



FINAL REPORT

TENNESSEE LONG-RANGE TRANSPORTATION PLAN

**TRANSPORTATION SYSTEM
PERFORMANCE MEASURES**

DECEMBER 2005



PLAN Go.

A Long-Range Multimodal Strategy

Prepared by
The PBS&J Consultant Team



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Chapter 5 Public Participation

During the November 2004 Regional Work Group and Statewide Steering Committee meetings, a two-page resource document on transportation system performance measures was provided for review and discussion. The document outlined the purpose of system performance measures, how they related to the LRTP goals and objectives, and how they would be used to guide the 10-Year Strategic Investments Program, the 3-year program of projects, and ultimately the State Transportation Improvement Program. A sample table (Table 2) of potential performance measures by mode and by goal was included in the resource document. Regional Work Group and Statewide Steering Committee members were asked to review the resource document and forward suggested performance measures to TDOT. No additional specific performance measures were recommended by the public.

Table 2. Sample Transportation System Performance Measures Document

| Guiding Principle | Aviation | Bicycles and Pedestrians | Highways | Ports and Waterways | Rail | Transit |
|--|---|--|---|---|--|--|
| Preserve and manage the existing transportation system | Number of airports with layout plans less than 10 years old | Miles of marked bicycle lanes | Pavement condition; bridge condition; time to clear incidents | Number of dams needing structural upgrades | Number of counties with access to rail | On-time performance |
| Move a growing, diverse, and active population | Percentage of population within 60 miles or 60 minutes of commercial airports | Bicycle lane miles per capita | Congestion levels for arterials | Locking times and delays by dam | Number of rail alternatives to truck routes | Passenger trips per capita; ridership; total boardings |
| Support the state's economy | Percentage of population within a 25-minute drive time of a regional service airport | Number of bicycle lane-miles leading to or within tourist destinations | Travel time to state, regional, and national markets or to employment centers | Number of operating ports and terminals | Commodity flows from, to, within, and through the state by rail | Employment within one-half mile of transit corridors |
| Maximize safety and security | Percentage of airports meeting federal and state design and safety criteria | Bicycle/pedestrian fatalities and injuries per 1 million residents | Number and rate of injury accidents (per 100 million vehicle miles) on state highway system | 5-year average of collisions and maritime injuries | Rail crossing accident rates | Fatalities and injuries per vehicle miles of travel |
| Build partnerships for livable communities | Number of airports with land use planning processes coordinated with adjacent communities | Number of local governments with bicycle/pedestrian plans and policies | Percentage of Metropolitan Planning Organization priority project phases advanced in work program | Number of regional plans with ports/waterways element | Number of new rail projects serving businesses and communities within 10 miles | Number of local plans encouraging transit-oriented development |

Chapter 6

Recommended Transportation System Performance Measures

6.1 System Objectives

The recommended transportation system performance measures for TDOT will achieve four basic purposes:

- Gauge how well TDOT is meeting its LRTP goals
- Rate transportation system performance against established benchmarks that define expected performance standards
- Identify system deficiencies and opportunities for improvement
- Guide allocation of resources

6.2 Key Measures

The number of TDOT's recommended key transportation system measures is small and manageable. When information and experience is gained, the performance measurement system can be expanded. This process is consistent with state of the practice and peer state Guiding Principles for developing performance measurement systems.

6.2.1 List of Key Measures

Table 3 lists recommended key transportation system measures for the TDOT LRTP. These measures are based on the availability of existing data. Because TDOT does not currently collect pertinent information for the aviation and ports and waterways modes, no key measures for these areas were identified. However, performance measures for these modes are recommended in Section 6.3 for consideration based on future data collection and future funding policy decisions. Similarly, the Bicycle and Pedestrian Plan element recommends performance measures and all will require future data collection. Chapter 3 of this report provides additional definition and clarification regarding these key transportation system measures.

Table 3. Key Transportation System Performance Measures

| Key Measure | Baseline/Current Performance | Desired Target |
|---|--|---|
| 1. Average highway bridge condition rating (scale is 1 to 100) | State routes: 96.4 Interstates: 96.6 | State routes: 90 Interstates: 90 |
| 2. Pavement Quality Index (scale is 1 to 5) | Interstates: 100%>3.5-0%<2 State routes: 96%>3.5-0%<2 | Interstates: 90%>3.5-10%<2 State routes: 85%>3.5-15%<2 |
| 3. Maintenance Rating Index (scale is 1 to 100) | Interstates: 80 State routes: 75 | Interstates: 90 State routes: 85 |
| 4. Average accident rates for interstates (per million vehicle miles) | Rural: .44 Urban: 1.16 | Rural: .44 Urban: 1.16 |

