

0-6683: Develop a Pavement Project Evaluation Index to Support the 4-Year Pavement Management Plan

Background

A pavement management plan (PMP) identifies candidate maintenance and rehabilitation (M&R) projects for a particular roadway network over a multi-year planning period. The PMP is a living document because projects are reevaluated and reprioritized every year. The PMP describes the location, treatment type, year, and cost of the planned M&R projects, and provides an assessment of the impact of these projects on the network condition throughout the planning period.

The Texas Department of Transportation (TxDOT) instituted the PMP requirement for all 25 districts to help expend its limited resources and achieve its performance goals in a cost-effective manner and in response to legislative requirements (Rider 55 of TxDOT's appropriations bill). Each of TxDOT's 25 districts prepares a PMP that identifies candidate M&R projects for a 4-year planning period. TxDOT is responsible for the upkeep of approximately 194,000 lane-miles of roadway pavement.

This research project seeks to support and enhance the PMP development process through a consistent methodology and computational tool. The methodology will help identify pavement M&R projects that yield the maximum performance benefits expected under different budget scenarios over a multi-year planning period.

What the Researchers Did

Researchers developed a systematic methodology for forming and prioritizing pavement M&R projects (e.g., Figure 1). TxDOT engineers can use this methodology to generate defensible and cost-effective 4-year PMPs. The researchers implemented the methodology in a web-based software tool for evaluation by TxDOT personnel. Specifically, the research team:

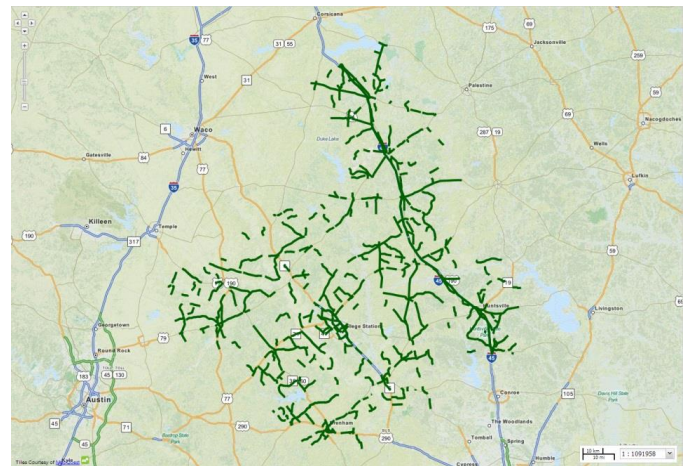


Figure 1. Candidate M&R Projects Identified by the Developed Methodology for Bryan District (2012-2015).

- Devised a scheme for forming realistic M&R projects out of data collection sections that are typically 0.5 miles long.
- Identified key factors that influence M&R project prioritization decisions at the district level, elicited representative weights for these decision factors based on input from TxDOT districts, and developed a multi-criteria project priority index based on these factors for use in the prioritization of M&R projects.

Research Performed by:
Texas A&M Transportation Institute

Research Supervisor:
Nasir G. Gharaibeh, TTI

Researchers:
Paul Narciso, TTI
Youngkwon Cha, TTI
Jose R. Menendez, TTI
Jeongho Oh, TTI
Andrew Wimsatt, TTI
Samer Dessouky, The University of Texas at San Antonio

Project Completed:
8-31-2013

- Integrated the developed project formation scheme, multi-criteria project priority index, and benefit-cost analysis to create a methodology and computational tool for generating PMPs and assessing their impact on the network condition (e.g., Figure 2).
- Tested and validated the developed methodology through comparisons to actual district PMPs.

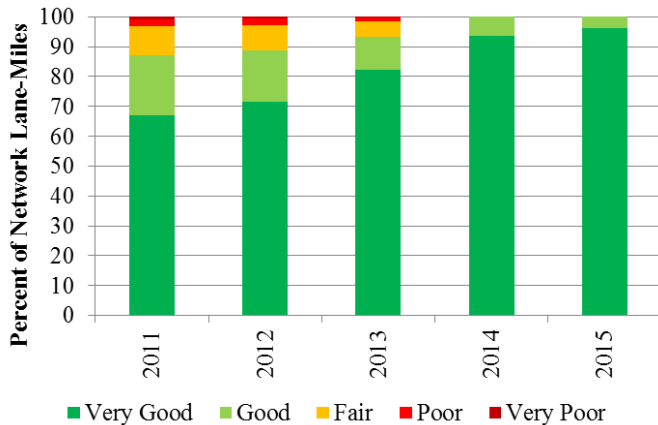


Figure 2. Predicted Impact of Candidate M&R Projects on Network Condition in Bryan District.

What They Found

Regarding the factors that are deemed important by TxDOT districts when prioritizing M&R projects, the researchers found the following:

- For urban and rural districts, pavement current condition and M&R initial cost are considered the most important factors.
- For metro districts, long-term performance benefits, M&R initial cost, and current traffic volume are considered the most important factors.
- For urban and rural districts, the district's own visual assessment is the top indicator of pavement current condition, followed by distress and condition scores and, to a lesser extent, skid resistance.

- For metro districts, skid resistance is the top indicator of pavement current condition, followed by the district's own visual assessment.
- All district types (metro, urban, and rural) consistently assigned the least weight to ride score as an indicator of pavement current condition.

Based on testing and validating the PMP methodology for the Bryan, Fort Worth, and Lubbock Districts, the researchers concluded the following:

- In terms of project boundaries, the PMPs developed by the districts and those generated through the PMP methodology agreed 50 to 62 percent of the time.
- Mismatches between the PMPs developed by the districts and those generated through the PMP methodology can be attributed to the influence of district visual assessment, skid assessment, structural assessment, and forced projects on the districts' PMPs.
- For the same budget, the methodology allocates funds to projects that have greater impact on improving the network condition score. For example, the PMPs generated through the PMP methodology are predicted to exceed the statewide goal (i.e., 90 percent of pavement lane-miles in good or better condition) by 2013, whereas the districts' PMPs remain at (or slightly above) this target throughout 2012–2015.

What This Means

The results of this research project highlight the potential of the developed methodology to support the 4-year pavement management process by incorporating district priorities, producing cost-effective PMPs, and providing insights into the impact of these plans on the network condition. The research team recommends implementing the developed PMP methodology and computational tool at pilot districts.

For More Information

Project Manager:

Kevin Pete, TxDOT, (512) 416-4738

Research Supervisor:

Nasir G. Gharaibeh, TTI, (979) 845-3362

Technical reports when published are available at <http://library.ctr.utexas.edu>.

Research and Technology Implementation Office

Texas Department of Transportation

125 E. 11th Street

Austin, TX 78701-2483

www.txdot.gov

Keyword: Research