

REFERENCE SERIES: Transportation in Connecticut

ARTICLE NO. 10 Performance Measurement and Asset Inventory

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This simple guide provides insight on Performance Measurement and Asset Inventory practices relating to Connecticut's transportation system. The article focuses on the Connecticut Department of Transportation's (CT DOT) initiatives in this arena as well as its vision to move towards performance and asset management. The recent passage of a federal transportation bill and related requirements are also briefly presented.

Several State initiatives and mandates are discussed in this article, including:

- [Our Mission](#)
- [Responsibilities](#)
- [Transparency in Government](#)
- [Staffing and Committee Guidance](#)
- [Department Focus Areas](#)
- [Performance Measures Reports](#)
- [Existing System \(Asset\) Inventory](#)

as well as the following national standards:

- [National Goal Areas](#)
- [Performance Management](#)
- [Performance-Based Planning](#)
- [Asset Management](#)

and, additionally, the breakdown of a performance measure:

- [National Goal Areas](#)
- [Department Focus Areas](#)
- [Objectives](#)
- [Targets \(Reporting Metrics, Baseline and Trends, Benchmarks\)](#)

Performance measurement is a topic of concern at both the State and federal level. Performance measurement is used as a method of assessing progress toward achieving predetermined goals and objectives, and to make well-informed decisions.

Performance measures maintain focus on organizational targets and vision, and monitor and track the progress towards achieving the targets or vision. Specific performance measures can be developed to meet the following business needs:

- tracking and forecasting impacts of transportation investments;
- monitoring condition of infrastructure;
- allocating resources efficiently;
- evaluating policy effectiveness;
- gauging quality of services;
- providing accountability to the public;
- improving public relations; and
- meeting federal and state mandates.

National standards, industry accepted practices, State initiatives and mandates, are all building blocks. Working from this foundation, the Department has been proactively developing a business process that uses performance data and asset inventories in programmatic decision-making. Over the coming two years, the Department will be continuing its efforts with a real focus on national standards given the recent authorization of a federal transportation bill, Moving Ahead for Progress in the 21st Century (MAP-21). The vision is to move towards a business structure where decisions are based on a system of performance and asset management.

State Initiatives and Mandates

The Department has voluntarily implemented performance measures for various agency functions and areas of management. The Department has also initiated efforts in the area of asset inventory, which it anticipates to develop more definitive practices over the next several years.

Our Mission

Our agency mission is to provide a safe and efficient, intermodal transportation network that improves the quality of life and promotes economic vitality for the State and the region.

Responsibilities

Section 13b-3 of the Connecticut General Statutes states that the Department “shall be responsible for all aspects of the planning, development, maintenance and improvement of transportation in the state.” The CT DOT has responsibilities pertaining to airports, bridges, highways, highway safety, bus systems, rail systems, port operations, ferries, and facilities for bicyclists and pedestrians.

Transparency in Government

Connecticut residents and businesses are looking for transparency in government. Easy access to information will enable them to use services; to participate in processes to plan, design, operate and/or construct government facilities and services; to understand how and why decisions are made; and to evaluate whether they are getting the best value for their tax dollars.

The Department is committed to full transparency in its business of preserving, managing and developing the State's transportation system. Our customers have a high expectation of us, and it is our desire to exceed these expectations. The establishment of goals, and the achievement of them, is a fundamental cornerstone of any successful business. Through the use of performance measures, the Department will provide the transparency and accountability that our customers expect.

Staffing and Committee Guidance

The Department formalized efforts in the performance measures and asset inventory arena in 2006 through the organization of a unit in its Bureau of Policy and Planning to lead and oversee agency reporting. The staff of this unit is responsible for developing and implementing policies, principles, and best practice methods to ensure optimal Department resource allocation and utilization decisions.

