be considered.





DATA COLLECTION AND ANALYSIS

Planned and Programmed Improvements

Project Tracker is TxDOT's online reporting system that provides information related to transportation projects in Texas.

The Statewide Transportation Improvement Program (STIP) is a 4-year program of project development, where all projects are funded and an expected let date is defined.

The Unified Transportation Program (UTP) is a 10-year plan to guide transportation project development. UTP programs that are planned to be constructed and/or developed within the first ten years of the 24-year Statewide Long-Range Transportation Plan.

When near an urban area, the MPO's Transportation Improvement Program (TIP) and the long range transportation plan should also be reviewed.

Review all available databases for Planned and Programmed Improvements. Local and regional plans should also be considered.

Documents are frequently updated. Review them on a regular basis and prior to finalizing information.

Road Designation

Highway designations are used to determine funding and need for upgrades/improvements. They can be confirmed through the Statewide Planning Map (desktop and online version) or the RHINO database.

The Texas Freight Network is comprised of a Primary Freight Network and Secondary Freight Network/Emerging Freight Corridors. Included in these are Interstates, the National Highway System (NHS), and the Texas Trunk System.

One key element of ISTEA was the development of a National Highway System (NHS) of interconnecting principal arterial routes, which would serve major population areas, international border crossings, and other modal transportation facilities.

The Strategic Highway Network (STRAHNET) is a system of roads necessary for emergency mobilization and support of U.S. military operations.

Designation under one or more of these categories lends prioritization to corridors or corridor segments when choosing implementation timeframes for improvements and possible funding sources.

Be aware of all the designations on a roadway as well as any past designations and future ones.

Search for road names using the TxDOT Statewide Planning Map Search tool to corroborate roadway designations.

Corridor Characteristics

Every year TxDOT publishes the Roadway Inventory dataset, georeferenced and including 144 attributes which allow for the assessment of current conditions on existing roadways and determination of needs and opportunities for improvements.

Data verification is necessary given the magnitude and ever-changing nature of the dataset. This can be performed based on videotaped corridor visits or desktop research by comparing RHINO data against Google Maps or other databases that are usually more up-to-date and incorporate the latest improvements.

Go to: [Data Verification](#)

RHINO averages data for segments of highway. ROW data from improvements is not consistently updated. ROW data has not been digitized for segments that have never undergone upgrades.

Perform more detailed examination of ROW widths when exploring feasibility of highway improvements.

ROW is not specified at interchange locations.

Geometric Review

Roadway design standards evolve to reflect new measures of safety, efficiency and improved vehicle performance.

A geometrical evaluation of the corridor in question should determine its consistency with current design standards as defined by TxDOT's Roadway Design Manual.

Consider:

- Exit and Entrance Ramps
- Sight distances along the roadway and at intersections
- Superelevations
- Passing lanes at intersections
- Horizontal and Vertical curves
- Review of traffic control devices at high crash locations

Vertical and horizontal information needs to be considered in facility and interchange reviews.

Horizontal curves can be measured from Google Map/TNRIS imagery. Vertical elevations have been acquired by collecting GPS data.

Cost estimates should use a more conservative approach than the lowest available bid prices.

Traffic Analysis and Forecasting

Data for forecasting purposes, can be obtained from the Historic Traffic Data, RHINO and the Statewide Planning Map.

Forecasting alternatives include:

- Historic trends.
- RHINO/SAMI/MPO model.
- Bluetooth, AirSage, or similar big data source/tools.

Separate truck traffic forecasts should also be considered for corridor studies, particularly if the study corridor is recognized as a major freight route. The RHINO dataset includes the percentage of trucks based on the total ADOT count. In addition, TxDOT provides truck volume forecasts for major corridors. However, the Statewide Flowband Maps do not provide forecasted truck traffic.

INRIX, Bluetooth and AirSage are useful in calculating congestion via actual/posted speed ratios. However averaging measured speeds can bring the total below observed speeds, and is necessary to perform spot checks.