Appendix A

Modal Plans Performance Measures

| TDOT Guiding Principle | Aviation Plan | Transit Plan | ITS Plan | Rail Plan | Incident Management Plan |
|--|---------------|--|---|---|--|
| Preserve and manage the existing transportation system | | Service effectiveness; Unlinked passenger trips per vehicle mile (boardings); unlinked passenger trips per revenue hour; average daily boardings, boardings per mile, boardings per trip, subsidy per boarding, fare box recovery; system average speed; deadhead miles per hours; travel time savings; average/system travel time; travel time reduction; ridership; | Traffic volume as a weighting factor among problem corridors; traffic volume per lane as a uniform measure of roadway utilization and level of service; number of ITS elements included in interstate construction and reconstruction projects, arterial traffic control and mass transit contracts | No performance measures for intercity rail or intermodal facilities. For new projects: reduced highway/pavement maintenance costs, reduced congestion costs | Number of highway incidents, number of training programs for highway incident responders, number of incident management teams by area, new technologies deployed to improve incident management, number of assists by HELP vehicles, response time |
| Moving a growing, diverse, and active population | | Mobility improvements; vehicle miles traveled; transit use; mode split; alternative services access; number of intermodal connections; linked trips; unlinked trips; passenger trips per mile; passenger trips per hour; transit mode share; number of park-ride lots, transit centers, pedestrian walkways, overpasses implemented; number of time-transfer connections implemented; number of bike racks installed | | For new projects: improvement in operational efficiencies; travel time savings; expandability; cost effectiveness/shipper cost reductions; truck traffic reduction; travel time effects | |

| TDOT Guiding Principle | Aviation Plan | Transit Plan | ITS Plan | Rail Plan | Incident Management Plan |
|-----------------------------|--|---|----------|---|--------------------------|
| Support the state's economy | Number of airports with layout plans less than 10 yrs old; number of airport preservation related topics at the annual conference; percentage of population within 60 miles or 60 minutes of commercial service airports with at least 10 daily weekday jet departures; percentage of populations within the 25 minute drive time market area (adjusted for overlap) of a regional service airport | Service efficiency: Operating expense per vehicle revenue mile; operating expense per vehicle revenue hours; economic impact: new businesses, cost of mobility; customer complaints received; on-time performance; % missed trips; number of road calls; reductions in travel time; average of vehicle fleet; miles between road calls; property values within one square mile of major transit nodes | | Number of businesses served by all railroads; number of employees in businesses served by all railroads; number of counties served; number of towns/cities provided with access to rail service; rail carloads (number of truckloads of cargo not moving on the State highway system); direct employees of businesses served by railroad; direct employees in rail customer base per mile of track; tons of cargo carried by mile of track; total value of cargo per mile of track; rail carloads per mile of track; number of employees in rail customer base per mile of track. For new projects: new capital investment, new operating output, indirect/induced employment resulting from project; local property tax generated; impacts to shipping costs, impacts to railroad operations costs | |

| TDOT Guiding Principle | Aviation Plan | Transit Plan | ITS Plan | Rail Plan | Incident Management Plan |
|--|--|---|-----------------|---|---------------------------------|
| Maximize safety and security | Percent of airports meeting federal and state design and safety criteria; percent of airports with approaches meeting FAA RPZ and Part 77 criteria; number of airports with minimum standards document; number of system airports with an instrument approach with minimums at least 400 feet and 1 mile; number of system plan airports with a weather-reporting system | Fatalities and injuries by person using each transit mode; passenger injuries/fatalities per x miles; number of preventable accidents per miles of service; average fleet age; | | For new projects: reduced crash costs (accidents, injuries) | |
| Build partnerships for livable communities | | Existing land use, transit supportive land use policies, future land use patterns (rural v urban); transit capital expenditure by targeted area; system headways; service coverage; miles/hours/span of service; number of persons within 1/2 mile of transit line or route; number of compliments/complaints; number of employees within one square mile of major transit nodes; residential density within one square mile of major transit nodes; funding per capita by urban, small urban and rural transit system; number of new service options implemented; number of joint marketing and service activities; number of private dollars invested in or near transit projects | | For new projects: ability to serve businesses; consistency with regional plans, community compatibility, public safety, public and agency support | |

