

How to Minimize Deicing's Environmental Impact

As concern for the environment continues to grow among the public and winter maintenance professionals, NCHRP oversaw development of comprehensive guidelines for selecting environmentally friendly snow and ice control materials. AASHTO implemented these guidelines in a computer-based winter maintenance training program, and other organizations took a proactive role in encouraging their use at the state and local levels.



The winter maintenance community is increasingly interested in minimizing the environmental impacts of deicing chemicals.

Establishing Guidelines to Minimize the Environmental Effects of Winter Maintenance

Every winter, transportation agencies apply large quantities of salt and other chemicals to roads to keep them clear of snow and ice. Rational decision-making guidelines were needed to help maintenance managers assess the properties of various materials and take steps to minimize their environmental effects.

To help meet this need, NCHRP conducted NCHRP Project 06-16 and produced *NCHRP Report 577: Guidelines for the Selection of Snow and Ice Control Materials to Mitigate Environmental Impacts* (www.trb.org/Main/Blurbs/158876.aspx). The report provides guidelines through an evaluation of cost, performance, and impacts on the environment and infrastructure.

The project also produced a decision tool for selecting snow and ice control materials to suit the specific needs of any given highway agency (www.trb.org/NotesDocs/NCHRP06-16_MaterialSelectionWizard.zip). The software serves as a purchasing specification and as a quality assurance monitoring program that includes evaluation procedures and standard test methods.

At the conclusion of the research, there was a need to communicate the guidelines and tools to practitioners at state and local transportation agencies.

“This project produced very useful results that needed to be implemented in state DOT training programs,” says project panelist Lee Smithson, coordinator for AASHTO’s Snow and Ice Pooled Fund Cooperative Program and former Iowa DOT state maintenance engineer. “Training needs included processes for field personnel to assess potential impacts to the natural environment along roadways in their maintenance area, as well as procedures for determining comparative material prices and writing material purchase specifications.”

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Paths to Practice

AASHTO computer-based training modules

AASHTO often serves as a critical bridge between NCHRP research and practitioners, and played an especially crucial role in this project, developing a computer-based training program on all aspects of winter maintenance and snow and ice control.

“A key to implementation of this project was AASHTO taking the lead and utilizing expertise from experienced state and local snow and ice control experts to develop these modules,” Smithson says.

“These modules are successfully teaching field and central office maintenance personnel how snow and ice control materials impact the receiving environment.”

Self-paced and accommodating multiple learning styles, the program’s eight modules can be accessed on maintenance garage computers or via the web. The web-based version was also made Shareable Content Object Reference Model-compliant, allowing integration with state DOT learning management systems.

The AASHTO computer-based training program is in use at nearly all state DOTs,

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Implementation Strategies AT A GLANCE

- **Partnering with AASHTO to Deliver Training:** Results were used to create computer-based training modules on all aspects of winter maintenance and snow and ice control.
- **Facilitating State and Local Implementation:** The American Public Works Association and the National Association of County Engineers helped incorporate results into the winter maintenance training programs of state and local agencies.
- **Disseminating Results:** Panel members presented results at conferences, symposia, and AASHTO meetings.
- **Framing Research for Practitioner Use:** Implementation was a key consideration in developing research goals.

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according to Smithson. The American Public Works Association (APWA) and the National Association of County Engineers (NACE) also include it in their recommended training programs.

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“These modules are successfully teaching field and central office maintenance personnel how snow and ice control materials impact the receiving environment, and how to recognize and rank these impacts,” Smithson says.

Facilitating state and local implementation

While AASHTO took the lead in making the guidelines and tools available nationally, APWA and NACE led implementation efforts at the state and local levels.



Chlorides from deicing salts can cause leaf burn—discoloration and decay in plant tissues—and other environmental effects.

“There were many marketing champions from both APWA and NACE,” Smithson says. “APWA incorporated research results into its certification program, and some state DOTs made the guidelines a requirement in their training programs.”

Ultimately, implementation of research depends on state and local agencies being proactive, according to Smithson, and sometimes this requires a change in culture. Michael Fitch, project panel member and associate principal research scientist at the Virginia Center for Transportation Innovation and Research, agrees. “There are risks involved with changing the way you do things,” Fitch says. “Implementing results

often requires a willingness to accept risks—because sometimes there will be setbacks.” Fitch advocates seeing such setbacks not as failures but as stepping stones to meaningful change.

Overcoming this resistance, according to Smithson, requires advocates within the agencies themselves to show that the potential benefits are worth the risks. “The money and support are out there,” Smithson says. “It’s just a matter of convincing people there are achievable outcomes that produce savings and improve customer service.”

Disseminating results

Disseminating results is critical to such advocacy and overcoming resistance at all levels—national, state, and local. “The more that agencies stay informed and key leaders stay current with research, the more likely implementation is to be successful,” Smithson says.

However, there’s still a risk, notes Fitch, that key decision makers won’t have the time to read lengthy reports. “*NCHRP Report 577* is a big document,” Fitch says. “It’s crucial that this really important research be boiled down into summaries and highlights so it’s accessible to leaders who are pressed for time.”

Also critical is presenting findings to fellow practitioners. Smithson himself wrote technical papers about the computer-based training program and presented them at conferences and symposia, including Transportation Association of Canada Annual meetings, PIARC in Sweden, SIRWEC in Finland, AASHTO Highway Subcommittee on Maintenance summer meetings, and various regional snow conferences for APWA and state DOTs.

There is evidence that such efforts have led to *NCHRP Report 577* having a significant reach within the transportation community. “The report is commonly referenced in other research designed to reduce the impacts of winter maintenance practices on the environment,” Fitch says. “It is also very commonly mentioned among DOT winter maintenance experts.”

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AASHTO’s computer-based training program uses animation, video, and pre- and post-assessment to foster environmentally aware decision making.

Keys to Implementation Success

In the end, successful implementation of *NCHRP Report 577* depended on multiple channels—from AASHTO, APWA, and NACE involvement to aggressive dissemination efforts and proactive engagement by state and local agencies.

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Fitch also believes that the way the research project was framed from the beginning was critical to its implementation success. “You have to ask the right questions from the get-go to optimize chances for implementation,” he says. “That’s something the excellent research team for this project did very well.”

Smithson agrees, noting that the report served as an excellent foundation for the development of computer-based training.

“When the project started, I was hoping for a broad foundation in the subject area that could be made understandable to field and central office personnel,” Smithson says. “That’s exactly what we got.”

Fitch concludes, “I felt really good about this project, because I saw a product that could clearly serve as a critical foundation to implementation on both the operations and research sides of organizations.”

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