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New Jersey Department of Transportation
Bureau of Research

**Technical Brief**

# Asset Management Implementation Strategy

*The objective of this research effort was to assist the New Jersey Department of Transportation (NJDOT) Office of Capital Investment Strategies (CIS) in developing an asset management decision support model for use in its resource allocation decisions. This effort both integrates with and builds off of NJDOT's existing asset management program. The research team formulated an appropriate decision support model that could inform NJDOT's project prioritization strategy and assist NJDOT in its cross-asset resource allocation decisions. The model specifies how NJDOT could use asset management data and systems to support integrated high-level resource allocation decisions and also focuses on how to use available data to prioritize identified problems (also termed "candidate projects" or "project alternatives" in this report), as well as planned projects.*

## Background

The New Jersey Department of Transportation (NJDOT) faces a significant set of challenges with respect to determining what investments to make in its transportation system. New Jersey's transportation network is extensive and well-developed. The State's transportation assets, including its roads, bridges, and other elements of its transportation infrastructure, are in widely varying condition, and have a vast range of needs. The available funds for transportation are not sufficient for supporting all of the needs that have been identified for preserving and improving the transportation network. Thus, NJDOT is challenged to balance investments in different asset and investment categories to best preserve the State's transportation network, while making targeted improvements in mobility, safety and other areas.

## Research Objectives and Approach

The objective of this research effort was to develop an asset management decision support model for resource allocation that integrates with NJDOT's existing asset management program. The approach included researching best practices in asset management, presenting options for an Asset Management Decision Support Model; and developing logical models/algorithms for allocating NJDOT resources, prioritizing problems and projects, and optimizing project timing..

## Findings

Several components of a decision support tool were developed, including a set of functions to estimate the expected benefits of potential projects by program area (pavement, bridge, mobility, safety), a process for combining these estimates into an overall score, and a means to optimize investments across program categories, given a set of funding

constraints (by year, by region, etc.). These estimates were formulated based on analysis of NJDOT asset data and by using Federal Highway Administration (FHWA) models for predicting agency and direct transportation benefits for representative, candidate project.

Provided with a set of candidate improvements, and predicted agency and direct transportation benefits of those improvements, the research team then developed a set of score functions for approximating the benefits by investment type. The score functions were intended to be easily computed functions correlated with the benefits estimated using FHWA models. For instance, for two similar highway improvements, one would generally expect the improvement on the section with higher average daily traffic (ADT) to have the higher score. Standard statistical techniques were used to determine statistically significant variables, and an appropriate functional form for the score functions.

To determine how to weight the scores calculated for each program area (pavement, bridge, mobility, safety), the research team facilitated a workshop with NJDOT staff. Prior to the workshop, NJDOT provided network-level data on predicted future conditions given alternative funding assumptions. These data were used to create a range of candidate scenarios reflecting different weights on each of the improvement types. These scenarios were shown to human decision makers, who then expressed their preferences concerning the different scenarios, ultimately resulting in a consensus concerning which scenario was preferred, which dictated the weights. Users review sets of three alternatives at a time, alternatively designating more and less preferred alternatives in an effort to narrow in on a preferred alternative.

Having developed weighted scores for candidate projects or problem statements, the research team developed an optimization routine for prioritizing projects given a set of constraints, including total budget (by year, region, program area, etc.), project phase (e.g., preliminary engineering is required before construction), and others. The optimization model will help NJDOT make prioritization decisions across program categories.

## For More Information Contact:


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A final report is available on-line at: http://www.state.nj.us/transportation/refdata/research/. If you would like a copy of the full report, send an e-mail to: Research.Bureau@dot.state.nj.us.

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