

RESULTS SUMMARY

Researchers developed a step-by-step guide and a flowchart tool to help agencies identify or develop severity index methods that fit their needs and their available data sources.

PROJECT DETAILS

Project Title: Evaluation of SSI and WSI Variables

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TOOLS AND STRATEGIES FOR DEVELOPING WINTER WEATHER INDEXES

Transportation agencies use storm severity indexes and winter severity indexes to gauge the impact of weather on roadway maintenance resources. By translating variables like storm duration, total snowfall and pavement temperature into a single severity value, these indexes are designed to allow agencies to make apples-to-apples comparisons between storms and across multiple winter seasons. In this way, severity indexes can be a valuable tool for measuring performance, managing maintenance operations, and budgeting for future costs and resource use.

Need for Research

Agencies need reliable and accurate severity indexes that are relatively simple to implement. However, developing an effective severity index can be challenging due to the complexity of weather and road environments, the multitude of variables that weather severity encompasses, and the availability and quality of data. With a range of options available, Clear Roads agencies requested guidance to help them identify and develop severity indexes that will best serve their particular needs.

Objectives and Methodology

The goal of this study was to evaluate severity index variables and methodologies and develop guidance for agencies on how to improve their existing indexes or develop new ones.

Researchers began by conducting a literature review to catalog methodologies, types of data, data sources and data analysis methods. They then surveyed local, state and international agencies about the variables, data and calculations used in their severity indexes, conducting follow-up interviews with selected agencies.

From this review, researchers selected 10 severity indexes that survey respondents identified as effective and evaluated the variables, data and data sources used in each. They cataloged 25 variables used in severity indexes in five categories:



Roadside environmental sensor stations collect data on air temperature, wind speed and direction, precipitation, visibility, and other variables used in severity indexes. (Photo courtesy of Utah DOT.)

atmospheric variables, precipitation variables, pavement variables, radiation variables and temporal variables.

Researchers also identified 17 data sources and classified them into four groups: road weather data sources, federal government-managed weather station networks, modeled data analyses, and other networks and databases.

Results

A key finding of this study was that developing a single standard severity index is not feasible because of differences in agency capabilities, goals, data access and partnerships as well as climate variations. Instead, researchers developed a step-by-step guide that agencies can use to create or improve their own index. The guide recommends six high-level steps:

1. Identify goals for severity index use.
2. Identify which agency staff should be involved.

3. Identify variables and data sources.
4. Develop or identify the severity index method to apply.
5. Identify the severity index application and how it will be used.
6. Evaluate the results and/or improve the severity index.

The guide details important considerations for completing each step, providing examples and lessons learned from agencies that have implemented the 10 severity indexes profiled in the report.

To help agencies select a severity index, researchers developed a simple flowchart tool that asks users about the weather patterns and key concerns for their jurisdiction and the variables that are of interest or available to them. The tool then highlights the severity indexes that use the relevant variables. This allows the user to assess the most feasible option: using or modifying an existing severity index or developing a new custom index.

Benefits and Further Research

This research compiles in one place and makes accessible a wealth of information about severity indexes, how to evaluate them, and alternatives to consider. By choosing the severity index that best fits their needs, agencies can more fully realize the benefit of weather-related performance measures as they develop budgets, allocate resources and provide services.

Future research could help refine our understanding of which severity index methods are most accurate and reliable. For example, the outputs from different methods could be compared at the same location. Additional research could also examine ways to incorporate other types of data into severity indexes, including mobile observations, traffic data, and data for special weather scenarios such as freezing rain, blowing snow and widespread frost.

“For states and municipalities interested in developing weather severity indexes, the flowchart tool will give them a solid idea of what data they need and what kind of index will answer their questions.”

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