RHINO traffic forecasts are based on average growth rates, not ideal to reflect local conditions.

SAMI has not been calibrated for specific corridors and corridor-level enhancement studies or expected future conditions. It is not suitable for use in a macroscopic level. Under-standably, it consistently underestimates localized traffic movements.

The SAM model should forecast Truck % separately from passenger vehicle traffic.

HIGHLIGHTS

Pavement Condition

Truck Parking

Alternative Modes

Energy Sector

Bridges and Clearances



DATA COLLECTION AND ANALYSIS

Pavement Condition

The Pavement Management Information System (PMIS) is TXDOT's automated system for reporting surface pavement condition. It can be used to illustrate current pavement conditions and to determine needs along a specific corridor.

Pavement score calculation makes considerations for traffic volume (ADT) and speed (speed limit). Pavement conditions are rated using both visual observation and automated pavement tools.

However structural soundness of pavement should be assessed based on actual pavement age and local staff assessment of need.

PMIS data usefulness is limited by lack of below surface pavement condition and historical costs.

Spending on pavement maintenance is not readily available or closely monitored. Districts do not usually keep records.

Non-facility specific yearly budgets are available. PMIS Scoring and implementation of pavement upgrades are not coordinated. Lag occurs between pavement improvements and resurfacing for PMIS.

Truck Parking

Trucking in Texas accounts for a large portion of freight movements. Responding to recent changes in legislation, the need for additional truck parking is due to reduced hours of operations for truck drivers. Determining the number of available parking spaces, estimating current as well as future demand, and identifying opportunities for additional parking and freight facilities is necessary to improve freight hauling and safety.

For parking space availability consider freight parking demand, truck yards, truck stops, safety rest areas maintained by TXDOT, and travel information centers.

The Federal Highway Administration and various states have developed equations to determine truck parking demand based on annual average daily traffic (AADT), length and average speed, percentage of trucks and average parking duration per hour of travel.

A general desktop survey would identify existing truck parking facilities. Armed with this information, a more detailed survey would be necessary to determine the specific number of parking spaces.

Phone surveys have proven effective in determining alternative truck parking supplies such as those in big box retail store.

Alternative Modes

Population and traffic growth across the State have increased the need for transportation alternatives. Safety concerns and pollution related to the use of private automobiles have also influenced the desire for the implementation of transportation alternatives.

Based on the individuality of each corridor, each study should analyze different elements to determine feasible passenger and freight transportation alternatives.

Alternatives should be explored for corridors with high demand for freight or passenger travel. Trip data on the number of trips beginning and terminating are necessary for this type of alternative.

Population density and system accessibility are usually determining factors of the success of new non-motorized alternatives. These are usually "last-mile" solutions.

Optimization of existing travel alternatives should also be explored before considering implementation of new alternatives. Coordination or restructuring of existing alternatives can help ameliorate demands on the system as well as help create the necessary conditions for other solutions in the future.

Use of emerging technologies should be explored in developing solutions that are relatively easy to implement with lower capital costs.

Energy Sector

Growth in the energy sector generates a significant impact on the service life of existing pavement, travel times and safety.

According to TXDOT, the service life of major roads is generally reduced by 30% and 10% respectively due to natural gas and oil wells related to traffic operations. This creates high repair costs from potholing damage especially in rural areas where roads were not designed to handle heavier freight loads.

The estimated truck traffic associated with a single windmill site is 336 trucks. While growth slowed significantly by 2013 and the market feasibility for wind power is still uncertain, freight impacts in Texas from wind turbines and parts being transported from ports to West Texas is substantial.

TXDOT's Statewide Planning Map (desktop version) includes information related to the energy sector. It contains information about existing oil and gas wells, permitted locations for exploration/production, and pipelines or shale play locations across the State.

Identifying existing and future location of windmills, oil and gas wells, may be a necessary part of the planning process since it aids in determining possible constraints and localized needs.