The unit works within the agency to compile inventories and analyze the condition of transportation infrastructure assets including, but not limited to, roadways, structures, roadside appurtenances, transit and ridesharing, rail services and facilities, ports, airports, rest areas, and commuter lots. Efforts will continue to be expanded within programs and modes as well as to other programs. The unit is also tasked with overseeing and coordinating the development of:

- strategies for optimal allocation of funds among preservation, operations, and capital expansion program categories to ensure transparency and involvement of all stakeholders;
- procedures for measuring, evaluating, and monitoring condition/deterioration of transportation assets;
- performance measures and target goals;
- analytic models for performance prediction;
- data sharing and analysis via database integration;
- infrastructure preservation policies and programs;
- reporting mechanisms to disseminate information on conditions, costs of maintaining assets, and predicted future conditions, as well as "what if" scenario reports; and
- criteria for resource allocation among infrastructure modal asset classes (e.g., trade-off analysis between highways, rails, transit, and other modes).

The unit will provide a key link between bureaus to ensure that decisions are based on appropriate economic considerations (life-cycle cost, benefit/cost, risk analysis) and data integration from multiple resources. This unit is the lead in coordinating the development, use and publication of executive-level

performance measures. And, it is the Department's vision that all infrastructure assets will be spatially linked to the Department's geographic information system.

Additionally, the Department established a Standing Committee on Performance Measures. The committee consists of upper management personnel across all bureaus of the Department, including the Commissioner, and meets quarterly. This committee provides an avenue for communication amongst the various disciplines at the Department. It provides the high level guidance for staff in the Bureau of Policy and Planning's Policy and Performance Measures Unit. In doing so, the diverse committee members are also charged with reinforcing to Department staff the need for agency-wide support of the necessary data-gathering efforts for reporting, tracking and developing performance measures.

Department Focus Areas

As part of the Department's effort, the "On the Move—Performance Metrics Report", dated January 2009, was developed. The Performance Metrics Report was the Department's preliminary report on performance. The metrics identified in the report represent the starting point for CTDOT's vision of becoming a performance driven organization. Since its publication, the Department has continued to develop, refine and expand its reporting, including objectives, topics and targets.

It is the current practice of the CT DOT to institute and maintain programs that optimize the allocation of resources for all transportation assets.

- The Department's efforts relating to performance measures is intended to utilize cost-effective strategies and methodologies to focus on commonly recognized asset-management principles including, but not limited to, transportation infrastructure condition and serviceability, performance measures and targets, preservation, economic and trade-off analyses, and financial and resource allocation.
- Performance measures are being developed in alignment with and to complement the Department's strategic goals and objectives and to mesh seamlessly with the transportation planning process.

The Department has established performance measures that address the eight focus areas, which are linked to our core agency mission:

- Provide Safe and Secure Travel
- Reduce Congestion and Maximize Throughput
- Preserve and Maintain our
- Transportation Infrastructure
- Provide Mobility Choice, Connectivity
- and Accessibility
- Improve Efficiency and Reliability
- Preserve and Protect the Environment
- Support Economic Growth
- Strive for Organizational Excellence

Performance Measure Reports

Many of the performance measures developed by the Department can be tied to more than one specific focus area. A series of performance measure reports, which focus on results and accountability, are accessible from the Department's website (www.ct.gov/dot), directly from the home page or by navigating to Publications > Other.

These reports address the listed focus areas and measure progress towards meeting targets. Since the implementation of performance measures is a relatively new initiative at the Department and is becoming more popular in the industry, there is continual reassessment of the process. Every effort is being made to improve the data integrity, consistency and format of reporting to ensure easy reference and clear, reliable sourcing.

The performance measures, themselves, are also regularly reviewed by the Department's Performance Measures Standing Committee, to determine their usefulness in helping the Department make strategic decisions for managing its infrastructure assets. Through this process, measures may be added or deleted in the future as well as adjusted for improving effectiveness at achieving the ultimate intended outcome.

Existing System (Asset) Inventory

The Department has historically reported an inventory of its assets through a variety of venues, typically in response to a federal or State mandate related to financial programming or state of good repair. The level of reporting is often determined by the magnitude of the asset's influence on system welfare and performance, its estimated financial value and level of financial aid provided for its purchase, repair or general maintenance.