| TDOT Guiding Principle | Aviation Plan | Transit Plan | ITS Plan | Rail Plan | Incident Management Plan |
|--|--|---|-----------------|--|---------------------------------|
| Promote stewardship of the environment | Total population with DNL65 noise contour; number of airport master plans reviewed by state and regional coordinating agencies; number of airport master plans reviewed by the state that have been included by local communities as part of their comprehensive plans; number of airport representatives on planning/zoning boards; number of airport communities with land use plans and zoning that include consideration of airport land use compatibility | Environmental benefits; air quality improvements; number of transit oriented and joint development opportunities; private dollars invested in transit; Increase/decrease in air quality pollutants in major transit corridors | | For new projects: Impact on natural environment; fuel savings by gallons and dollars | |

| TDOT Guiding Principle | Aviation Plan | Transit Plan | ITS Plan | Rail Plan | Incident Management Plan |
|------------------------------------|---|---|----------|--|--------------------------|
| Emphasize financial responsibility | Number of projects awarded based on the TAD priority ranking system and functional classification; number of system airports with a pavement management plan; number of airspace/procedural changes resulting in increased capacity | Cost effectiveness; operating expense per passenger mile; operating expense per unlinked passenger trip; operating efficiencies; amount of dollars in transit investments; cost per passenger mile per hour; cost per vehicle mile per hour; improvements in fare box/cost recovery ratios; subsidy per passenger; expense per vehicle mile; expense per vehicle hour; expense per trip; passengers/operating cost per total vehicle miles; passengers/operating cost per total vehicle hour; passengers/operating cost per vehicle revenue mile; passengers/operating cost per revenue vehicle hour; state funding per capita; federal funding per capita; funding per capita by urban, small urban and rural transit system | | Level of railroad infrastructure investment by state; annual railroad revenue per mile of track; annual state expenditures by mile of track; state dollars expended per ton of cargo; annual railroad revenue per dollar of state expenditure; dollars of revenue per mile of track; tons of cargo per dollar of TDOT rehab expenditure; ton miles of cargo per dollar of TDOT rehab expenditure; railroad revenue per dollar of TDOT rehab expenditure; rail carloads per dollar of TDOT rehab expenditure; number of employees in rail customer base per dollar of TDOT rehab expenditure. For new projects: amount of public/private capital investment; induced capital investment. state fees and revenues generated. | |

Appendix B

Peer State Performance Measures

| TDOT Guiding Principle | Florida | Maryland | North Carolina | Washington | Wisconsin |
|--|--|--|---|---|---|
| Preserve and manage the existing transportation system | <p>Conducts self evaluations and customer satisfaction surveys.</p> <p>Evaluated by the state's Transportation Commission.</p> <p>Annually publishes short-range component of long-range plan that contains measurable objectives.</p> <p>Annual performance reports summarize the financial operations of the Department and evaluate how well the adopted work program meets the short-term objectives in the short-range component.</p> <p>State considers performance measures very important.</p> | <p>Prepares annual attainment report (legislative requirement) to public showing how organization performed compared to goals and objectives (some goals in the attainment report differ from transportation plan).</p> <p>Percentage of state-maintained roads with acceptable ride quality; percentage of state and national highway system bridges meeting federal structural standards; percentage of time that accumulation of sediment in channels causes ship delay or reduction in draft; percentage of transit service provided on time; percentage of transit bus routes with successful/acceptable performance; average motor vehicle agency branch customer visit time; percentage of motor vehicle agency transactions completed by alternative services; reduction in incident congestion delay.</p> | <p>None yet developed.</p> <p>Collects land use, o/d, traffic counts, GIS, and road inventory data.</p> <p>Performance measures somewhat important.</p> | <p>Prepares quarterly performance reports (Gray Notebook) available to the public that assesses transportation programs and department management against established benchmarks.</p> <p>Focus is on projects, financial information, worker safety, construction program.</p> <p>Not related to the specific goals and objectives in the plan; much more detailed.</p> | <p>Performance measures very important.</p> <p>Database looks at existing and future pavement conditions, accident rates, geometric conditions, traffic capacity, congestion, and bridge deficiencies.</p> <p>Database program establishes thresholds and performance measures.</p> <p>Pavement performance thresholds identify when pavement/bridge needs repair/replacement (roughness, structural integrity, and rutting).</p> <p>Bridge performance thresholds improvements made to ensure that no bridges are posted to restrict truck travel.</p> <p>Grey book performance: customer satisfaction index, customer complaint versus compliments; surveys measure road maintenance/performance, pavement smoothness, percentage of road miles surveyed.</p> |