Bridges and Clearances

The Bridge Inventory, Inspection, and Appraisal Program (BRINSAP) assesses all aspects of bridge structures within the State's transportation network.

Sufficiency Ratings are evaluated using a scale of 0 to 100, with higher scores symbolizing better structural condition. Functional Obsolescence and Structural Deficiency are also evaluated and taken into consideration.

Vertical clearance information is considered based on the UnderClearance Database (UCDB).

Vertical Clearances are evaluated under two standards:
1) Federal Highway Administration (FHWA) = minimum acceptable bridge clearance nationwide is between 14' and 16'; and

2) State standards = 16' 6"

BRINSAP and UCDB datasets are available through TXDOT and can be imported into GIS.

UCDB database is the most accurate source for vertical clearances. Familiarize yourself with BRINSAP criteria used to apply for funding and improvements.

HIGHLIGHTS

Planned and Programmed Improvements

Road Designation

Corridor Characteristics

Geometric Review

Traffic Analysis and Forecasting

HIGHLIGHTS



DATA COLLECTION AND ANALYSIS

Crash Analysis

There are two main sources where raw crash data can be obtained:

FARS

The Fatality Analysis Reporting System (FARS) is a dataset maintained by the National Highway Traffic Safety Administration (NHTSA) containing data on all vehicle crashes on a public roadway involving a fatality going back to 1975.

Only crashes that resulted in the death of a person (occupant of the vehicle or not) within 30 days of the crash are included. FARS offers additional information such as sequence of events leading to the crash, any visual obstruction and/or driver distractions, and number of fatalities.

Data usually requires some management before being geographically analyzed and imported into GIS. The most commonly used data fields for crash analysis include the following:

Data Field

- Crash ID
- Crash Date
- Crash Date of Week
- City
- County
- Rural Flag
- Highway
- Control Section
- Crash Time
- Crash Milepoint
- Crash Latitude
- Road Type
- Secondary Highway
- Derived Intersecting Road
- First Harmful Event
- Light Condition
- Weather Condition
- Surface Condition
- Manner of Collision
- Crash Severity
- Crash Contributing Factor List
- Vehicle Body Style
- Road Part

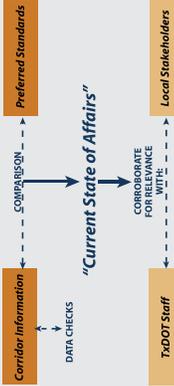
The CRIS and the FARS databases do not share a unique ID per crash, but it is possible to intuitively identify the same crash in the two databases, using its date, time, and location (city, county, geocoding).

TxDOT publishes an annual report called the Texas Motor Vehicle Crash Statistics, which contains statistics generated from CRIS data and aggregated by several categories. The report can be accessed off the web and is divided by year (2003-2014).

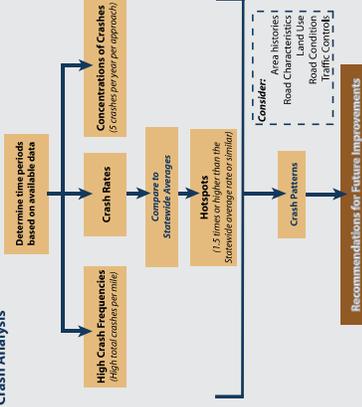
Since TxDOT's Web-based Statewide Average Crash Statistics regularly updates, it's a good idea to backup any analysis in which they were included.

CORRIDOR ANALYSIS

Characteristics Analysis



Crash Analysis



DATA VERIFICATION

Data verification is necessary given the magnitude and ever-changing nature of the datasets.

This can be performed based on desktop research by comparing RHNo data against Google Maps or district office databases since they are usually more up-to-date and have incorporated the latest improvements.

Videotaping a corridor during first field visit is advisable to have the latest possible resource for subsequent verification.



Crash Data - Verification

Joint Designation

A highway with multiple designations exists when multiple highways intersect.