The Department has historically performed extensive long term capital programming of its assets. Reporting, whether informal or formal, is made periodically to the following agencies:

- the Federal Highways Administration (FHWA),
- the Federal Transit Administration (FTA),
- the Federal Aviation Administration (FAA), and
- the National Highway Traffic Safety Administration (NHTSA)

as well as the Governor, Connecticut General Assembly and various legislative committees and stakeholders.

Additionally, on a large scale, an inventory of the major assets for the State's transportation system has been undertaken every several years as part of an existing systems report. This reporting was more expansive than required but was influenced by State and federal transportation planning mandates and the interest in trend reporting. All modes of travel were represented — air, surface and water, including motorized and non-motorized. This reporting is being transitioned to other formats and, with time, asset management directives are anticipated to be developed.

Job-specific reporting is also performed by various offices in the Department based on the components of the system being managed. For example, bridge condition as well as pavement condition data is reported to the federal government on a yearly basis. In terms of public transportation, the age and number of vehicles in the transit fleet (rolling stock) are some of the aspects of the system tracked for purposes of maintenance and replacement plans. Airport master plans are also a good example of asset inventorying and evaluation for a specific mode.

National Standards

Federal transportation legislation, referred to as Moving Ahead for Progress in the 21st Century (MAP-21), was enacted October 1, 2012. With the passing of this bill, national standards for performance management and asset management will be developed. These federal requirements will likely mirror industry accepted practices relating to measuring the effectiveness of transportation programs and infrastructure.

The legislation requires a performance-based approach for statewide transportation planning and metropolitan transportation planning. State and metropolitan planning organization (MPO) success in meeting these standards will be required to maintain competitiveness and eligibility for federal-aid. Much of the information presented herein on the requirements of this bill is taken directly from federal materials released on MAP-21, either in full or in part.

The Federal Highway Administration maintains a web page for information on MAP-21: www.fhwa.dot.gov/map21. The Department has also launched a web page for navigating MAP-21 related topics; the information can be accessed from the Department's home page (www.ct.gov/dot).

National Goal Areas

With MAP-21, national performance goals were established for federal highway programs.

- Safety—To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.
- Infrastructure Condition—To maintain the highway infrastructure asset system in a state of good repair.
- Congestion reduction—To achieve a significant reduction in congestion on the NHS.
- System Reliability—To improve the efficiency of the surface transportation system.
- Freight Movement and Economic Vitality—To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.
- Environmental Sustainability—To enhance the performance of the transportation system while protecting and enhancing the natural environment.
- Reduced Project Delivery Delays—To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.

Performance Management

Under the National Highway Performance Program (NHPP), within eighteen months of enactment of MAP-21, the Secretary of Transportation will release a rulemaking developed in consultation with states, MPOs, transit agencies and other stakeholders that establishes:

- minimum standards for States to use in developing and operating bridge and pavement management systems;
- performance measures for Interstate and National Highway System (NHS) pavement condition, NHS bridge condition, and Interstate and NHS performance;
- minimum conditions for Interstate pavements that may vary geographically; and
- data elements necessary to collect and maintain standardized data to carry out a performance-based approach.

Additionally, under the Highway Safety Improvement Program (HSIP), within eighteen months of enactment, the Secretary, in consultation with states, MPOs, and other stakeholders, will publish rulemaking to establish measures for the States to use to assess serious injuries and fatalities per vehicle mile traveled and number of serious injuries and fatalities.

Within one year of the final rule on national performance measures, the Department will establish targets for these measures, in coordination with the State's MPOs, to be periodically updated.

- NHPP performance targets—Connecticut will also report to the federal government on progress in achieving targets within four years of the bill enactment and then every two years thereafter. If Connecticut does not meet or make significant progress toward targets for two consecutive reporting periods, the State will then be required to document in its next report the actions it will take to achieve the targets.
- HSIP performance targets—In the event that HSIP performance targets are not met, there will be consequences imposed on the State based on formula that impact the transportation funding priorities as well as tighter reporting requirements. Reporting will be required but the content and schedule has not been outlined as yet.