| TDOT Guiding Principle | Florida | Maryland | North Carolina | Washington | Wisconsin |
|--|--|---|-------------------------------|---|--|
| Moving a growing, diverse, and active population | Increase transit ridership at twice the average rate of population growth. | Percentage of lane miles with average annual volumes below congested levels; peak period congestion of freeways in Baltimore/Washington; percentage of vehicle trips on toll facilities served by E-Zpass; annual vehicle revenue miles of transit service provided; average delay per aircraft operation at airport; average delay per aircraft operation at airport (take off and landings); percent of freeways with daily traffic volumes per lane greater than 20,000; percentage of arterials with daily traffic volumes per lane greater than 10,000; vehicle miles of travel per capita; centerline miles of marked bike lanes; percentage of transit vehicles that accommodate bicycles; number of local jurisdictions implementing local ordinance that support bike/pedestrian use; dollars committed to bike/pedestrian projects; distribution of work trips; transit boardings; percentage of state roadway miles within priority funding areas that have sidewalks. | None yet developed/published. | Number of van pools in operation; park and ride occupancy; commute mode share; daily vehicle hours of delay per mile; travel time reliability; travel time to work. | Miles of congested highways (moderate, severe, extreme); amount of travel (vehicle miles traveled) under congested conditions. |

| TDOT Guiding Principle | Florida | Maryland | North Carolina | Washington | Wisconsin |
|-------------------------------|---|---|-----------------------|--|------------------|
| Support the state's economy | Number of commercial vehicles that illegally exceed weight limits on roads and bridges; percent of pavement on highway system that meets department standards; ensure that 90% of state-maintained bridges meet standards; achieve 100% of the acceptable maintenance standard on highway system; 50% of highway capacity improvement to highway system; keep annual growth in traffic density at or below 4%; allocate a minimum of \$30 million in state funds for intermodal access program. | Performance indicators: general measures for which information is primarily presented for a single period (fiscal year, calendar year). Data availability precludes reporting historical trends or long-term targets; performance targets: data collected for a while, provide guidance to policymakers; cost effectiveness measures: track performance outcomes relative to expenditures; percentage of covered storage facilities that meet industry standard (port); percentage of breakbulk vessel berths that meet industry standard (port); average age of transit buses; airport terminal gate capacity; number of direct, indirect and induced jobs at the port; number of jobs resulting from highway construction; percent of household income expended on transportation; total passengers at airport, annual tons of foreign cargo at port authority and tons of general cargo; total pounds of domestic cargo moved at airport | None yet developed. | Response time to incidents; age of bridges, bridge ratings; pavement condition; on time performance; operating costs; passenger trips by station; ridership by month, year; bicyclist fatality rates; pedestrian fatality rates; number of incidents responded to; total number of responses by month; cross border truck volumes; freight shipments to, from, and within state; truck share of total daily vehicle volumes. | |

| TDOT Guiding Principle | Florida | Maryland | North Carolina | Washington | Wisconsin |
|-------------------------------|--|--|-----------------------|--|---|
| Maximize safety and security | Rates of motor vehicle, bicycle and pedestrian fatality rates (for vehicles per 100 million vehicle miles of travel); improve safety at highway/railroad crossings and other locations where modes intersect; minimize response times for each entity responsible for responding to crashes and other incidents; keep the percentage of crashes on the highway system where road-related conditions were listed as a contributing factor below 1.0 percent | Number and rate of injury accidents (per 100 million vehicle miles) on roadways and transit facilities; number and rate of fatalities on roadways and transit facilities; customer perception of the safety of the transit system; number; airport compliance with FAA safety inspections; airport compliance with Transportation Security Act regulatory assessment of security certification; port compliance with Maritime Transportation Security Act 2002 mandates; pedestrian fatalities/injuries per 1 million residents; bicyclist fatalities/injuries per 1 million residents; dollar value of cargo thefts; number of industrial accidents at MPA property | None yet developed. | Recordable injuries per 100 workers per fiscal year. | Single vehicle crashes, multiple vehicle crashes, fatal crashes, persons killed, injury crashes, persons injured, roadway miles, hundred million VMT. Fatality rate, injury rate, crash rate. Number of passing lane miles constructed for safety on two-lane rural roadways. |

| TDOT Guiding Principle | Florida | Maryland | North Carolina | Washington | Wisconsin |
|------------------------------------|---------|--|---------------------|------------|-----------|
| Emphasize financial responsibility | | Maintenance expenditures per lane mile; motor vehicle agency cost per transaction; transit agency operating cost per passenger; transit agency operating cost per passenger mile; airport operating cost per enplaned passenger; airport revenue versus operating costs; port authority revenue versus operating costs; operating expense per annual ton of general cargo; innovative revenues; capital program versus transportation commission recommendations | None yet developed. | | |

