

MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 18-358 (project 463) | December 2018

Rehabilitation Project Selection and Scheduling in Transportation Networks



the **ISSUE**

Highway project selection and scheduling are traditionally treated as two separate problems in the literature. There is a pressing need to develop an integrated framework for simultaneous selection and scheduling of multiple maintenance and rehabilitation (M&R) projects at the network level.

the **RESEARCH**

This goal of this study is to develop a systems approach for selecting and scheduling M&R projects simultaneously. The proposed modeling framework will accomplish the following two objectives: 1) explicitly capture the impacts of the presence of multiple M&R projects on travelers' route choice behavior, 2) strategically select and schedule M&R projects in a transportation network over a finite planning horizon to maximize social benefit. Among various types of M&R projects, road capacity expansion is the one that requires the most resources and takes the longest time to complete. Therefore, this study focuses on project selection and scheduling for road capacity expansion projects.

The modeling framework adopts a bi-level programming structure, whose upper-level problem represents the selection of M&R projects and their corresponding construction schedules, while the lower-level problem captures travelers' spontaneous response to the choice and schedule of multiple M&R projects made in the upper level. We employ the active-set algorithm to solve the model and test two numerical examples to demonstrate the effectiveness of the proposed model.

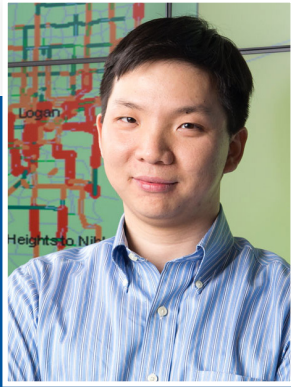


A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

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University of Denver
University of Utah

Utah State University
University of Wyoming



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Rehabilitation Project
Selection and Scheduling in
Transportation Networks

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the FINDINGS

This study proposed a systems approach for selecting and scheduling M&R projects simultaneously. The primary significance of the model developed in this study is that it introduces the time dimension into the traditional network design problem (NDP) to consider the impact of road construction work and applies the overtime policy to further improve the design. The proposed model can solve the capacity expansion project selection and project scheduling problems simultaneously. The proposed model also allows for the addition of time-dependent resource constraints. Results show that the proposed model has the potential of providing better solutions than a conventional approach that separately optimizes the selection and scheduling of road expansion projects. Note that the modeling framework and solution algorithm developed in this study are capable of modeling the selection and scheduling of other types of M&R projects.

the IMPACT

This study provides transportation agencies an integrated approach for selecting and scheduling M&R projects. Agencies can use the proposed modeling framework to choose a limited number of projects subject to budget constraints and determine the optimal sequence of implementing those selected projects within a finite planning horizon simultaneously.

For more information on this project, download the entire report at <http://www.ugpti.org/resources/reports/details.php?id=935>

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7767 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.



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