Transit performance measures are also included in MAP-21 mandates. The federal government will establish state of good repair (SGR) standards for measuring the condition of capital assets of federal-aid recipients, including equipment, rolling stock, infrastructure, and facilities. Measures will be established within one year of the rulemaking process. All recipients of federal transit aid will be required to develop performance targets within three months of the rulemaking.

The Department will coordinate with MPOs and transit providers in establishing targets (including targets for rural transit-related measures). MPOs will coordinate with the State and transit providers in establishing targets.

Performance-Based Planning

Additionally, performance-based planning was incorporated into MAP-21. As such, targets are required to be included as part of several transportation planning processes at both the State and MPO level:

- metropolitan long-range transportation plans;
- metropolitan Transportation Improvement programs (TIPs);
- Statewide Transportation Improvement Program (STIP);
- State asset management plans under the NHPP;
- State performance plans under the Congestion Mitigation and Air Quality (CMAQ) Improvement Program.

Per MAP-21, statewide long-range transportation plans should also include state and MPO targets.

Asset Management

Also as part of the NHPP, the Secretary will release rulemaking, within eighteen months of enactment of MAP-21, that establishes the process for states to use in developing a risk-based, performance-based asset management plan for preserving and improving the condition of the NHS. States are encouraged to include all infrastructure assets within the right-of-way corridor and the plan must include, at least, the following:

- summary list, including condition, of the State's NHS pavements and bridges;
- asset management objectives and measures;
- performance gap identification;
- lifecycle cost and risk management analysis;
- financial plan; and
- investment strategies.

Each State's process must be reviewed and recertified at least every four years. If certification is denied, Connecticut will have 90 days to resolve deficiencies. Penalties via the reduction of NHPP funds to the State exist if Connecticut has not developed and implemented an asset management plan consistent with federal requirements in a timely manner.

Also as part of the MAP-21, there will be minimum interstate pavement and bridge condition rules as well as new bridge and tunnel inspection standards. Additionally, with respect to assets, the inventory of NHS will increase somewhat as a result of new MAP-21 rules. An enhanced NHS will now include roadway miles in Connecticut associated with rural and urban roads serving major population centers, intermodal transportation facilities, and major travel destinations.

Breakdown of a Performance Measure

Performance measures should be quantifiable. Each measure should contribute to a focus area and relate to one or more of the national goal areas.

Transportation performance measures developed for Connecticut will also address Department focus areas and meet the following overarching tests, in that they will be:

- meaningful—significant and directly related to the national goal areas and/or the Department's strategic focus areas;
- credible—based on accurate and reliable data and information;
- simple—in addition to being easily calculated, measures and their results should be easily understood to effectively inform the public and manage agency resources;
- organizationally accepted—valued within the organization, including amongst differing disciplines; and
- responsibility linked—assigned to an organizational unit responsible for maintaining the measure and monitoring its effectiveness.

Several of the components to developing performance measures are described here. The Department will update these definitions as necessary in the next two years.

Essentially, the hierarchy of the various components of a performance measure—moving from general (top) to more detailed (bottom) with an example of how the model can be applied to develop several performance measures from these components would be illustrated as follows:

- National Goal Area – congestion reduction
- Department Focus Area - reduce congestion and maximize throughput
- Objective - reduce percent of State-maintained roadway miles over capacity by one percent per year
- Target (reporting metric, baseline and trend, benchmark) - zero percent of State-maintained roadway miles over capacity
- Resulting Performance Measures -
 - Percent of all State-maintained roadway miles with traffic volumes over capacity, statewide and by planning region.
 - Percent of State-maintained NHS miles with traffic volumes over capacity, statewide and by planning region.
 - Percent of State-maintained expressway miles with traffic volumes over capacity, statewide and by planning region.

National Goal Areas

[National goal areas](#) established under MAP-21 were previously outlined under the national standards discussion in this article. Additional information and guidance relating to MAP-21 can be accessed from the Department's web page (www.ct.gov/dot).

