

Modifying Winter Performance Criteria Using a Storm Severity Index

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ABSTRACT

The challenge of any given winter storm, from the point of view of the service provider, is a direct function of how severe that storm is. Therefore, using a performance criterion that does not take into account the severity of the storm provides an incomplete measure of how well a given agency has performed during any specific storm. The challenge is to normalize performance as a function of the severity of the storm. This paper will describe a method for this normalization. A previously developed winter storm index expresses the severity of a storm as a number between 0 and 1. The severity is a function of six variables: the type of precipitation in the storm, the pavement temperature during the storm, the early storm behavior, the wind speeds during the storm, the pavement temperature trend after the storm, and the wind speeds after the storm. The algorithm developed to measure storm severity in this way was previously evaluated by a group (about 40) of road managers who provided input to the process. Measuring winter service performance can be done in a number of different ways: for example, pavement friction, visual observation of the pavement condition, average vehicle speeds, and average traffic volume. Each of these methods have benefits and drawbacks. The challenge addressed in this paper is to take one of the measures (average vehicle speed) and use the storm severity index to normalize the performance measure. Studies have shown that vehicle speeds drop during winter storms. The amount of speed reduction is a function of the road type as well as the storm severity. Examination of historical data indicates that there is a maximum expected speed reduction under the most severe conditions, beyond which the road essentially becomes closed (either by direct agency action, or as a result of crashes and traffic jams). This maximum expected speed reduction can be considered a target value for the most severe storm (i.e. one with a storm severity of 1). As an example, on a typical US 2-lane highway, the maximum expected speed reduction is 18 mph. Since most storms are not so severe, this speed reduction can be simply modified by multiplying it by the storm severity. So, in a case where the storm severity is 0.50, the expected speed reduction would be 9 mph (18×0.5). If average speeds on a given road segment during a storm are seen to drop more than this, then additional resources are needed and can be supplied prior to the end of the storm.