Crashes need to be requested for each of the designated routes, especially since CRIS associates a crash with only one major highway.

Example:
- I-30 / US 67 in Greenville



Geocoding of Crashes

Several highways in Texas intersect the same facility twice, overlapping with it in between.

CRIS may not differentiate between connection points, leading to distances where a crash is coded to the wrong intersection.

Example:
- US 290 West and East intersecting US 281



CRIS - US 290 W



Crash Report - US 290 E



Crash Descriptions

Since CRIS is based on interpreted officer reports, keep in mind that a crash may be interpreted in different ways. This is an essential point for identifying patterns.

Example:
- Channelized right turn crash.

<p>1</p> <p>Manner of Collision: SO Both Right Turn</p> <p>Directions: North-North</p>	<p>2</p> <p>Manner of Collision: SO Both Going Straight</p> <p>Directions: North-North</p>	<p>3</p> <p>Manner of Collision: SO One Straight One Stopped</p> <p>Directions: North-North</p>
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Accident # A 14-0078



INPUT

The first round of input is critical to obtaining information on issues about the corridor that are important to stakeholders and communities related to it.

This input will be crucial in assessing if the communities' concerns are being addressed in both your data collection efforts and the proposed improvements.

CORRIDOR ANALYSIS

After analysing all databases, a preliminary "current state of affairs" assessment can be developed.



ALTERNATIVES IDENTIFICATION

Based on the data collected and its analysis, a matrix of proposed projects or improvements is developed.

When adding proposed improvement to the matrix consider how each one:

- Lines up with projects proposed in districts and local plans
- Incorporates district and local visions of the corridor
- Responds to existing deficiencies
- Creates the most improvement with the least negative impacts

INPUT

Findings from this preliminary assessment of the current state of affairs and proposed improvements should be presented and corroborated with local stakeholders and TxDOT staff to warranty its relevance, and ensure consistency with planned or programmed improvements.

ENVIRONMENTAL SCAN

An environmental scan is designed to identify physical, ecological, social, and cultural features within the study area of a corridor that may be impacted by potential improvements.

- Determine:**
- potential impacts
 - constraints
 - opportunities
- environmental features needing further analysis*
- Additional project-level analysis could be required depending on the nature of an improvement before it is implemented.

EVALUATION

Proposed projects have to be evaluated based on specific criteria.

TxDOT's current goals are performance-based, including MAP-21 or other performance measures.

Safety benefits can be addressed through specific measures like the crash rate ratio of a segment to that of the state as a whole. If a working group or advisory committee is involved during the corridor study, this evaluation should be validated through public input or coordination with involved stakeholders.

FEASIBILITY AND COSTS

A feasibility analysis can help to determine if specific projects should be undertaken based on delineated costs and technical limitations (design alternatives, geographic location of the project, etc)

Preliminary cost estimates can be calculated based on unit bid prices.

With all preliminary costs identified, alternatives to traditional funding sources should be considered.

PRIORITIZATION

Prioritization of projects is a necessity when conducting corridor studies due to limited resources and programming constraints.

Prioritization could be based on general considerations (i.e. traffic levels or safety considerations) or on project specific elements.

Priorities and the evaluation approach will vary depending on the characteristics of each corridor.

There's a need for more discussion of alternative methods of financing and implementation, both to gather local support for State initiatives and to identify and build support for local sources of funding.

INPUT

Working groups or advisory committees should have input and approve the proposed prioritization process and results, whenever they are involved in a corridor study.

REPORT

Creation of a report in compliance with TxDOT's graphic standards and requirements for data delivery.



PROGRAMMING

Comprehensive and project level programmatic recommendations are created based on:

- Advisory or working group input
- Public Input
- Needs Assessment Results
- Prioritization of Proposed Projects

Classified in a logical timeframe (*near, mid and long term*).

Assembled into an Implementation Plan document to be attached to the final Report document.

BACK

CORRIDOR STUDY





TEXAS DEPARTMENT OF TRANSPORTATION

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