

## RESULTS SUMMARY

Researchers found that agencies with effective response plans for severe winter weather employ a transportation emergency management office, facilitate interagency cooperation, and embrace technologies for tracking and reallocating equipment.

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# EXTREME WINTER STORM RESPONSES REQUIRE COORDINATION, PLANNING

**A**s severe winter storms become increasingly common and potentially more disruptive, state DOTs are responding with planning that goes beyond routine winter maintenance activities. Agencies look to one another for best practices in planning and responding to severe winter weather.

## Need for Research

Severe winter storms may not cause damage as acute as that from hurricanes, tornadoes or flooding, but they can affect larger geographic areas for longer periods of time, impeding mobility on a regional scale. Winter storms have become more frequent and intense since the 1950s, and the northern United States expects increasing extreme precipitation in the coming decades. Clear Roads member agencies are interested in how states plan for severe winter weather, how state DOTs coordinate with other agencies, and what best practices can be identified for storm preparation.

## Objectives and Methodology

This study's goal was to synthesize best practices for response planning for severe-to-extreme winter storms, including coordination between agencies.

Researchers from the University of Vermont Transportation Research Center conducted a literature search and a survey of established practices at transportation and emergency management agencies. The 52 survey responses included 30 state transportation and local public works agencies as well as two state emergency management departments.

Eighteen state DOT respondents indicated that their agency had a written winter emergency response plan. Researchers identified six states with thorough operational plans to serve as the subjects of case studies: Colorado, Georgia, Michigan, New York, Pennsylvania and South Dakota. Through in-depth interviews, the research team explored (1) the organizational structures of the DOT divisions responsible for the plans, (2) how the plans are implemented, and (3) the differences among states in managing extreme winter storm responses.

## PROJECT DETAILS

**Project Title:** Emergency Operations Methodology for Extreme Winter Storm Events

**Project Number:** CR16-04

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A 2015 winter storm in Massachusetts was so severe that it led to the activation of the State Emergency Operations Center for 28 days and required interagency coordination that included assistance from the Massachusetts National Guard.

## Results

The literature review identified key activities transportation agencies must execute to ensure public safety and minimize economic impacts from extreme storms. For example, snow and ice control operations must ensure that emergency supplies can be delivered and that police and fire departments can provide services throughout a winter storm emergency. Transportation emergency management operations must maintain access to hospitals, power stations and other critical facilities, keep evacuation routes at sufficient capacity, and facilitate repairs to infrastructure.

From the six case studies, investigators distilled several recommended best practices for achieving these outcomes, grouped into two categories: organization and communication, and planning, training and review. Organizational best practices include:

- Establishing a transportation office of emergency management.
- Holding structured conference calls with stakeholders before forecasted storms.
- Creating plans for communicating with the public about road conditions, speed restrictions and travel times.
- Using road-weather information systems and automatic vehicle location systems to track resources for efficient reallocation during storms.
- Maintaining regional coalitions through workshops, conferences and communication channels that cross maintenance districts and state lines.

Planning, training and review best practices include:

- Developing scalable roadway snow and ice control operations plans that allow for adjusting routes, work shifts and resource allocations.

- Establishing legal authority for road restrictions in coordination with state highway patrols.
- Developing procedures for identifying and assessing winter threats.
- Holding formal training and review for emergency operations, including annual or biannual operations meetings and after-action reviews.

The six case studies demonstrate varied approaches to effective organization and planning. Bottom-up approaches focus on localized control and autonomy, emphasizing flexibility in responses, while top-down approaches revolve around centralized planning and direction and formalized plans and procedures. For example, when reallocating personnel in the field, some states prefer that plow operators report to supervisors in the districts they have been shifted to, and others prefer that shifted personnel follow a centralized statewide plan. Both approaches have been successful for the states that use them.

## Benefits and Further Research

State DOTs can use the case studies and recommendations in the report to help develop and improve their own response plans for more efficient, flexible approaches to ensuring public safety during intense winter storms.

A key finding is that the agencies profiled in this study all assigned a transportation office or official to lead emergency operations in response to severe storms. The role may be filled by staff with emergency management experience or with snow-removal experience. Researchers found that either approach can be effective, though each has implications for the organizational structure. Further study could more fully explore the relative merits of these two approaches.

“It is vital that transportation departments develop detailed plans to respond to severe and extreme winter storm events. This project’s case studies illustrate several approaches to coordinating with state agencies and local officials to develop an effective plan.”

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