Department Focus Areas

The State initiatives and mandates discussion in this article highlighted the [Department's focus areas](#). The Department will continue to review its current focus areas. Through development of performance and asset management, these areas may be modified, expanded or may be discontinued in lieu of the new national goal areas and State established objectives and targets. Additional discussion on this subject will occur at staff and the Standing Committee level as performance and asset management is further developed.

Objectives

Objectives are typically developed for each performance measure. In doing so, the Department follows the generally accepted S.M.A.R.T. structure:

- Specific,
- Measurable,
- Attainable,
- Realistic, and
- Time-bound.

With respect to time-bound, data will need to be reportable on a reasonable time-frame and frequency. Also, it is important that the data gathering and analysis is easily replicable to be measurable and realistic—otherwise, future reporting will be resource-prohibitive (i.e. time, staff, cost) as well as potentially unreliable for meaningful and credible trends.

Targets

Per MAP-21, States will develop targets to meet the four critical national goal areas for the National Highway Performance Program (NHPP), Highway Safety Improvement Program (HSIP), Congestion Mitigation and Air Quality Improvement Program (CMAQ) as well as aspects of planning, freight movement and transit. These targets will be more specific than the Department's objectives in order to gauge progress or monitor status.

The setting of targets will be based on the following considerations:

- an acceptable condition, usage level, or desired level of service;
- an attainable level of improvement;
- stakeholder or customer expectations for services and points of view;
- regulatory needs, minimum performance standards, or safety requirements;
- agency objectives, policy goals or statewide priorities; and
- cost-effectiveness and affordability with anticipated funding levels, including employment of reasonable data collection and processing costs.

Reporting Metric

The majority of performance measures will be reporting in one of the following units of measure; examples are provided:

- count—e.g. number of riders, number of projects;
- index score—e.g. 0 to 100 scale, 0 to 9 scale, or good/fair/poor average condition score;
- rate—e.g. fatalities per 100 million vehicle miles traveled;
- percentage—e.g. percent in good or better condition;
- ratio—e.g. $40/30=1.33$ travel time with congestion compared with travel time in free flow;
- average or mean—e.g. average fleet age, mean distance traveled; or
- cost/budget—e.g. dollars saved or dollars expended.

Baseline and Trends

A baseline is the current or past level of performance at which an organization or process is functioning, and is the basis for which future performance will be compared. After at least three data points are recorded, a trend line is then plotted. Where reasonable extrapolations are possible, future trends can be projected.

In general, metric results should be easily comparable to themselves over time unless changes to the methods in measurement were necessitated. This assists with the measurement of progress towards the target.

Benchmarks

Benchmarking is the comparison of the Department's products or services against the best existing products or services of the same type. Benchmarking will only be used where appropriate or necessary. For example, the Department's performance could be compared against the following:

- standard— e.g. Federal Highway Administration (FHWA), American Association of State Highway and Transportation Officials (AASHTO);
- other state peers—e.g. national average, New England area states
- Best in the business—e.g. state or country; or
- Department's own prior record.

Other Notes and Resources

The information in this article is provided as a first step in understanding the transportation planning, development, design and implementation process. Many topics focus on elements particularly relevant to locally administered transportation projects. The full detail of the process, particularly rules of eligibility, special provisions, requirements, or constraints is not within the purview of this reference document. It is imperative that municipal staff contact their RPO early in the process for guidance.

In addition to the CT DOT website at www.ct.gov/dot, the Local Project Administration website of the University of Connecticut's CTI-Technology Transfer Center provides many resources for municipal staff and managers of local projects: www.t2center.uconn.edu. Other articles in the Reference Series: Transportation in Connecticut are posted at the Department's website and can be located by navigating to Publications > Pamphlets.

Article No. 05, entitled "FHWA/FTA Statewide Transportation Improvement Program (STIP)", may also be of interest. This simple guide addresses common inquiries regarding the process for programming federal aid for transportation projects received from the Federal Highway Administration and Federal Transit Administration.

Connecticut...On The Move!

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